3 A MODEL TO ESTIMATE THE COMPOSITE INDEX OF ECONOMIC ACTIVITY IN ROMANIA – IEF-RO

Lucian-Liviu ALBU*

Abstract

One of the most significant impediments for short-term forecasts is the frequency of publishing GDP. At present, national institutes of statistics are publishing officially registered GDP only quarterly. In our study, we tried to build a composite indicator based on usually monthly data and to use it in order to obtain short-term forecasts for economic activity at national level. This indicator could be useful taking into account that actually there is no synthetic indicator to describe the short-run dynamics of economic activity. Thus, such an estimating model we are proposing for the Romanian economy is coming from the last results in this field, especially from the OECD methodology. Moreover, to validate the main hypotheses of the estimating model for the composite indicator in the case of the Romanian economy we used the quarterly data and, as benchmark indicator was considered the quarterly published GDP. Using certain models based on composite indicators (leading indicators, coincidence indicators, and post-cycle indicators), beside other models to analyse high frequency time series and to obtain sort-term forecasts (such as principal component method, so-called virtual monthly GDP method or various interpolating methods), it can result in richer information for the business environment which in modern times founds itself in an accelerated process of change.

Keywords: business cycle indicators, coincident and leading indicators, composite index.
JEL Classification: C22, C63, E20, E32.

1. Introduction

Over the last period it was an intensification of efforts to compute composite indicators in order to show synthetically the evolution of national economies. Still coming from 60's, in USA it was developed year by year a database comprising so-called indicators of business cycle within the Bureau of Economic Analysis of US Department of Commerce together with the National Bureau of Economic Research. Since 1996, this

* Research Professor, Institute for Economic Forecasting, e-mail: albul@ipe.ro

activity is under *The Conference Board US Business Cycle Indicators* or shorter *Conference Board* (CB). At present, this organisation is managing the database for economic cycles, including 250 time series and reporting periodically on the so-called leading index for the US economy. Moreover, its programme is focusing on extending of computing leading indicators at least in the case of 15 countries (last years, beside the US economy, leading indexes were computed in the case of United Kingdom, France, Germany, Japan, South Korea, Australia, Mexico and Spain). New synthetic indicators, based on more performing computing techniques, have to try to estimate economic dynamics on shorter periods. Already a monthly computing scheme was adopted, taking into account that the delay in publishing statistical data is generally of 2-3 months.

Usually, components of business cycle indicators and even computing methodology are different among countries. Moreover, in the case of a country there are periodical revisions, regarding the total number of considered indicators or/and in matters of how components are included within the composite indicator of the business cycle. Over the last years, *Conference Board* reported, as total number of indicators, 10 for Mexico and Spain, 12 for South Korea, Germany, and UK, 13 for Australia, 14 for France, 16 for Japan, and 21 for USA.

Starting in the 80's, within the OECD Division of Economic Statistics for Short-Run a system for evaluating a composite leading indicator in the case of each member country was built. Following a number of revisions and methodological reformulations, in the last years the main efforts were concentrated on replacing, as it was possible, the quarterly series by monthly series. In cases where official publications do not satisfy this necessity it is recommended for conversion to use certain interpolating techniques. In the last period, it was an intensification of efforts made by national bodies or research institutes from many countries in order to compute composite indicators of the business cycle and, implicitly, to elaborate better short-run forecasts. In this matter, we can mention the use of the principal component method, adapted after the methodology of Global Insight, under the coordination of Lawrence Klein, for the Russian and Romanian economies (within a project run in 2002-2004 under the Regional Think Tank Partnership Programme by CMASF-Moscow, IEF-Bucharest, and Global Insight-Eddystone, former DRI-WEFA, USA), and some attempts of research teams (including from IEF) to estimate the so-called monthly virtual GDP.

2. Methodology

In this section, we are presenting synthetically the general computing methodology of composite indexes, following to present in the next section the results of its application on the Romanian economy case, for the moment as an experiment. Applying the CB methodology supposes a number of steps; implying time consuming processes for computing and testing statistical significance in the case of a large number of macroeconomic variables or indicators in order to finally select the components of the composite indexes. There are three types of indicators: leading, coincident, and lagging indicators.

Burns and Mitchel (1946) defined the business cycle in terms of fluctuations in economic activity. GDP is mostly used as a measure of economic activity, but since GDP is only available at a quarterly frequency, extra variables are necessary to establish a monthly chronology. Therefore, it is needed to look at other monthly

macroeconomic variables. Usually, the economic activity in the USA, for example, is defined explicitly by NBER in terms of monthly variables, namely employment, personal income, industrial production and manufacturing and trade sales, together making up the composite coincident index. Potentially relevant macroeconomic variables are evaluated based on how closely they track the cyclical behaviour of the reference series.

According to the CB, the composite indexes of leading, coincident, and lagging indicators are summary statistics for an economy. They are constructed by averaging their individual components in order to smooth out a good part of the volatility of the individual series. Historically, the cyclical turning points in the leading index have occurred before those in the aggregated economic activity, cyclical turning points in the coincident index have occurred at about the same time as those in the aggregated economic activity, and cyclical turning points in the lagging index generally have occurred after those in the aggregated economic activity.

In order to assess the properties of a given composite indicator, it is necessary to compare it with a reference series considered to be representative for the economic activity. We have chosen GDP, since it is the most comprehensive variable among the official statistics, and also because it is regularly used for analysing the economic evolution. Since the GDP is a quarterly variable, the assessment of the indicators was made on a quarterly basis (notwithstanding the fact that they are monthly indicators). Thus, the composite indicator was compared with the quarter-on-quarter growth rate and/or the year-on-year growth rate of the GDP. The sample period considered in the case of Romania was Q1-2001– Q4-2007.

At present, in the case of the EU and the OECD only the leading and coincident indexes are reported. The procedure for computing the composite leading indicator in the case of the Romanian economy, IEF-RO, has a number of distinct steps, as it follows:

- Building a monthly (and quarterly) database for a reasonable large period, comprising the selected economic variables, V, supposed to be significantly correlated with the aggregated economic activity.
- Testing statistically the correlation and analysing the relation between each variable included in database and the GDP as benchmark variable (by cointegration test and Granger causality test).
- Choosing the variables (indicators) that have to be included in the composite index.
- Computing the month-to-month (or quarter-to-quarter) changes for each component. If the component X is in percent change form or an interest rate, simple arithmetic differences are calculated

$$v_t = V_t - X_{t-1} \quad (1)$$

If the component is not in percent change form, a symmetric alternative to the conventional percent change formula is used

$$v_t = 200*(V_t - V_{t-1})/(V_t + V_{t-1}) \quad (2)$$

- Adjusting the month-to-month (or quarter-to-quarter) changes to equalise the volatility for each component. First, standard deviations s_v of the changes in each component are computed. Then, these statistical measures of volatility

are inverted

$$r_v = (1/s_v)*[1/\Sigma(1/s_v)] \quad (3)$$

where $\Sigma(1/s_v)$ is the sum of inverse values of components v included in the composite index (it is easy to demonstrate that, by construction, the sum of all components in the composite index is equal to 1, $\Sigma r_v = 1$). The adjusted change in each component is the month-to-month (or quarter-to-quarter) change multiplied by the corresponding component standardization factor

$$m_t = r_v * v_t \quad (4)$$

- Finally, the level of the index is computed using the same symmetrical percent change formula and, in the case of our application on the Romanian economy, the index is rebased to average 100 in 2000 (as a base year in the case of quarterly data) and in 2001, respectively (as a base year in the case of monthly data).

3. Application

Using the presented methodology, in the case of our application on the Romanian economy we selected the following five macroeconomic variables as components of the composite index: industrial production, number of employees, number of registered unemployment, exports (FOB), and imports (CIF). Some results of the composite index estimation for the period 2000-2007 are reported below.

In the case of using quarterly data, available for the GDP at the end of 2007, the composite index for Romania, thus named IEF-RO (Institute for Economic Forecasting – RO), reflects well the economic cycle for the period 2001-2007 (correlation coefficient = +0.9506668842 in the case of trend and correlation coefficient = +0.7363531917 in the case of seasonal component), as shown in Figures 1 and 2. The first figure presents the trend of GDP (Ty) and that estimated on the basis of the composite index (TyE), respectively and the second one the seasonal component of GDP (Sy) and that estimated on the basis of composite index (SyE), respectively. In the graphics, the quarters are denoted on the abscise axe from 1 (2001 Q1) to 28 (2007 Q4).

Taking into account that available data for the five components of the composite index were published up to the end of March 2008, we computed the quarterly composite index, IEF-RO, until the end of the first quarter of 2008, as shown in Figure 3 (where IT is the quarterly composite index).

We also applied the composite index methodology in the case of monthly data for the period December 2001–March 2008. The resulted evolution is shown in Figure 4, where IL is the monthly composite index. In this figure, the months are denoted on the abscise axe from 0 (December 2001) to 75 (March 2008).

Figure 1

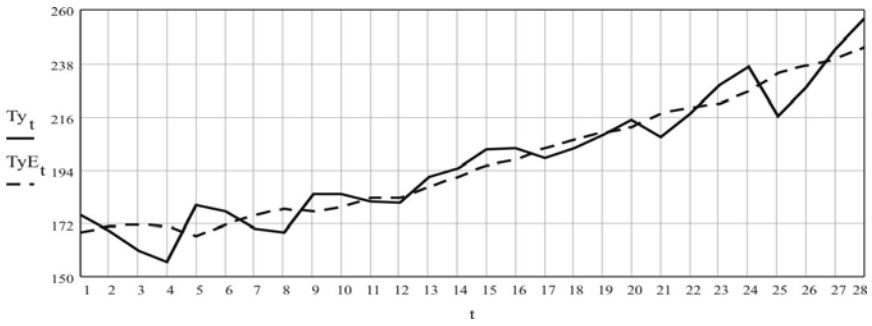


Figure 2

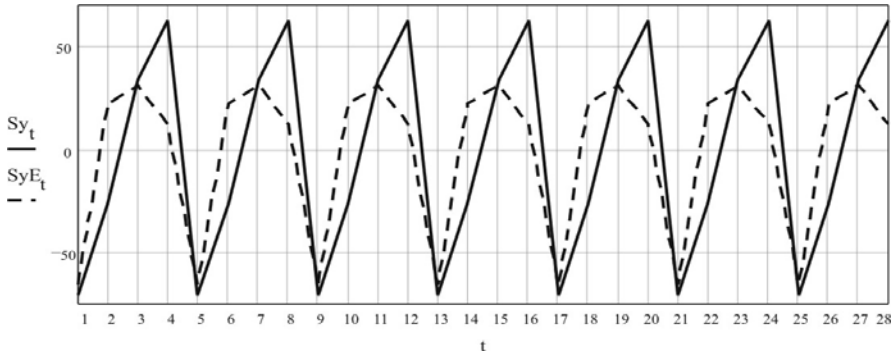


Figure 3

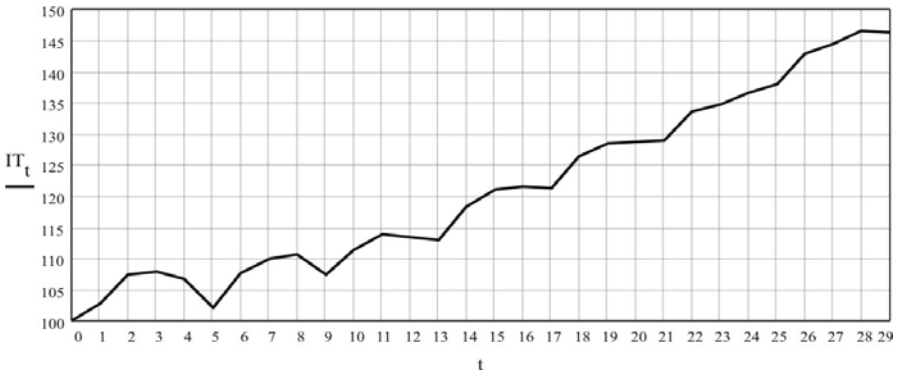
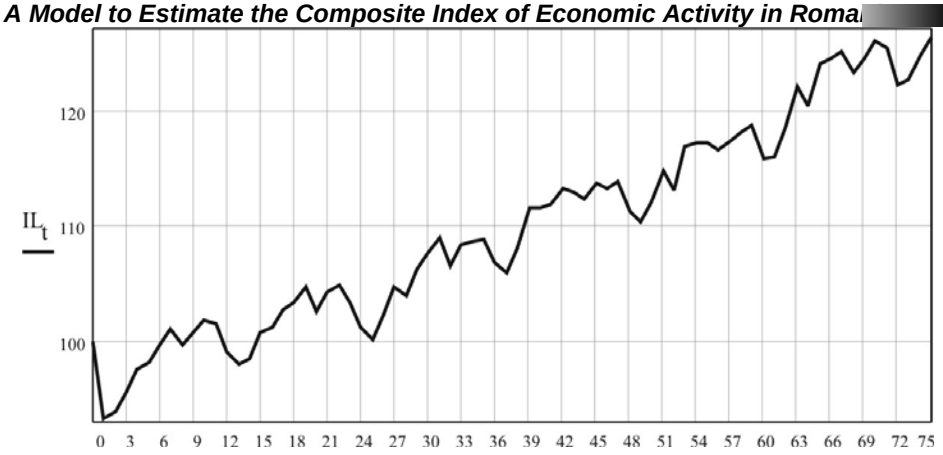


Figure 4



4. Conclusions

Applying a system of composite indexes could be very useful for forecasting the economic activity in Romania over a short-term horizon. It is needed to use together some available high frequency (monthly) data series as a "virtual monthly GDP".

Covering the period 2001-2007 and including only five macroeconomic monthly indicators, it was empirically demonstrated that the preliminary composite index built for Romania, IEF-RO (Institute for Economic Forecasting – RO), could well reflect the evolution of the economic activity and business cycle. Indeed, according to the EU trends in matter of building national composite indexes, it has to be developed in order to express better the specificity of the domestic economic activity.

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