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The Choice of Unemployment Indicators for Assessing Internal Equilibrium and Fiscal and Monetary Regulation: The Example of Eastern European Countries*

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Abstract

The possibilities of monetary and fiscal regulation are actively used today to create conditions for establishing the desired macroeconomic proportions or macroeconomic equilibrium. To obtain feedback on the effectiveness of monetary and fiscal interaction, as well as on deviations in the macroeconomic environment, it would be advisable to use aggregated macroeconomic indicators presented in the literature - Balanced Development Index (BDI) or General Macroeconomic Equilibrium indicator (GME). The choice for further improvement of the GME calculation methodology is due to the high level of aggregation of macroeconomic data. This opens up wide opportunities for unification of calculations and subsequent use of GME for comparative analysis of the economies of different countries. Also, the advantage of the GME indicator is the comparability of the obtained estimates also for long-term data. For this purpose, the statistical method of least squares was applied to fill incomplete time series of the non-accelerating inflation rate of unemployment (NAIRU) indicator using LTUR - a widely published statistical indicator of the labor market. As a result of the work done, we come to the conclusion that the transition to using a variable indicator of natural unemployment, based on widely available data on LTUR, is a reasonable and necessary improvement in the methodology for calculating the GME indicator. Testing the replacement of the unemployment indicator on data from 5 economies of Eastern Europe gave good results, which allows further use of the proposed improvement in studying the results of fiscal and monetary regulation.

Introduction

Assessing actual deviations of internal and external macroeconomic equilibrium from the long-term trajectory or from predicted values is an urgent task of great practical importance. After all, the more accurate the results of an ex-post assessment of the macroeconomic environment and its imbalances, the more accurately it will be possible to plan the necessary changes in economic policy, in particular, its fiscal and monetary components. In turn, clarification of fiscal and monetary guidelines for economic policy makes a positive contribution to the formation of a sound strategy for managing the trajectory of sustainable economic development.

The basis for a comprehensive assessment of macroeconomic dynamics are aggregated indicators, such as gross and net output indicators, value added indicators, employment indicators, price indices and others. In order to comprehensively assess macroeconomic dynamics, a wide range of economic, social, institutional, infrastructural and other indicators are usually used. Depending on the methodology used, these may be indicators reflecting the state of the entire economy (macro level), as well as regional and sectoral indicators, which together help assess the dynamics and response of the economic system to internal and external shocks - not only economic ones. For example, in an

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aggregated assessment of macroeconomic equilibrium based on the original Balanced Development Index (BDI) methodology proposed by Koźmiński et al. (2014; 2016), indicators of the level of social development, indicators of entrepreneurial activity and others are used.

The set of economic, social, institutional, infrastructural, etc. characteristics that make it possible to judge the state of macroeconomic equilibrium and dynamics forms the basis for the formation of a single indicator or index that meets the requirements of universality, compatibility, adequacy and continuity. An example of such an indicator is the general macroeconomic equilibrium indicator (GME). This indicator, also called the "macroeconomic equilibrium index" takes into account changes in the main macroeconomic proportions and their impact on the internal and external balance of the economy. The GME indicator was first described in 2004 using the example of the Ukrainian economy (Alimpiiev, 2004). The GME was also used for cross-country comparisons as part of a study of the economic results of post-socialist transformation in 1990-2002 in a number of economies in Eastern Europe - Ukraine, Bulgaria, Romania, Hungary, the Czech Republic, Slovakia and Poland (Alimpiiev, 2005; 2013; 2018).

General macroeconomic equilibrium indicator meets the most important requirements that apply to tools for assessing macroeconomic equilibrium, and which can be reduced to the following:

- the most complete coverage and reflection of all significant macroeconomic, social and other characteristics of the economy;
- temporal continuity and spatial comparability of indicators;
- clarity, simplicity, compactness and usability of presenting assessments.

These requirements formed the basis for choosing the methodology for compiling the GME indicator.

Theoretical and methodological framework

The theoretical basis of the GME calculation methodology is that the trajectory of balanced economic development is based on internal and external equilibrium. Based on the fundamental concepts of macroeconomic theory, a quantitative assessment is given to the extent to which the actual values of macroeconomic indicators deviate from the indicators taken as desired or target. Thus, it becomes possible to quantify how much the actual state of a given economy deviates from the desired and possible state under the prevailing conditions and existing opportunities. We define this state as internal and external balance. Special attention in the GME indicator is paid to the so-called gap between internal and external equilibrium, which characterizes the relative degree of deviation of these two components of macroeconomic equilibrium from their desired values. At the same time, the GME calculation methodology we adopted as the basis is not without the need to calibrate the final index, since the equilibrium parameters as a set of macroeconomic proportions in different economic systems can differ significantly.

The key macroeconomic factor in determining the deviation of the economy from the state of internal equilibrium is the so-called natural unemployment rate (NRU), which is most often defined as the share of the unemployed corresponding to the appropriate level of full employment in the economy, i.e. potential GDP. This unemployment rate is not related to the dynamics of economic growth. It depends on natural reasons, such as: staff turnover, migration, demographic factors. It should be noted that today there is no single generally accepted approach to the theoretical determination of the natural rate of unemployment. In the absence of a clear theoretical description, various ways to quantify this indicator have been proposed. The most often used indicator in applied scientific research as the natural level of unemployment is the Non-accelerating inflation rate of unemployment (NAIRU) also called Equilibrium unemployment rate, which is defined as is estimated using a Kalman filter in a Phillips curve framework which assumes inflation expectations are anchored at the central bank's inflation target (Rusticelli et al., 2015).

To determine the natural rate of unemployment, there are quite a lot of different methods, none of which gives an accurate estimate, since the measured value of NRU itself is not observable. In applied scientific research, when assessing the deviation of the actual level of aggregate output in the economy from its potential values, that is, possible in conditions of full employment and full use of all production capabilities in a given economy, several different methods are used to determine the minimum fixed level of unemployment, which can be considered irreducible due to natural socio-demographic reasons. The NRU calculation methods discussed in the literature can be divided into two categories.

1. Methods that allow obtaining a single NRU value for the entire study period. We include:
- empirical constant method,
- average value method,
- a method of balancing incoming and outgoing flows in the labor market.

2. Methods that allow obtaining a variable NRU value in accordance with current, retrospective and, in some cases, forecast macroeconomic conditions. We include:
- SMA(10) method
- OECD method

- LTUR method

Methods allowing to obtain a single NRU value for the entire study period

The empirical constant method or "just take 4"

The simplest way to obtain quite high-quality estimates of the deviation of internal equilibrium is to use the natural unemployment rate as an empirically determined constant. In particular, according to Geets et al. (2003), according to their empirical research, the natural unemployment rate for Ukraine in the first 10 years of independence (1992-2002) was approximately 4%.

Average value method. This method of measuring the natural rate of unemployment consists in calculating it as the average annual rate of unemployment over a long period. This method is based on the proposition that the average level of actual unemployment over long periods of time smooths out its cyclical fluctuations around the natural level. This method of determining the natural level of unemployment assumes that the level of actual unemployment fluctuates over a long period, i.e. periods with a high level of unemployment alternate with periods of low unemployment (Semenova, 2016).

Method of balancing incoming and outgoing flows in the labor market

This approach to determining the natural rate of unemployment was proposed by Mankiw (1994). He starts from the fact that the equilibrium in the labor market is observed when the number of people laid off is equal to the number of employed:

$$fU=s(L-U), \qquad (1)$$

where f is the employment rate, which reflects the share of employed unemployed among the unemployed;

s is the layoff coefficient, which reflects the share of laid-off workers among the employed;
L – economically active population;
U – number of unemployed;
(L-U) – number of employed.

However, the practical application of the Mankiw method may be difficult due to the following reasons. First, if the necessary condition of this method is not fulfilled - the constant number of labor force during the studied period of time. Secondly, if in the labor market the size of the gap between the number of employed and the number of dismissed citizens is unstable. That is, if the value of this gap fluctuates significantly during the studied period of time (Semenova, 2016).

From the review of methods that allow to obtain a single unchanging value of the natural rate of unemployment for medium-term and even long-term periods of time, it follows that such an approach would be too simplistic, since the value of the natural rate of unemployment is a variable, albeit inert value.
According to Abel and Bernanke (2005): "a single official value of the natural unemployment rate is not accepted, many economists believe that its value fluctuated between 4 and 5% during the 1950s and increased to 6% in the 1980s. Many economists believe that the natural rate of unemployment then decreased to 5.5% or to an even lower value in the 1990s." In other words, the more common point of view is the noticeable "drift" of the natural level of unemployment, at least at the level of 10-year intervals. Consequently, calculation methods that allow obtaining a variable value of the natural level of unemployment seem more preferable.

Methods allowing to obtain the variable value of NRU

Simple moving average method SMA(10)

According to the methodology proposed by Nebava (2003), the natural unemployment rate can be defined as the average of the actual unemployment rate over the previous 10 years or a longer period:

$$U(SMA_t)=\frac{1}{n}\sum_{i=0}^{n-1}u^*_{t-i}=\frac{u_t+u_{t-1}+\ldots+u_{t-i}+\ldots+u_{t-n+2}+u_{t-n+1}}{n} \qquad (2)$$

where (U)SMA_t is the value of the simple moving average at point *t*,

n is the number of values of the smoothing interval of the initial function (the number of values for calculating the moving average),

u_{t-i} is the value of the initial function at point *t-i*.

In order for the resulting indicator to truly reflect the long-term component of the unemployment phenomenon, the authors (Nebava, 2003) suggest taking into account both retrospective and forecast values of the natural rate of unemployment. For this purpose, forecast estimates are used taking into account the probabilistic dynamics of the expected inflation rate. This method of calculation seems to us to be too primitive and difficult at the same time, both in retrospect and in the future. Because, in order to get a series of *n* values of the natural level of unemployment NRU, it is necessary to have *n* more values of the earlier level of unemployment, and this is difficult, for example, for countries that have recently experienced transformation. The forecast for 10 years ahead also does not look reliable.

Taking into account that the NRU indicator reflects the long-term trend of the unemployment rate, the value of the NRU can be determined by extracting the long-term component from a number of actual values of the unemployment rate. Isolation of the long-term trend in the series of unemployment data can be carried out similarly to the described SMA(10) method, and with the help of other various standard methods of detrending or filtering widely described in the literature on statistics.

The OECD method is a method of determining the natural rate of unemployment, which corresponds to such a level of unemployment that does not accelerate inflation. Therefore, the natural rate of unemployment is called not acceleration inflation rate of unemployment (NAIRU) in another way. This concept was proposed by M. Friedman in 1968 and independently developed by E. Phelps in the same year.

In the OECD methodology described by Chalaux and Guillemette (2015), the relationship between inflation and unemployment described by the Phillips curve, taking into account inflationary expectations, is used to determine the natural level of unemployment:

$$\Delta\pi_t = \Theta * (\pi_{t-1} - \pi^e) + \alpha(L)\Delta\pi_{t-1} + \beta * (NAIRU_{t-1} - UNR_{t-1}) + s\_shocks_{t-1} + \varepsilon_t \quad (3)$$

where *UNR* – rate of unemployment,
NAIRU – not acceleration inflation rate of unemployment,
π is the core inflation rate,
π^e is expected inflation,
L is a distributed lag of changes in past inflation,
s_shocks are supply shocks include country-specific variables which have a temporary effect on inflation and ε is a residual.

The unemployment rate that does not affect inflation (NAIRU) acts as one of the components of the disaggregated indicator of actually registered unemployment. This component can be presented as some average trend of the actually registered unemployment indicator. Quantitative NAIRU values can be obtained based on trend selection using filtering methods. In particular, the described technique uses a Kalman filter.

Method of value of long-term unemployment LTUR

This method assumes the use of the Long-term unemployment rate (LTUR), which is defined as "share of unemployed people looking for work for a period of 13 months or more (12 months or more according to Eurostat) in the economically active population" (Statistics Poland, 2023). Due to its long-term nature, the LTUR indicator reflects the average long-term trend (trend) as part of the actual unemployment indicator. Then, based on publicly available data on the level of actual unemployment and the share of long-term unemployment in it, the natural unemployment rate of NRU can be determined as the percentage of long-term unemployed in the workforce:

$$NRU_t = \text{Unemployment Rate}_t * LTUR_t / 100 \quad (4)$$

Based on the above methods that could be used to calculate the natural unemployment rate indicator, the most theoretically justified is the use of the NAIRU indicator, which should be used in further calculations of internal balance gaps. However, this indicator is not always available in open sources of statistics, namely, it was published by the OECD only until 2014, including forecast data (Economic Outlook, 2013). Therefore, incomplete or completely missing time series of NAIRU values are proposed to be replaced by LTUR values, which are available in open sources of Eurostat and the IMF for most countries over long periods. The method proposed by us for determining the natural level of unemployment NRU on the basis of data on long-term unemployment LTUR, firstly, has a solid theoretical basis, and secondly, it is simple and practically implementable in all cases when there are data on actual unemployment and its long-term component .

Verification of the choice of statistical indicator of the level of natural unemployment

As was shown in the methodological section, the quantitative value of the natural unemployment rate indicator can be taken as a quasi-constant, unchanged for a fairly long period – 10 years or more (Geets, Abel) based on data from authoritative sources according to the empirical constant method. For all other methods discussed above, it is necessary to carry out calculations based on statistical data.

Unemployment data published by national statistical agencies, for example Poland – the General Department of Statistics (GUS) or international organizations (OECD, IMF) can be used as the initial statistical data necessary for calculating the values of the natural unemployment rate indicator. In accordance with the theoretical foundation of GME, the NAIRU indicator provided by the OECD is most suitable as an indicator of the level of natural unemployment. However, in open sources of OECD statistics, this indicator is published only for OECD member countries. In addition, we were able to find data series calculated using the NAIRU method only up to 2014 (OECD Statistics, 2013, 2023). In this case, the available NAIRU values should be taken as "reference" in order to find an accessible and widely calculated indicator that allows replacing NAIRU with minimal statistically acceptable deviations. Labor Markets, Unemployment Rate indicators calculated by IMF or similar indicators calculated by national statistics bodies can be used as a basis for calculating such a substitute. The use of IMF data seems preferable to us due to their wide availability, advanced methodology, and the possibility of using long hourly series in econometric methods.

The NAIRU time series, which ends with data from 2014, can be continued using another indicator calculated by the OECD – Long-term unemployment rate, Total, % of unemployed (OECD Statistics, 2023). This indicator (LTUR) reflects Long-term unemployment refers to people who have been unemployed for 12 months or more. The long-term unemployment rate shows the proportion of these long-term unemployed among all unemployed.
In order to obtain a formula for calculating the replacement NAIRU indicator, we used a paired regression equation using the OLS method of the form:

$$NAIRU_t^* = b_0 + b_1 UNR_t (LTUR_t / 100) + \varepsilon_t \qquad (5)$$

Based on this equation, the least squares method was used to obtain quantitative estimates of the relationship between the NAIRU and LTUR indicators and the corresponding characteristics of the quality of regression equations using the example of the economies of Slovenia, Slovakia, Poland, Hungary and the Czech Republic.

Slovenia:	NAIRU_S = 4.773316165 + 0.5398544829*LTUR_S	R2=0.78	(6)
Slovakia:	NAIRU_SR = 8.24343021 + 0.7139753819*LTUR_SR	R2=0.82	(7)
Poland:	NAIRU_P = 7.028282745 + 1.051932844*LTUR_P	R2=0.93	(8)
Hungary:	NAIRU_H = 3.670780751 + 1.210148488*LTUR_H	R2=0.72	(9)
Czech Republic:	NAIRU_CZ = 4.707800141 + 0.6378696648*LTUR_CZ	R2=0.66	(10)

Thus, based on IMF unemployment data and the share of unemployment that is caused by long-term causes, we can obtain an indicator similar to the required NAIRU. This statistical indicator successfully replacing or continuing the existing NAIRU hourly series after 2014 can be obtained using IMF and OECD statistics.

Conclusions

The need to improve the methodology for calculating the general macroeconomic equilibrium indicator GME is due, among other things, to the convenience of using a single quantitative indicator with a high level of aggregation of macroeconomic data as part of a single quantitative assessment. This also opens up wide opportunities for the unification of calculations and the subsequent use of the GME indicator for a comparative analysis of the economies of different countries. This is an example of good practice, since the GME indicator is characterized by a solid theoretical foundation, a transparent, non-overloaded calculation methodology, has long hourly series and high continuity of data. At the same time, the use of an overly simplified approach to assessing the level of natural unemployment in calculating GME gave too approximate estimates of gaps in internal equilibrium. Therefore, the transition to using a variable indicator of natural unemployment is no matter how justified and necessary an improvement, but it is also difficult to implement due to the incompleteness of statistical data - the indicator of the natural rate of unemployment (NRU) and the indicator of non-accelerating inflation rate of unemployment (NAIRU). However, the presented research results suggest that there is an effective solution to this problem. Based on IMF statistics on unemployment and the share of unemployment that is caused by long-term causes, it is possible to obtain an indicator similar to that required by NAIRU. This statistic, which successfully replaces or continues the existing NAIRU hourly series after 2014, can be obtained using publicly available IMF and OECD statistics. Checking the possibility of this replacement while maintaining acceptable quality of the original data using the least squares method

allows us to speak about the high quality of the obtained regression equations with an R2 indicator in the range of 0.66 – 0.93 and, therefore, about the acceptability of such a replacement. Testing the proposed methodology for replacing the indicator using the example of economic statistics from 5 countries - Slovenia, Slovakia, Poland, Hungary, and the Czech Republic for the period 1999-2014. gave good results, allowing for the practical use of the proposed improvement of the GME macroeconomic equilibrium indicator for assessing fiscal and monetary regulation. At the same time, confident confirmation of the statistical quality of the proposed improvement requires its testing on a larger scale.

References

- Abel, A., Bernanke, B. (2005), Intermediate Macroeconomics, Pearson Education, Addison Wesley.
- Alimpiiev, Y. (2004), 'Assessment of the impact of financial and monetary policy using the integrated macroeconomic balance indicator', *Economy: problems of theory and practice. Collection of articles*, *Dnepropetrovsk National University,* Vol. 3 (195), 641-646.
- Alimpiiev, Y. (2005), Cooperation of financial and monetary policy in the transformational economy after the crisis, *Dissertation of a candidate of economic sciences, KROK University of Economics and Law, Kyiv.*
- Alimpiiev, Y. (2013), 'The impact of monetary and financial transmission on the formation of macroeconomic balance', *Scientific journals of the Academy of Economics and Law, Republic of Kazakhstan, Almaty*, Vol. 1 (24), 96–102.
- Alimpiiev, Y. (2018), 'Integral assessment of macroeconomic balance on the example of the Polish economy', *Scientific Journals of the Humanitas University, Management*, Vol. 2/2018, 159–170.
- Chalaux, T., Guillemette ,Y. (2015), 'The OECD Potential Output Estimation Methodology', *OECD Economics Department Working Papers, No.* 1563*, OECD Publishing, Paris*.
- Geets, V., Panchenko, E., Libanova E. and others (2003), Transitional economy. Kyiv, Higher School.
- Koźmiński, A., Noga, A., Piotrowska, K., Zagórski, K. (2014), 'Index of Balanced Socio-Economic Development (IBESD) for Poland, in: G. Kołodko (ed.), Management and Economic Policy for Development. New York: Nova Science Publishers, 161-182.
- Koźmiński, A., Noga, A., Piotrowska, K., Zagórski, K. (2016), 'The Balanced Development Index: Its Construction and Application in Times of Uncertainty, Poland 1999-2017', Polish Sociological Review, Vol. 3 (195), 267-289.
- Mankiw, G. (1994), Macroeconomics. 2-nd ed. – New York: Worth Publishers.
- Nebava, M. (2003), 'Unemployment as a violation of macroeconomic balance', Theory of macroeconomics: Study manual, Kyiv: Slovo.
- OECD Statistics (2013), Economic Outlook No 93 - OECD Annual Projections: *NAIRU (structural unemployment), forecasts*, [Online], [Retrieved September 10, 2023], https://stats.oecd.org/Index.aspx?QueryId=48230
- OECD Statistics (2023), Economic Outlook No 113, [Online], [Retrieved October 10, 2023], https://stats.oecd.org/Index.aspx?DataSetCode=EO
- Rusticelli, E., Turner, D. and Cavalleri, M. (2015), 'Incorporating Anchored Inflation Expectations in the Phillips Curve and in the Derivation of OECD Measures of Equilibrium Unemployment', *OECD Economics Department Working Papers, No. 1231, OECD Publishing, Paris*.
- Semenova, Y. (2016), 'Natural rate of unemployment and inflation', *Working Notes (draft) of Kyiv National University of Economics named after Vadym Hetman.*
- Statistics Poland (2023), Central Statistical Office GUS, [Online], [Retrieved September 10, 2023], https://stat.gov.pl/en/metainformation/glossary/terms-used-in-official-statistics/list.html