

## **New Composite Indicators for Bulgarian Business Cycle**

**Roumen Vesselinov<sup>1</sup>**

### **Abstract**

*The paper presents the creation of a new composite coincident monthly indicator for Bulgaria. The Bry-Boschan method is used to determine the turning points for the Bulgarian business cycle for the 2000-2011 period. A new composite leading indicator is also created and tested. The paper finds that the latest recession for Bulgaria had started in June 2007 and was still continuing by March 2011. The national business cycle was lagging the Euro Area cycle before 2007 and was early after that.*

**Keywords:** business cycle, coincident, leading, indicator

**JEL Classification:** E32

### **1. Introduction**

The work on this study was driven by three major factors. First, in the light of the recent 2007-2009 world economic and financial crisis many politicians and researchers became acutely aware of the need to have a reliable and strong measure of the current economic situation. Second, great debate has ensued among economic researchers and practitioners in Bulgaria regarding when the recent crisis has started and when or whether the crisis was over. Third, the recent availability of new reliable monthly data from the National Statistical Institute (NSI) of Bulgaria lent themselves for use in this area of research.

This work is a continuation on some previous work (Vesselinov, 2004; 2008). The paper presents a new set of indicators based on a larger set of available and more reliable data. There are published measures of the current economic activity in Bulgaria like the Economic Activity Indicator of the Bulgarian Ministry of Finance (<http://www.minfin.bg/>), and previous work by the Agency for Economic Analyses and Forecasts ([www.aeaf.bg](http://www.aeaf.bg)). The main difference with the current work is that most of them are based on quarterly data while our indicators are monthly, and second, our leading indicator is stand-alone and not derived from the current economic activity measure.

---

<sup>1</sup> rvesselinov@qc.cuny.edu

The need for a reliable measure of the current economic situation has long ago been established (Zarnowitz, 1992). The so called reference series or reference cycle is the first instrument needed to evaluate the current phase of the business cycle. The Gross Domestic Product (GDP) is one of the most important indicators of economic development but it is available only quarterly and for our purposes we would need monthly data. In some cases a single indicator, like the index of industrial production has been accepted as a reference series (OECD, 1997, p. 7). But the majority of researchers recommend using a composite indicator (Diebold and Rudebusch, 1999; Lahiri et al., 2003; Conference Board, 2000) which is usually calculated using several monthly indicators combined in one measure. We chose this methodology because it is widely used, and, in our opinion, it is directly applicable and very appropriate for our data.

The paper presents the creation of a new composite coincident monthly indicator for Bulgaria. The Bry-Boschan method is used to determine the turning points for the Bulgarian business cycle for the 2000-2011 period. A new composite leading indicator is also created and tested. Another goal of this study is to compare the business cycle of Bulgaria and the Euro Area. The main question here was whether the two cycles are synchronized or not and how different the timing is.

## **2. New Composite Coincident Business Cycle Indicator (CBCI)**

The data for the components of the coincident indicator are from the online database of the Bulgarian NSI ([www.nsi.bg](http://www.nsi.bg)).

The following series were considered for inclusion as components of the new CBCI:

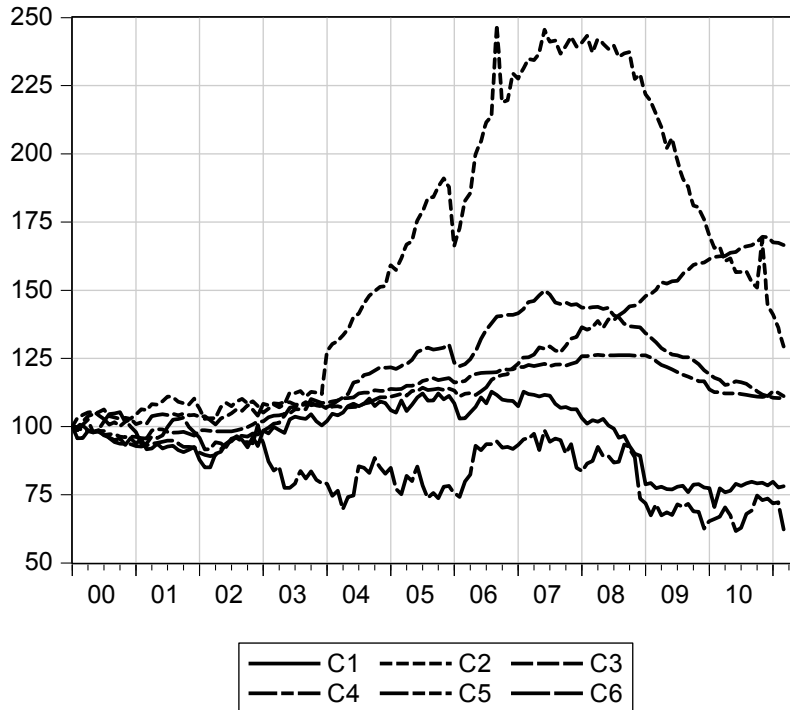
- C1. Industrial production index;
- C2. Construction production index;
- C3. Turnover index in retail trade;
- C4. Labor (number of employed by the end of the month);
- C5. Income (average monthly wages and salaries);
- C6. Service sector (business survey of current business situation in the service sector).

All series except C6 needed seasonal adjustment and they were adjusted using the X12 method. Where appropriate the components were adjusted for inflation.

The above time series were taken into consideration following the justification by The Conference Board (Conference Board, 2000, p. 13). They are broadly related to the current economic activity like production, employment, income, construction, retail trade etc.

In this study we use the methodology of The Conference Board (Conference Board, 2000, p. 47) for constructing a composite indicator. The dynamics of the components of CBCI is presented in Figure 1.

**Figure 1: Components of CBCI**  
(Indexes 2000=100)

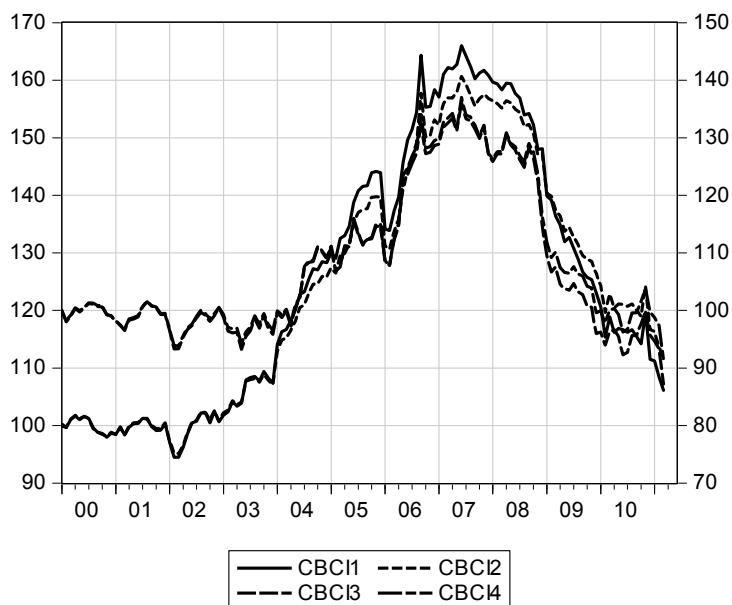


Applying the Conference Board methodology we constructed the new CBCI. We experimented with 4 different versions of the index:

- CBCI1: includes C1 to C4;
- CBCI2: includes C1 to C4, plus C5;
- CBCI3: includes C1 to C4, plus C6;
- CBCI4: includes C1 to C6;

The four versions of the CBCI are presented in Figure 2.

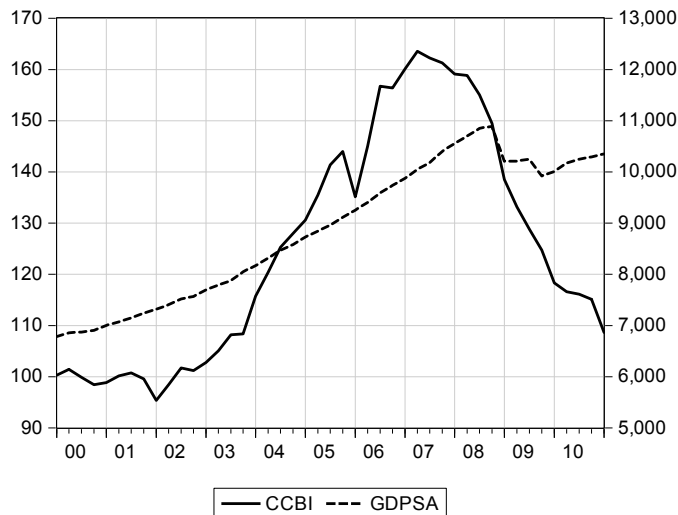
**Figure 2: Four Versions of CBCI**  
 (Indexes 2000=100; CBCI1 and CBCI2 - left-hand scale)



Econometric tests (Alberola-Lopez and Martin-Fernandez, 2003) showed that there is no significant difference between the four time series. Following the principle of parsimony we selected the version with fewest components as the final version of the CBCI. Thus the final indicator has only four components: C1 to C4.

Before we employ the new index we tested its quality. First and foremost, we checked the correspondence between the new coincident indicator and GDP. We converted the monthly CBCI into a quarterly series by taking the quarterly averages and compared them to GDP. The results are presented in Figure 3.

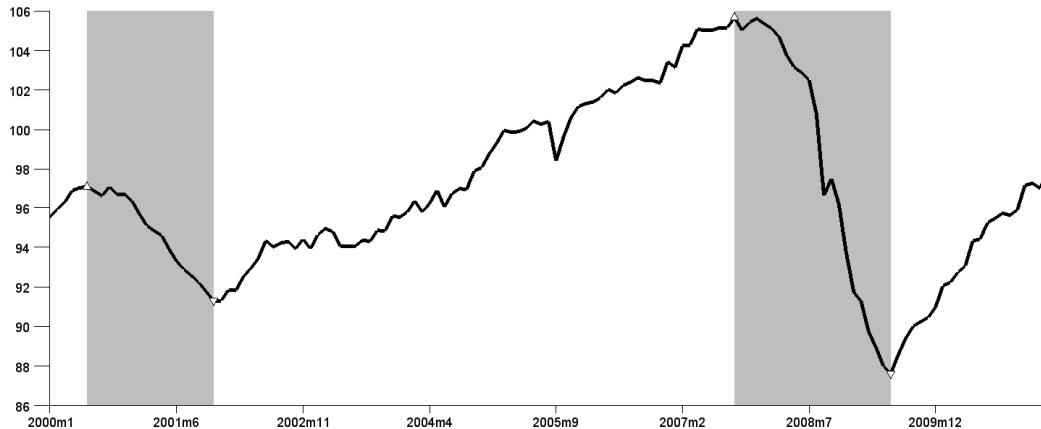
**Figure 3: GDP and CCBI**  
(CCBI Index 2000=100, left-hand scale; GDP in mln BG leva, 2000 prices)



As expected the new coincident indicator resembles to a certain extent the dynamics of GDP, seasonally adjusted and in constant 2000 prices.

The main purpose of constructing a coincident indicator is to use it for determining the turning points of the classical business cycle. The classical methodology for this purpose was defined by Bry and Boschan (Bry and Boschan, 1971). We tested the current applicability of the classical methodology on the U.S. coincident indicator published by OECD (OECD, 2011). According to the official dating of the US business cycle by NBER after year 2000 there were two recessions: March - November 2001 and the “Great Recession” December, 2007 - June 2009. With the Bry-Boschan method and the OECD indicator for US we were able to match almost exactly the official turning points of the US business cycle (see, Figure 4). This result gave us the confidence to use the Bry-Boschan method further in the study.

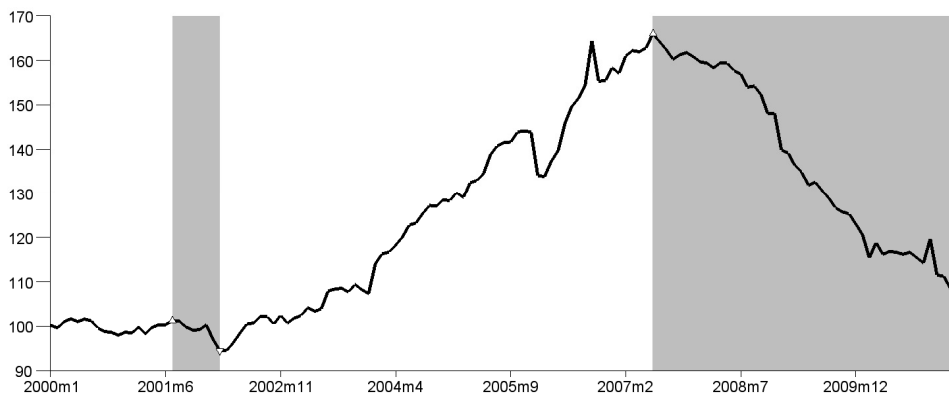
**Figure 4: Confirming US Business Cycle Turning Points with the Bry-Boschan Method**  
(US CCBI Index 2005=100)



We applied the Bry-Boschan method to the new CCBI for Bulgaria for the period January 2000 – March 2011. The results are presented in Figure 5 and Table 1.

According to the classical Bry-Boschan method there were two periods of recession. First recession: July 2001 to February 2002, and second recession starting in June 2007 and still continuing by March 2011. Obviously according to this measure, the latest recession in Bulgaria had started very early, at the same time as the “great recession” in the U.S. but did not end in 2009 and in fact the economy is in recession at least by March 2011.

**Figure 5: Bulgarian Business Cycle 2000 – 2011**  
(Bulgarian CCBI Index 2000=100)



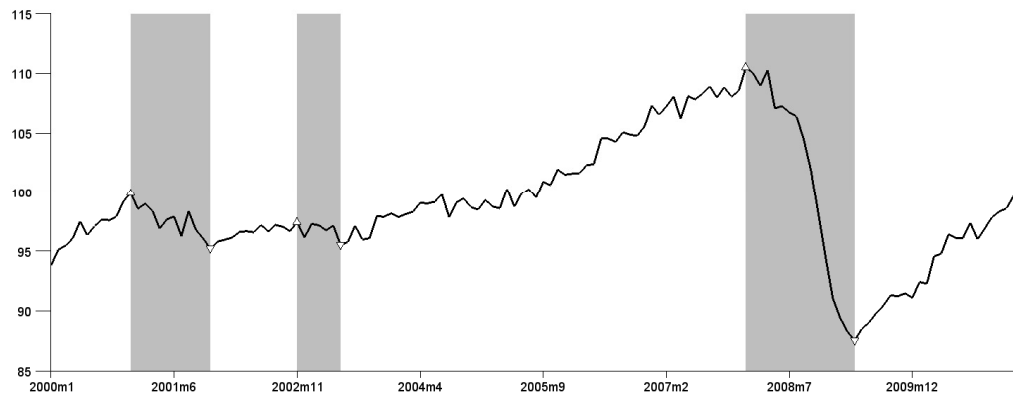
**Table 1: Bulgarian Business Cycle 2000 – 2011**

Recession			Duration (months)
No.	Peak	Trough	
1.	July 2001	February 2002	8
2.	June 2007	Still in recession by March 2011	At least 46

### 3. Comparison of Bulgarian and Euro Area Business Cycle

Euro Area business cycle analysis is based on the reference series for Euro Area (17 countries) published by OECD (OECD, 2011). The Bry-Boschan method applied to this reference series gave us three recessions for the Euro area (Table 2 and Figure 6).

**Figure 6: Euro Area Business Cycle 2000 – 2011**  
(EU17 CCBI Index 2005=100)



**Table 2: Euro Area Business Cycle for 2000 – 2011**

Recession			Duration (months)
No.	Peak	Trough	
1.	December 2000	November 2001	12
2.	November 2002	May 2003	7
3.	January 2008	April 2009	16

The first recession for the period is December 2000 to November 2001, and the second recession is November 2002-May 2003. The last, “Great Recession” for Europe lasted from January 2008 to April 2009. As compared to the US it started later and ended earlier.

Before joining the EU in 2007 the Bulgarian business cycle was somewhat lagging the Euro Area cycle since the first recession in Bulgaria for the period started 7 months later than the Euro Area's first recession. Bulgaria missed the second recession for the area in 2003. But six months after joining EU Bulgaria fell into the "Great Recession" and had not recovered by the end of March 2011, while the Euro Area as a whole recovered by April 2009. The Bulgarian "Great Recession" started 6 months earlier than the Euro Area, and continued at least two years longer.

#### **4. New Leading Business Cycle Indicator**

The idea of a leading business cycle indicator is to predict the turning points of the business cycle and give early warnings for impending recessions. The lead time should be at least 3-6 months if not more.

We constructed the new leading indicator for Bulgaria using the same methodology as the new coincident indicator described earlier. The difference here is the new component series. There are 6 component series for the leading indicator:

- Comp1: Business climate in industry;
- Comp2: Business climate in construction;
- Comp3: Business climate in retail trade;
- Comp4: Business climate in services;
- Comp5: Vacancies;
- Comp6: Bulgarian Stock Exchange index (SOFIX).

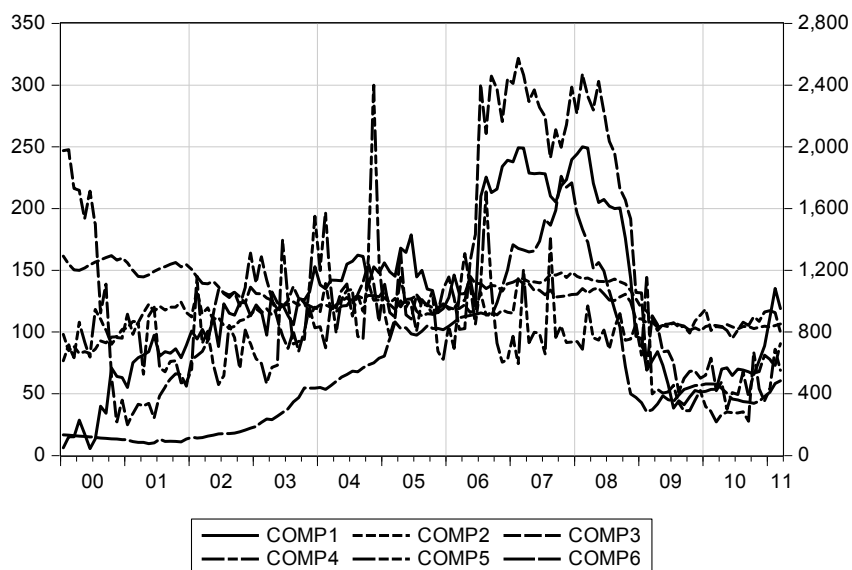
All series are monthly data or average monthly data (e.g. SOFIX) for January 2000 – March 2011. The first four series are published by the Bulgarian National Statistical Institute ([www.nsi.bg](http://www.nsi.bg)), the vacancies are published by the Bulgarian National Employment Agency ([www.az.government.bg](http://www.az.government.bg)) and SOFIX is published by the Bulgarian Stock Exchange ([www.bse-sofia.bg](http://www.bse-sofia.bg)).

The above components were included following suggestions by The Conference Board (Conference Board, 2000, p. 13). They are broad measures closely related to expected business climate in four major economic sectors, vacancies in labor market and stock prices.

The dynamics of the six components are presented in Figure 7.



**Figure 7: Components of the Leading Indicator**  
( COMP6, right-hand scale)

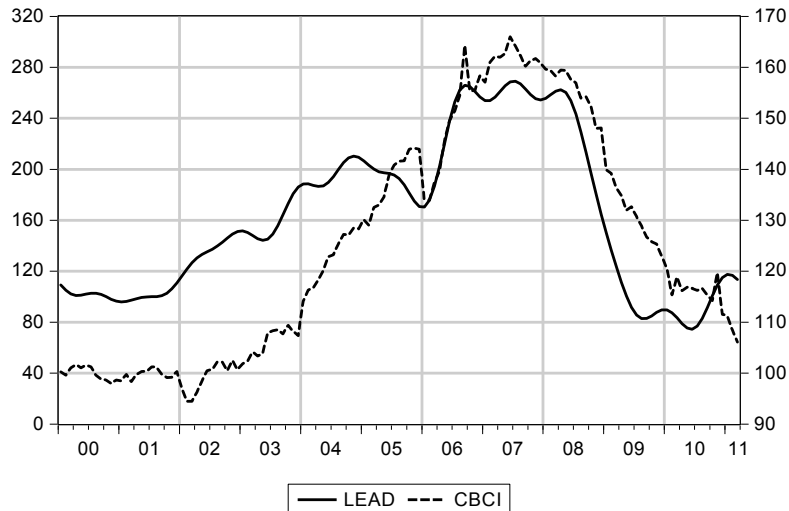


The new leading indicator was constructed using the methodology of The Conference Board (Conference Board 2000, p. 47) for constructing a composite indicator.

The composite coincident and leading business cycle indicators are presented in Figure 8. The Leading indicator is smoothed using the fast Fourier transformation (Brockwell and Davis, 2002, p. 28).

As is clear from the graph the leading indicator seems to give early warnings of the change of direction in the business cycle. However more turning points are needed before we can confirm that the leading indicator is useful for practical purposes.

**Figure 8: Coincident (CBCI) and Leading (LEAD) Indicators**  
(Indexes 2000=100, LEAD, left-hand scale)



## 5. Conclusion

The newly created coincident business cycle indicator for Bulgaria revealed good econometric qualities and could be used as a viable research tool. The applied Bry-Boschan method for dating of the Bulgarian business cycle gave a definitive answer for determining the turning points of the recessions for 2000-2011 period. The national business cycle seemed to be lagging the Euro Area cycle before January 1, 2007 and was early after that. The current “Great Recession” for Bulgaria started in June 2007 and was still continuing by March 2011. It seemed to be very deep and very long and not synchronized with the Euro Area business cycle. The leading indicator gives signs that the “Great Recession” for Bulgaria may be nearing its end.

## References

- Alberola-Lopez, C. and Martin-Fernandez, M., 2003, ‘A simple test of equality of time series’, *Signal Processing*, 83, pp. 1343-1348.
- Brockwell, P. and Davis, R., 2002, *Introduction to Time Series and Forecasting*, 2ed, Springer.
- Bry, G. and Boschan, C., 1971, ‘Cyclical Analysis of Time Series: Selected Procedures and Computer Programs’, NBER Technical Paper 20, *National Bureau of Economic Research*.

- Conference Board, The, 2000, *Business Cycle Indicators Handbook*.
- Diebold, F.X. and Rudebusch, G.D., 1999, *Business Cycles. Durations, Dynamics, and Forecasting*, Princeton University Press.
- Lahiri, K., Stekler, H., Yao, W., Young, P., 2003, 'Monthly Output Index for the U.S. Transportation Sector', *Journal of Transportation and Statistics*, V. 6, N2/3.
- NBER, 2011, Business Cycle Dating Committee announcements, <http://www.nber.org/cycles.html>.
- OECD, 1997, Cyclical Indicator and Business Tendency Surveys, Paris, <http://www.oecd.org/dataoecd/20/18/1844842.pdf>.
- OECD, 2011, StatExtracts, <http://stats.oecd.org> .
- Vesselinov, R., 2004, 'Periodicity of the Bulgarian Economy', *Statistica*, Bulgarian National Statistical Institute, No. 1, pp. 22-41.
- Vesselinov, R., 2008, 'Chronology of the Bulgarian Business Cycle', *Statistica*, Bulgarian National Statistical Institute, No. 1, pp. 22-43.
- Zarnowitz, V., 1992, *Business Cycles: Theory, History, Indicators, and Forecasting*, Chicago, IL: University of Chicago Press.