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COINCIDENT INDICATOR FOR ASSESSING THE STATE OF THE BUSINESS CYCLE IN REPUBLIC OF MACEDONIA

Abstract

Assessing the state of the business cycle is a complex task that requires a lot of expertise. In developed countries special committees for business cycle dating (such as CEPR or NBER committees in the EU and the USA) are being formed and these committees inform the concerned public about the most recent business cycle developments. In developed countries can also find a plenitude of business cycle indicators developed for the purpose of presenting business cycle information in a way more apprehensible to the general public. However, in Balkan countries, except Croatia, neither business cycle committees nor business cycle indicators exist. Such a situation is thus ideal for the proliferation of irresponsible and populist economic policies that thrive when general public is uninformed about the actual state of the economy. Therefore, the tendency of this paper is to demonstrate and master the previously developed methodology applied by Croatia in order to be able to apply it in the future in the Republic of Macedonia, and thus to assess the business cycles through the construction and assessment of the coincident indicators. The obtained indicators will show the current phase of the cycle of the economy and what measures should be taken.

Key words: business fluctuation, cycle, coincident indicator, economic activity, peaks and troughs

JEL classification: E3, C5

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Introduction

The conditions of the business cycle are of paramount importance in any economy around the world. The business sector, the financial markets and the institutions responsible for implementing various economic policies, devote huge resources to assess the continued development of the state of the real economy. In order to avoid the disadvantages of the only indicator of the business cycle conditions available from the official statistical offices (services), which is the Gross Domestic Product (GDP), efforts are being made to accurately determine the current state of the real economy, which are necessary. For this purpose, several new approaches have been developed in the literature in order to find alternative solutions for approximating the conditions of the business cycle. One of those ways is the creation of different indicators for tracking business cycles, such as Leading, Coincident and Lagging indicators. The indicators for tracking the activities of the business cycle (especially the Coincident and leading economic indicators) are the focus of the academics and policymakers. Leading indicators are those that are usually used as a tool for predicting the business cycle development, while coincident indicators are used as a tool for assessing the current state of the business cycle and possibly for predicting the immediate future.

Given the importance of this type of indicators, in this article focus is on showing the way in which the coincident indicator of real economic activity is constructed using a dynamic factor model, combined with a correlation analysis, logit and Markov switching (MS) model. In order to easily understand the construction of this indicator, it is more specifically represented by the example of Croatia. This is done in order to serve as an example of how such a composite coincident indicator could be built in the Republic of Macedonia, which is especially important when making business decisions and creating macroeconomic policies of the economy.

1. INDICATORS FOR TRACKING THE BUSINESS CYCLE ACTIVITIES

In the theory and practice several cyclical indicators are applied in order to track the activities of each business cycle. Basically, they can be classified into three categories, according to their usual timing of calculation in terms of the business cycle: leading indicators, coincident indicators, and lagging indicators.

Leading indicators are determined for categories that predict a change in the business cycle. Leading indicators are indicators that usually, but not always, change before the economy as a whole changes.¹ These types of indicators signal future events. For example, stock market returns are a leading indicator: the stock market usually begins to decline before the economy as a whole decline and usually begins to improve before the general economy begins to recover from a recession. Other leading indicators include the index of consumer expectations, building permits, and money supply (M1, the stock price, credit). Despite these other potential leading indicators might include: the confidence of producers/consumers; activity/orders of companies; international indicators; prices (interest rates, exchange rates), vacancies, bankruptcies.

Hence, in principle there are 5 leading indicators in total, of which 4 are confidence indicators (Table 1). This is quite logical, because as a sentiment factor, confidence in the economy will adjust to the business cycle faster than the physical economic indicators and labor market indicators (production, unemployment, consumption, exports, bankruptcy, etc.).

Table 1. Phasing of business cycle indicators

Business Cycle Phasing	Sentiment Indicators	Economic Indicators	Labour market Indicators
Leading	Consumer - confidence Large purchases Producer - confidence Orders received		Temp jobs
Coincident		Manufacturing Fixed capital - formation Consumption Exports GDP Capital market rate	Bankruptcies
Lagging			Vacancies Unemployment Labour volume

Source: CBS

Source: <https://www.cbs.nl/en-gb/background/2009/42/the-business-cycle-tracer-leading-coincident-and-lagging-indicators>

¹ Sullivan; Steven M. Sheffrin, Economics: Principles in action. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall, 2003, p. 314.

As a rule, leading indicators are the first to show how macro-economic activity is headed in the medium term. Normally they move into a next phase an average six months earlier than the coincident indicators.

Lagging indicators are indicators that usually change once the economy as a whole changes. Usually the lag is for several quarters of the year. The unemployment rate is a lagging indicator. Namely, employment tends to increase two or three quarters, after the improvement of the general economy. In the performance measurement system, the profits earned by the business is a lagging indicator so that it reflects the previous efficiency; similarly, improving customer satisfaction is the result of initiatives taken in the past.

Lagging economic indicators provide the final, conclusive evidence that peaks and troughs did occur, making it possible to direct attention to the next phase of the business cycle. These lagging indicators are the second confirmation that the business cycle has moved to or is in a next phase. And it is no coincidence that the 3 lagging indicators are all labour market indicators: labour volume, job vacancies and unemployment (Table 1). Compared with the other two groups of indicators, the movements of the lagging indicators are the calmest. Once they begin to change, there is no doubt about the way the economy is headed. The role of the lagging indicators is mainly to confirm the durability of the business cycle changes. This is important because the course of the cycle is not constant but variable.

Coincident indicator, is created as an indicator that changes along with the business cycle and it provides information about the current state of the economy. It contains all information that otherwise would be calculated by analyzing a number of economic series. Hence, it is an ideal tool that the public can use to keep track of the business cycle trends and in that way to make every decision of public policy in an appropriate economic context.

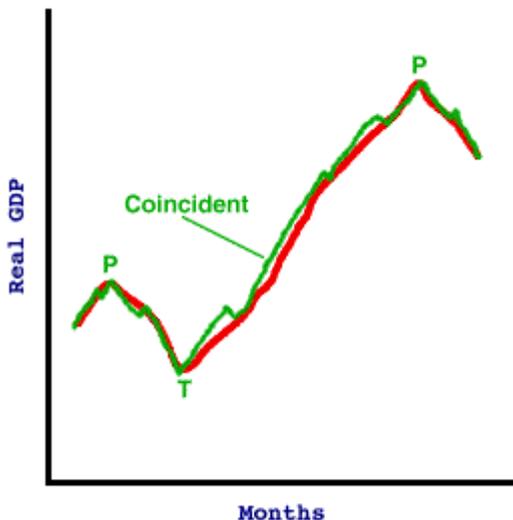
In general, these indicators are a series of data composed of several measures of economic activity collected from different sources in order to track the activity of the business cycle on a monthly basis. In particular, they measure four key aspects of the aggregate economy:

- employment,
- production,
- income and
- sales.

When concerns are directed toward the current state of the macroeconomy, these are the four most important areas of interest. When the aggregate economy is expanding or contracting, these are the four areas that are expanding and contracting. Each of these four individual areas is useful in its own right, but when combined as a composite measure, even greater insight into the business-cycle activity is achieved. There are 7 coincident indicators (Table 1), of which 6 economic and 1 labour market indicator (bankruptcies). The coincident indicators are very important for the business cycle tracking.

Coincident economic indicators give consumers, business leaders and policy makers an information about the current state of the economy and make it possible to determine in which direction the economy could move. The role of this indicator is to estimate what is the actual frequency (incidence) of the peaks and the troughs of the business cycle at the time when they actually occur.² Namely, when the economy grows, then coincident indicators are also increasing and when the economy falls, then the indicators are also declining at that moment. The coincident economic indicators are used as a primary source of information used to document “official” business cycle turning points.

Chart 1. Coincident indicators



Source: http://www.amosweb.com/cgi-bin/awb_nav.pl?s=wpd&c=dsp&k=coincident%20economic%20indicators

² Smith Emrys Charles, ‘Economic Indicators,’ in Wankel, c. (ed.) *Encyclopedia of business in Today’s World*, California, USA, 2009.

Chart 1 is used to illustrate how coincident economic indicators relate to the official tracking of business cycle peaks and troughs. First, to take in consideration the somewhat jagged red line shown on the chart, which provides a hypothetical tracking of real GDP over several months. Evident two peaks marked by P and a trough indicated by T. The thin green line that rises and falls along with the rise and fall of real GDP, tracking together the peaks and troughs of the business cycle, is a coincident indicator line that lies almost at the top of the red real GDP line.

Coincident business cycle indicators are useful in three ways. First, it is a single-number business cycle indicator containing information that would otherwise have to be accrued by analyzing a large number of economic time series. Second, unlike the GDP series, it provides monthly estimates of the state of the economy, thus providing information on subtle changes that took place in a short period of time. Third, coincident business cycle indicators are available one to three months prior to quarterly GDP estimates, meaning that policy-makers and the general public can observe the current state of the economy in a timely manner. There are a several other arguments as to why coincident indicators may be a useful alternative measure of the state of the economy compared to GDP. GDP, as well as other economic series, is estimated with noise. On the other hand, the coincident indicator, that uses statistical weights to combine a large number of economic series, can be able to abstract in a certain part of this noise. The assessment of the business cycle based only on aggregate GDP also can not take into account important developments in the various sectors of the economy. For example, estimates of GDP at times can be driven by temporary shocks to one part of the economy, such as short-term shocks to the agricultural sector or to public spending, that are not representative of developments in the broader economy. In addition, coincident indicators could be less prone to the revisions that are made with GDP, in part due to the fact that they can be constructed from series that either are not revised or are subject to smaller revisions.³

³ Gillitzer Christian, Kearns Jonathan and Richards Anthony, THE AUSTRALIAN BUSINESS CYCLE: A COINCIDENT INDICATOR APPROACH, Economic Group, Reserve Bank of Australia, Research Discussion Paper 2005-07, October 2005, p. 1

2. CREATING THE COMPOSITE COINCIDENT INDICATOR

2.1. Literature review

Dynamic factor models used its wider application in the analysis and forecasts of business cycles in the late 1980s, after which a series of papers from Stock and Watson were published. Stock and Watson (1989) applied a single factor to model the co-movements of the four main coincident indicators in United States: industrial production, real disposable income, hours of work and sales. The main assumption of this dynamic factor model is that the given set of data is driven by two components, the first one is an unobservable common component, while the second one is a variable-specific unobservable component. The use of dynamic factor model was further improved by many authors Stock and Watson (1991, 1993), Kapetanios and Marcellino (2003), Forni, Hallin, Lippi, and Reichlin (2000, 2001, 2005), and Doz, Giannone, and Reichlin (2011, 2012).⁴

Unlike the dynamic factor model, Markov switching (MS) model provides a dependency between the growth rate of the variables and the business cycle status. This model after its introduction in econometrics by Goldfeld and Quandt (1973) is extended by Hamilton (1989). The Hamilton's approach is that the expansion and contraction of the business cycle can be seen as different regimes with the business cycle modelled as a Markov chain. Unlike dynamic factor model in which the single unobservable component is continuous, the unobservable component in the MS model is a discrete variable and indirectly determines behaviour of the variables. Hamilton's work contributed to the considerable scope of research that follows, such as those of Diebold and Rudebusch (1996).⁵

According to our findings, there are no studies that use MS model, the dynamic factor model, or the combination of these two models in order to construct a monthly composite coincident indicator for European post-transition countries. It is also characteristic that in recent years in these countries, dynamic factor models have been applied more intensively in order to build short-term composite coincident indicators that are used for predictive purposes. This is the case with Arnoštová, Havrlant, Růžička and

⁴ Bakarić Rašić Ivana, Tkalec Marina & Vizek Maruška, Constructing a composite coincident indicator for a post-transition country, *Economic Research-Ekonomska Istraživanja*, VO L. 29, NO . 1, 2016, p. 436

⁵ *Ibidem*

Luboš (2011) and Rusnak (2013) that develop cyclical indicators for the Czech Republic and Porshakov, Deryugina, Ponomarenko and Sinyakov (2015) that build a composite coincident indicator for Russia.⁶ The only work that combine MS and dynamic factor models (DFM) in order to construct a coincident indicator of real economic activity in Croatia, as one of the post-transition economies, is the one of Bakaric I. R., Tkalec M. and Wizek M. (2016).⁷ It is taken as an example that should be taken into consideration in the Republic of Macedonia.

Considering that in the Republic of Macedonia so far analyzes have been made only in the context of determining the usefulness of applying the leading indicators for tracking and forecasting of the business cycle, and the coincident indicator is not applied at all, it is quite justifiable to see some examples of its application as is the case with the Republic of Croatia. This would be an incentive in the future to carry out such analyzes and to assess the current state of the business cycle by applying the coincident indicator in the Republic of Macedonia.

2.2. The main steps for constructing the composite coincident indicator

Constructing a monthly coincident indicator of real economic activity involves showing the time series that closely and carefully track the entire business cycle and its turning points. Hence, in the example of Croatia, 278 time series available for the Croatian economy are investigated, and those that match the reference GDP and the most probability of entering the recession series are selected. This statistical database covers the most important sectors of the Croatian economy such as:⁸ Prices of industrial products (8 indicators),

⁶ Arnoštová, K., Havrlant, D., Růžička, L., & Luboš, T. P., Short-term forecasting of Czech quarterly GDP using monthly indicators. *Finance a Uver*, 61, 2011, p. 566–583; Rusnák, M. Nowcasting Czech GDP in real time, Working Papers 2013/6, Czech National Bank, 2013; and Porshakov, A., Deryugina, E., Ponomarenko, A., & Sinyakov, A., Nowcasting and short-term forecasting of Russian GDP with a dynamic factor model, BOFIT Discussion papers, 19/2015.

⁷ Bakarić Rašić Ivana, Tkalec Marina & Vizek Maruška, Constructing a composite coincident indicator for a post-transition country, *Economic Research-Ekonomska Istraživanja*, VO L. 29, NO. 1, 2016

⁸ Bakarić Rašić Ivana, Tkalec Marina & Vizek Maruška, Constructing a composite coincident indicator for a post-transition country, *Economic Research-Ekonomska Istraživanja*, VO L. 29, NO. 1, 2016, p. 437

Consumer prices (20 indicators), Industrial production (40 indicators), Construction (3 indicators), Trade (1 indicator), Tourism (6 indicators), Unemployment (7 indicators), Employment (24 indicators), Gross wages (23 indicators), Net wages (24 indicators), Capital market (2 indicators), Monetary statistics (66 indicators), Fiscal indicators (17 indicators), International series/statistics (15 indicators), Foreign trade (22 indicators). In order to choose the series that will form the Croatian coincident indicator, statistical and econometric techniques, i.e. correlation coefficients, logit model and Markov switching (MS) model are used. First of all, from total 278 series, 22 series that have a significant and the highest correlation coefficient with GDP are selected. These are potential components of the composite coincident indicator and they are shown in Table 2.

Table 2. Potential CCI components correlation coefficients

Indicator	Time lag				
	t	t-1	t-2	t-3	t-4
Domestic tourists' arrivals	0.79*	0.76*	0.62*	0.50*	0.33*
Total industrial production	0.85*	0.81*	0.74*	0.57*	0.37*
Gross volume index of industrial production – Intermediate goods	0.81*	0.78*	0.73*	0.54*	0.37*
Gross volume index of industrial production – Consumer durables	0.46*	0.53*	0.59*	0.48*	0.31*
Gross volume index of industrial production – Consumer non-durables	0.71*	0.62*	0.55*	0.38*	0.19
Gross volume index of industrial production – Manufacturing	0.84*	0.79*	0.72*	0.55*	0.35*
Gross volume index of industrial production – Other mining and quarrying	0.61*	0.60*	0.56*	0.44*	0.28
Gross volume index of industrial production – Manufacture of food products	0.72*	0.70*	0.56*	0.49*	0.35*
Gross volume index of industrial production – Manufacture of fabricated metal products, except machinery and equipment	0.79*	0.77*	0.66*	0.44*	0.31*
Volume index of real retail sales	0.76*	0.78*	0.75*	0.61*	0.45*
Total import of goods	0.83*	0.77*	0.65*	0.45*	0.23
Import of food and live animals	0.71*	0.59*	0.41*	0.19	0.08
Import of machinery and transport equipment	0.77*	0.68*	0.56*	0.43*	0.23
Import of miscellaneous manufactured articles	0.90*	0.85*	0.71*	0.50*	0.38*
Newly registered unemployed persons	-0.75*	-0.72*	-0.56*	-0.35*	-0.16
Value added tax revenues (net)	0.74*	0.69*	0.65*	0.50*	0.32*
Employment contribution revenues	0.70*	0.62*	0.56*	0.50*	0.38*
Money M1 (in million kuna)	0.65*	0.68*	0.64*	0.57*	0.44*
Broadest money M4 (in million kuna)	0.47*	0.43*	0.35*	0.35*	0.32*
Time and savings deposits with banks (in million kuna)	0.77*	0.70*	0.56*	0.46*	0.37*
Loans to households (in million kuna) – nominal	0.69*	0.64*	0.59*	0.54*	0.50*
Spread: Long-term credits indexed to foreign currency RH (total average) – Euro Area 12-month money market rate	-0.71*	-0.76*	-0.74*	-0.70*	-0.56*

Source: Bakarić Rašić Ivana, Tkalec Marina & Vizek Maruška, Constructing a composite coincident indicator for a post-transition country, Economic Research-Ekonomska Istraživanja, VO L. 29, NO. 1, 2016, p. 440

Further, it is continued with logit analysis using 11 variables that are characterized not only by the highest current coefficients of the correlation, but also with a higher level of aggregation of data, since the higher series aggregation more realizes the behavior of the referent GDP series.

In the next step, the Markov switching (MS) model is applied in order to derive the smoothed probability of entering in recession from the series of real GDP in the first differences. This probability is used to build a binary series that proxies recessions and expansions using the transformation rule. Namely, the dependent variable was obtained by converting smoothed transition recession probabilities into a discrete variable that defines whether the economy is in an expansion or recession regime at time t . The dependent variable has value 1 if there is a recession (transition probabilities are greater or equal to 0.5), and has value 0 if there is expansion (transition probabilities are smaller or equal to 0.5).⁹

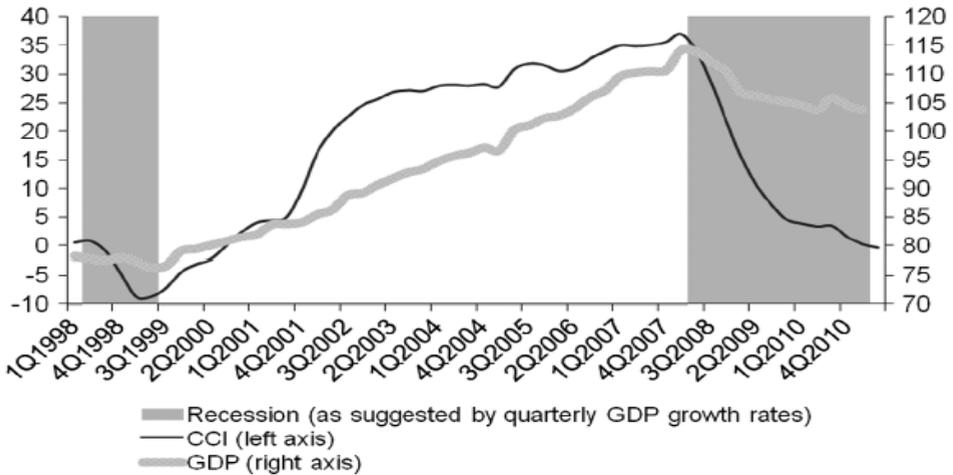
As a third step, the logit model is applied in order to determine the final components of the composite coincident indicator. Logit assessment begins with a wider model that includes the dependent variable, constant and potential components of the coincident indicator in annual growth rates in time t , $t-1$, $t-2$, and $t-3$. On the basis of z-statistics and their p-values, those time series that have the best coincident properties, i.e. those with highly current growth rates, the lowest Schwarz information criteria and representative statistics for LR and McFadden R^2 are selected. In the case of Croatia, the results of the logit estimates indicate that the following series should be included in the composite coincident indicator: total industrial production, volume index of real retail sales, value added tax revenues (net) and broad money M4.¹⁰

Once the best components of the coincident indicator have been identified, the dynamic factor model is applied and its common component i.e. the monthly composite coincident indicator is estimated. It represents the overall fluctuations of the business cycle instead of GDP. Chart 2 presents the estimated common factor of the coincident indicator that is based on four coincident variables and compares it with the series of GDP in order to show how really the composite indicator coincides with the overall business cycle trends, in the case of Croatia.

⁹ *ibid.*, p. 438 and 440

¹⁰ *ibid.* p. 441

Chart 2. Composite coincident indicator and GDP



Source: Bakarić Rašić Ivana, Tkalec Marina & Vizek Maruška, Constructing a composite coincident indicator for a post-transition country, *Economic Research-Ekonomska Istraživanja*, VO L. 29, NO. 1, 2016, p. 442

As can be seen, the composite coincident indicator closely follows the behavior of GDP, and corresponds to changes in the business cycle mode, whose dating is based on quarterly GDP growth rates. This suggests that the monthly coincident indicator can be used not only as an indicator of the business cycle, but also as a tool for predicting future business cycle trends.

Conclusion

By applying the coincident indicator, the activity cycle of the business cycle is tracked on a monthly basis, for a certain period, the subtle changes that occurred in a short period of time are realized and the real frequency of the peaks and troughs of the business cycle are determined in the time when they actually happen. Thus, the “official” turning points in the business cycle are documented and consumers, business leaders and policy makers are provided with information on the current state of the economy and the direction in which the economy could move in the future. Thus, from what has been shown for Croatia, it is concluded that the composite indicator successfully fulfills its goal to closely monitor the behavior of GDP, and the changes in its trend correspond with changes in the business cycle regime (ie recessions and expansions). This points to the exceptional importance and

usefulness of the composite coincident indicator for each economy, as well as for the Republic of Macedonia. Hence, the elaborated methodology used in constructing the composite coincident indicator and the concrete example presented for calculating this indicator in the case of Croatia is expected to stimulate and facilitate in the future the application of this indicator in assessing the business cycle current situation in Republic of Macedonia. With the building of this indicator can be interpreted monthly changes in the value of the index and present findings obtained from the analysis of the index. This will show in which phase of the economic cycle the economy is located and what are the key points where it is necessary to intervene in the future. It will certainly help a lot of consumers, business leaders and policy makers to learn about the current state of the economy and the direction that could move the economy, which more appropriately can define economic policies.

References

1. Arnoštová, K., Havrlant, D., Růžička, L., & Luboš, T. P., Short-term forecasting of Czech quarterly GDP using monthly indicators. *Finance a Uver*, 61, 2011
2. Bakarić Rašić Ivana, Tkalec Marina & Vizek Maruška, Constructing a composite coincident indicator for a post-transition country, *Economic Research-Ekonomska Istraživanja*, VO L. 29, NO. 1, 2016
3. Christian Gillitzer, Jonathan Kearns and Anthony Richards, THE AUSTRALIAN BUSINESS CYCLE: A COINCIDENT INDICATOR APPROACH, Economic Group, Reserve Bank of Australia, Research Discussion Paper 2005-07, October 2005
4. Porshakov, A., Deryugina, E., Ponomarenko, A., & Sinyakov, A., Nowcasting and short-term forecasting of Russian GDP with a dynamic factor model, *BOFIT Discussion papers*, 19/2015
5. Rusnák, M., Nowcasting Czech GDP in real time, *Working Papers 2013/6*, Czech National Bank, 2013
6. Smith Emrys Charles, 'Economic Indicators,' in Wankel, c. (ed.) *Encyclopedia of business in Today's World*, California, USA, 2009
7. Sullivan; Steven M. Sheffrin, *Economics: Principles in action*. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall, 2003
8. http://www.amosweb.com/cgi-bin/awb_nav.pl?s=wpd&c=dsp&k=coincident%20economic%20indicators
9. <https://www.cbs.nl/en-gb/background/2009/42/the-business-cycle-tracer-leading-coincident-and-lagging-indicators>