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COMPOSITE INDEX OF ECONOMIC ACTIVITY OF NATIONAL BANK OF SERBIA

Abstract: *Composite index of the National Bank of Serbia is the first official synthetic macroeconomic indicator published in Serbia. The novelty is also the approach to the analysis and prediction of economic activities by means of a synthetic indicator, which is rather a frequent practice of the developed market economies nowadays. The composite index includes only the changes in real sector of economy. It omits the results of econometric researches, which is the common practice regarding composite indexes. However, although modest in methodology and possibilities of application in relation to other known composite indexes, it has given relatively satisfying results in this kind of analysis and prediction of economic activities in Serbia for the short time since its construction.*

Key words: *indicators of economic activity, time series, composite indexes.*

1. Introduction

Serbia does not have a developed system of macroeconomic indicators, as is the case with contemporary market economies. However, the interest in this area certainly exists, both in the country and abroad. In the course of the last four years positive results in the process of transition have been made, economic activities become more dynamic and more complex and the openness towards the world increases. All this imposes the need to raise the analytical instruments of macroeconomic analysis to a higher level. More efficient, more comprehensive and more complex indicators, coordinated with the international standards and requirements, would additionally contribute to the development of positive expectations and creation of a favourable business environment, and make the hard task of managing economy in transition easier for the economic policy creators.

The building of a comprehensive system of macroeconomic indicators based on which more complex indicators of economic activity would develop also is a complex process that requires certain conditions. First of all, the efficient and

widespread statistic system is required, which should provide for the relevant databases. It is necessary to solve many theoretical and methodological problems concerning defining and division of macroeconomic indicators. The support of academic and expert public in the form of statistic and econometric researches that would study the connection between the indicators and economic trends and more complex indicators develop is also important. Not all these conditions have been provided in Serbia until recently. Therefore, the macroeconomic analysis remained within the scope of the possible and available.

The composite index of the National Bank of Serbia represents an important shift to this respect. It is the first official synthetic macroeconomic indicator published in Serbia. The approach to the analysis and prediction of economic activity by means of a synthetic indicator on the model of the developed market economies is also a novelty. Although modest in methodology and possibilities of application in relation to other composite indexes used in the world nowadays, it has produced relatively satisfying results in the analysis and prediction of economic activity in Serbia for the short time since its creation. However, before we present it, we shall say something more about the concept of composite indexes and the way they are used in the analysis of economic activity.

2. Composite indices of economic activity – short survey of the history and methodology

As the most general expression of economic activity at the national level for the realistic GDP, only the annual data are published. Therefore, the current macroeconomic analysis uses economic indicators such as industrial production, employment, inflation rate, which are available on a monthly basis. However, for the requirements of a thorough macroeconomic analysis and monitoring of trends of the economic activity as a whole, it is necessary to take into account many various indicators, the changes and importance of which are not easy to consider simultaneously. This is why grouping of related indexes is considered a good solution, so that they jointly describe certain wider aspects of economic activity.

The composite indexes of economic activity essentially represent weighted aggregate indexes calculated for groups of economic activities indicator data series. The aggregate indexes show the changes of a complex series in which simple series are included. The role of weight is to assign importance to each constituent series that it has in a complex series. The general formula to calculate aggregate indices by method of weighted arithmetic mean, which is most frequently used for composite indexes of economic activity, is:

$$I = \sum I_i * w_i / \sum w_i$$

where I stands for individual indexes (in case of composite indexes of economic activities for indicator indexes), and \square for weights of individual indexes.

Composite indexes of economic activity do not have to represent related groups of indicators in the narrowest sense, such as production of only certain products or prices, but can include indicators from various sectors of economy – real, monetary, fiscal relations with other countries. In addition, they contain the known characteristics of aggregate indexes: to level the variability of constituent data series, and then to point out the relative importance of constituent series within the structure of considered aggregates by weighing of individual indices. All these make them particularly convenient for consideration of such a complex entity such as macroeconomic activity.

The application of composite indexes in the analysis of economic activities is based on the division of economic indicators into the leading (the changes of which precede the changes of economic activity), coincident (which describe the current economic activity) and lagging indicators (they fall behind the changes of economic activity). This system of division of indicators was established in 1930s by the researchers of the National Bureau of Economic Research (NBER), Wesley C. Mitchell and Arthur F. Burns.¹ Later in the course of 1950s and 1960s, Geoffrey H. Moor and Julius Shishkin², the NBER researchers as well, developed the methodology for making of leading, coincident and lagging composite indexes based on the appropriate indicators. At the beginning of 1960s, calculation of composite indexes for the American economy was taken over from NBER by the Department of Commerce (DOC), and since 1995, it has been done by The Conference Board.³ At the end of 1980s, James Stock and Mark Watson,⁴ the NBER researchers also, suggested methodological changes more significant with respect to the traditional NBER-DOC approach, introducing new statistic and econometric solutions into the procedure.

We shall briefly present how the procedure of construction of composite indexes looks like.⁵ First, it is necessary to identify the indicators of coincident

¹ Their work *Measuring Business Cycles* from 1946 is the basic literature in this field.

² G. H. Moor, J. Shishkin, "Indicators of Business Expansions and Contractions", *NBER Occasional Papers*, New York, 1967.

³ The Conference Board is an American non-profit organization dealing with macroeconomic analyses, prognoses and market researches with the aim of improvement of American economy and management. The notices on composite indices and all other activities are published at www.conference-board.org.

⁴ J. Stock, M. Watson, "New Indexes of Coincident and Leading Economic Indicators", *Macroeconomics Annual NBER*, eds. O. Balanchard, S. Fischer, Mass.: MIT Press, Cambridge, 1989.

⁵ Based on: A. Simone, "In Search of Coincident and Lading Indicators of Economic Activity in Argentina", *IMF Working Paper* 01/30, International Monetary Fund, 2001; T. Jagrič, *Leading Indicators of Aggregate Economic Activity of Slovenia*, Department for quantitative economic analysis, Faculty of Economics and Business, University of Maribor, Slovenia, 2003, and OECD: *Cyclical Indicators and Business Tendency Surveys*, Paris, 1997, www.oecd.org.

economic activity – time series, which best reflect the GDP trends on a monthly basis, therefore the current economic activity. The choice of coincident indicators can be made based on various criteria, such as the participation in GDP formation, the importance for the national economy, availability of data and possibilities of statistical system. Some OECD countries use only the index of industrial production as the indicator of their current economic activity, or quarterly/monthly estimates of GDP or GNP, while some other countries use several indicators, such as non-agricultural employment, unemployment rate (inverse), and available income, turnover in processing industry and trade and other.⁶ As for the American economy, the coincident indicators of the Conference Board are the population employed in non-agricultural sector, the available income reduced for transfer payments, industrial production and turnover in processing industry and trade.

By identification of indicators of current economic activity, we obtain reference series in relation to which trends of other time series – indicators are examined statistically and econometrically and they are then classified into leading or lagging indicators. The following indicators are most frequently identified as leading: orders and stocks in production, average working week, money stock, interest rates, prices of some products, etc. In countries that are heavily dependent on import, the indicators of foreign economic activity are often identified as leading indicators, for instance the indicators of the country with which they have the largest scope of foreign trade. Some of the leading indicators for the American economy are: average working hours per week in processing industry, average weekly requirements for unemployment insurance, the prices of shares (500 most important joint stock companies), M2 money stock, while some of lagging indicators are the average duration of unemployment, costs of labour power per product unit in processing industry, consumer and business loans.

After the division of indicators, it is necessary to choose those that will take part in the appropriate composite index. NBER-DOC methodology, based on the work by Moor and Shishkin, defines some desirable characteristics that the indicators should have in order to take part in composite index, such as economic significance, data availability and coordination with previous economic cycles. The indicators are point rated in relation to how well they fulfill each characteristic, whereas the final score of all characteristics represents orientation for choice of indicators. Stock and Watson method (SW method) consists of a detailed examination of the connection between series – candidates and indicators of current economic activity by statistic-econometric methods such as regression analysis and Granger test of causality, in order to determine those with the best performances.

⁶ If the economic activity is analyzed within the context of cyclical trends research, it is important to study whether the series – candidates are of the same cyclical characteristics as GDP. Besides, this is the most frequent approach to economic activity analysis today.

Finally, composite index will represent a weighted average of chosen data series. NBER-DOC methodology prescribes equal weights for all chosen series, while according to SW methodology weights are determined by econometric techniques. Depending on the kind of component series – indicators, composite indexes can also be leading, coincident or lagging, and will range analogue to the kind of indicators they consist of. Some countries use composite index of coincident indicators as reference series in relation to which leading and lagging indicators are determined.

The methodology for calculation of composite indexes has been developed further and adapted to their own requirements and specific characteristics by some other countries, international organizations and research institutions also. In the course of 1980s, the OECD developed its own system of indicators: the *International System of Leading Indicators*. Their Composite Leading Indicator is well known and it is calculated for its 22 member countries.⁷ Some of well-known composite indexes of economic activity for the European territory are also €COIN, Composite index of current economic activity of the Centre for Economic Policy Research (CEPR), as well as Economic Sentiment Indicator (ESIN) of the European Commission.⁸ The methodologies differ more or less in relation to those two presented, as regarding the general approach and purpose (trend analysis or business cycles analysis) as in the details of the procedure itself.⁹

3. Composite index of economic activity of the National Bank of Serbia

The composite index of economic activity of the National Bank of Serbia has been constructed in the Research Center of the National Bank of Serbia and was presented to the public in October of 2003, in the publication of the National Bank of Serbia “Economic Review”. According to their authors, “...the purpose of introduction of the composite index is:

- To show changes of total economic activity in an integrated manner by means of one indicator;
- To obtain a synthesized indicator for short time periods (three-month periods and one-month periods), and
- To serve as a basis for short-term predictions of economic activity.”¹⁰

⁷ OECD *Composite Leading Indicators – a tool for short-term analysis*, OECD Statistics Directorate, 1998, www.oecd.org.

⁸ A. Rua, “Composite Indicators for the Euro Area Economic Activity”, *Economic Bulletin*, Banco de Portugal, September 2002.

⁹ About the similarities and differences in methodology, see: “Cyclical Indicators and Business Tendency Surveys”, Paris, 1997, www.oecd.org.

¹⁰ Narodna banka Srbije: *Ekonomski pregled*, October 2003, p. 32.

- The composite index integrates the changes of the following “components of economic activity”:
- Industrial production;¹¹
- Agricultural production (on the basis of changes of real scope of the purchase of agricultural products);
- Trade (on the basis of changes of real scope of turnover in retail trade);
- Construction (in working hours completed);
- Tourism and hotel business (on the basis of changes of number of tourist arrivals).¹²

These components of economic activity, as the Index authors call them, include together eight out of twelve branches of economic activity that take over 90% of the structure of GDP in Serbia. Industry includes three branches: extraction of ore and stone; processing industry; production and supply with electric energy, gas and water. Tourism and hotel business are entered as hotels and restaurants in the official classification of branches; agriculture as agriculture, hunting, forestry and management of water resources; traffic as traffic, warehousing and communications; trade as retail and wholesale trade, repair. The remaining branches are activities related to real estates, renting, health and social work, other utility, social and personal services.

The National Bank of Serbia has decided in favour of a somewhat simpler approach to the construction of composite index when compared with the presented ones. “Series of de-seasoned data in real expression have been used in calculation of the composite index. De-seasoning has been made by X12 method of the USA Bureau of Inventory. The share of the stated branches of economic activity within the GDP was used as relative share of certain variables (weights), according to the last available data of the Bureau of Statistics of the Republic of Serbia.”¹³ Methodology has not been described and explained in more details either in this or other issues of *Economic Review* or in some other publications of the National Bank.

When the Composite index was first presented, its changes were given from the beginning of 2000, with the estimates for the last quarter of 2003. The Index values were not given however, but only the graphic representation that we quote here.¹⁴

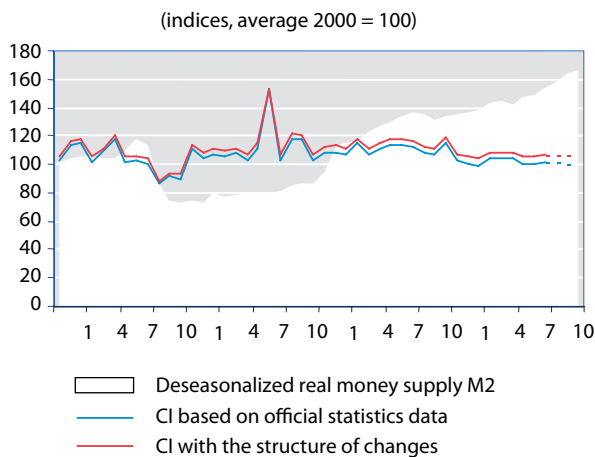
¹¹ Although it has not been stated explicitly, we assume that index of physical scope of industrial production was used for industrial production.

¹² All these data series are available monthly in publications of the Republic Bureau of Statistics.

¹³ Narodna banka Srbije: *Ekonomski pregled*, October 2003, p. 32.

¹⁴ The upper line at the graph represents the influence of “estimated structural changes” on the composite index. It has not been stated, however, what are these structural changes.

Composite index of economic activity (CI)



The rise of CI in August 2001, is the result of the increased agricultural production and the buy-off of agricultural products.
The data for the period October-November 2003, are the estimates.

The estimates by the National Bank analysts based on the index trends were that there would be a certain improvement of economic activity in the course of the last quarter of 2003.

Since October 2003, the National Bank of Serbia has used this Index regularly in their analyses, although the Index values are still not published, even its change with reference to the previous month, as is the common practice with composite indexes and other similar indicators abroad.

4. The characteristics of the Composite Index of the National Bank of Serbia and possibilities of application in analysis

Considering that only the annual data on GDP are published in Serbia,¹⁵ the indicators of economic activity monitored by the statistic system on a monthly basis are used for the requirements of the current analysis. However, the following example illustrates well that individual indicators are not sufficient to have a better insight into the actual trend of economic activity. In the course of 2003, until the end of the third quarter, there was a fall of industrial production

¹⁵ The GDP calculation in Serbia is made according to production method, based on determination of value of production and services of production units. The calculation is based on the concept of material production, according to which Gross domestic (material) product equals the sum total of depreciation and national income.

in Serbia recorded, and the agricultural trends were rather unfavourable. For two consecutive years already, since the beginning of transition in 2001, Serbia recorded lower and lower rates of GDP growth, and the estimates for 2003 were unfavourable considering the fact that only 1.5% GDP growth was expected. It turned out however, that the achieved growth of GDP was a somewhat higher than expected (3%), which was significantly contributed by the construction activities (which recorded the growth of 10.5% more than the previous year), telecommunications within the branch of traffic, warehousing and communications (24.8%) and retail trade (12%). The dynamic growth in these branches continued in the first half of 2004, also.

The unfavourable trends in agriculture and industry in the course of 2003, led the majority analysts in Serbia into pessimistic prognoses for 2004 as well. At that moment, every piece of information that represented positive indication and supported the creators of economic policy was of great significance. The National Bank, however, indicated that there would be a growth of total economic activity in the first half of the year already,¹⁶ and by the end of the year, even 8% of GDP growth was achieved. Its prognoses based largely on the Composite Index.

According to its characteristics and scope, the Composite Index of the National Bank of Serbia belongs to composite indexes of current economic activity, although it aspires to be the leading indicator. It can be assumed that the estimated data for component series are obtained by trend extrapolation. In any case, the methodology of index calculation is modest, since a thorough composite index that should represent the national economy requires a much more complex approach and wider scope. For instance, for the requirements of calculation of the composite index of the leading indicators of Slovenia, first the index of industrial production was identified as the indicator of the current economic activity (reference series). Then, for the requirements of identification of leading indicators the combination of NBER-DOC and SW methods was used. Three hundred and sixty five time series from all sectors of economy were examined and scored econometrically. Thirty-nine of them were identified as potential leading indicators and ten entered the structure of the composite index.¹⁷

The possibilities of the Index use in analyses are very limited for the users out of the National Bank, which is largely conditioned by the manner of its presentation. Neither the index values nor its components are given. Based on the graphical presentation, it can only be concluded that the level of economic activity is higher than at the beginning of 2000, that economic activity continues to grow and that the oscillations of economic activity alleviate over time. This shows that since the end of 2000, when the process of transition began, certain macroeconomic stability has been achieved. Based on the graphic presentation only, nothing can be concluded about the trend of constituent series, what is the

¹⁶ Narodna banka Srbije: *Ekonomski pregled*, January 2004.

¹⁷ T. Jagrič, *ibidem*

contribution of certain branches to the growth of economic activity (social product), which is rather a significant issue for macroeconomic analysis.

“Composite indexes represent the national economy to the extent to which the data series on which these indexes are based are representative.”¹⁸ However, it is not known to what extent the data series chosen by the National Bank of Serbia are representative for the branches they represent. For instance, as for the traffic, warehousing and communications in the last three years, the traffic (expressed in passenger kilometers) records the falling trend, while telecommunications (expressed by physical scope of services) record very high growth rates.¹⁹ The question may be asked which of these two series better reflects the trends in this branch.

Let us now see what the share of branches included by the composite index in the structure of gross domestic product was. This would also give the weight from the basic period (year of 2000). However, as the methodology has not been explained in detail, we do not know for certain what weighing method was used.

Table 1. The structure of social product per branches in Serbia for 2000 (in %).

Branches	Share in %
1. Extraction of ores and stone	1.8
2. Processing industry	33.8
3. Production and supply with el. energy, gas and water	1.8
4. Agriculture, hunting, forestry and management of water resources	23.8
5. Construction	6.1
6. Retail and wholesale trade, repairs	17.6
7. Traffic, warehousing and communications	9.2
8. Hotels and restaurants	1.9
□ 1 - 8	96.0
9. Fishing industry	0.1
10. Activities related to real estate, renting	3.5
11. Health and social services	0.3
12. Other utility, social and personal services	0.1
□ 1-12	100.0

The data for Kosovo and Metohija are not included.

Sources: The Official Gazette of Yugoslavia, 2001; Bureau of Statistics of the Republic of Serbia, *Social and economic trends in 2003*.

¹⁸ G. Harkenrider, *Kentucky Composite Economic Indicators*, Center for Business and Economic Research, University of Kentucky, 1999.

¹⁹ Republika Srbija, Republički zavod za statistiku: *Društveno-ekonomska kretanja u 2003. godini*, Saopštenje 22, p. 7.

The branches included in the Composite Index participated with 96% in the structure of the domestic product in 2000. It can be noted that the branch related to the real estate and renting was not included by the composite index, and it had larger share within the structure of domestic product that year than tourism and hotel business (hotels and restaurants).

The composite index included only the changes in the real sector of economy, i.e. in production. It is possible that such an approach is the consequence of the calculation of social product of Serbia according to the production method, and it was considered that the changes in the real sector, i.e. in the production would best reflect the trend of the economic activity as a whole. However, the statistics in Serbia monitors many other indicators, both in real and other sectors, which can be used for the construction of the composite indexes. The Bureau of Statistics of the Republic of Serbia identifies the following "basic indicators of economic activity": retail price index, cost of living index, price index of the manufacturers of industrial products, price index of the agricultural and fishery producers, price index of catering industry, index of industrial production, index of average nominal salaries, the unemployed persons, persons looking for a job for the first time, number of the retired persons, average retirement fee paid monthly. As "more important indexes of economic trends", foreign trade and industrial work productivity are added.²⁰ The behaviour of monetary aggregates should also be examined. All these are potential candidates that could make part of a more complex and more comprehensive Composite index.

5. Conclusion

The National Bank of Serbia, as a monetary institution of the greatest importance in the country, must follow the events in the real sector in the function of achieving its main tasks of keeping the monetary stability and creation of monetary policy. These tasks at the current historical and economic moment are not at all easy considering that the effects of transition on certain branches have been uneven and have had contradictory trends as their consequence. By means of the composite index, the National Bank has achieved relatively satisfying results in the analysis and prediction of economic activity. The approach to analysis itself is a shift with respect to the approach that has been common so far, which consisted of the isolated observation of individual indicators and their synthesis based on either experience or intuition. Therefore, the National Bank of Serbia indicated the way in which macroeconomic analysis and its instruments in Serbia will develop further.

²⁰ See: Republika Srbija, Republički zavod za statistiku: *Društveno-ekonomska kretanja u 2003. godini*, Saopštenje 22.

In January 2004, the Bureau of Statistics of the Republic of Serbia formed a Basis of time series of economic indicators for Serbia.²¹ The reform of the statistic system of Serbia in accordance with the UN System of National Accounts²² and IMF General Data Dissemination system²³ is also on the threshold. This would provide for the first condition to create the system of macroeconomic indicators discussed in the Introduction. However, hard work is still to be done by the analysts of the National Bank of Serbia and all scientists in this field.

²¹ Republika Srbija, Republički zavod za statistiku: *Trendovi*, December 2004, Beograd, xi.

²² SNA is the internationally accepted system of statistic standards in the field of national accounts. See: www.un.org.

²³ GDDS is aimed at improving the statistic system of member countries considering the quality of data, manner of their presentation and achievement of the international comparability of data. The considerable part of the system is devoted to defining and classification of macroeconomic indicators. See: www.imf.org.

References

- Harkenrider, G.: *Kentucky Composite Economic Indicators*, Center for Business and Economic Research, University of Kentucky, 1999.
- Jagrič, T.: *Leading Indicators of Aggregate Economic Activity of Slovenia*, Department for quantitative economic analysis, Faculty of Economics and Business, University of Maribor, Slovenia, 2003.
- Mitchell, W. C. – Burns, A. F.: *Measuring Business Cycles*, NBER, New York, 1946.
- *Ekonomski pregled*, Narodna banka Srbije, October 2003 – January 2004.
- *Cyclicas Indicators and Business Tendency Surveys*, OECD, Paris, 1997, www.oecd.org
- *OECD Composite leading indicators – a tool for short – term analysis*, OECD Statistics Directorate, 1998, www.oecd.org
- Republika Srbija, Republički zavod za statistiku: *Društveno-ekonomska kretanja u 2003. godini*, Saopštenje 22.
- Republika Srbija, Republički zavod za statistiku: *Trendovi*, Beograd, December 2004.
- Rua, A.: “Composite Indicators for The Euro Area Economic Activity”, Banco de Portugal”, *Economic Bulletin*, September 2002.
- Simone, A.: “In Search of Coincident and Leading Indicators of Economic Activity in Argentina”, *IMF Working Paper 01/30*, International Monetary Fund, 2001.
- Stock, J. – Watson, M.: “New Indexes of Coincident and Leading Economic Indicators”, *NBER Macroeconomics Annual*, eds. O. Balanchard, S. Fischer, Mass.: MIT Press, Cambridge, 1989.
- www.conference-board.org
- www.imf.org
- www.oecd.org
- www.un.org