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Cyclic characteristics of Macroeconomic Variables in Serbia

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***Abstract**: The paper focuses on identification of the characteristics of the business cycles in Serbia. In that purpose, the empirical connection between the aggregate economic activity and key macroeconomic variables was examined, such as the GDP components, industrial production, employment, wages, price and monetary aggregates from the aspect of volatility, synchronization, and co-movements, as well as persistency. Also, the obtained results were compared to the results of similar researches in transition countries of the Central and Eastern Europe. Findings confirm the existence of significant regularities in movements of the analyzed economic time series compared to movements of the aggregate economic activity. Thus, the determined cyclical characteristics of the macroeconomic variables in Serbia do not deviate significantly from the so far documented characteristics in other European developing countries, even in respect of the differences compared to the developed countries.*

***Keywords**: business cycles, macroeconomic variables, stylized facts, volatility, correlation, persistence.*

Ciklične karakteristike makroekonomskih varijabli u Srbiji

***Apstrakt**: Rad se fokusira na identifikovanje karakteristika poslovnih ciklusa u Srbiji. U tu svrhu ispitivana je empirijska veza između agregatne ekonomske aktivnosti i ključnih makroekonomskih varijabli, kao što su komponente BDP-a, industrijska proizvodnja, zaposlenost, zarade, cene i monetarni agregati sa aspekta volatilnosti, sinhronizovanosti i vremenske podudarnosti, te*

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perzistentnosti. Takođe, dobijeni rezultati komparirani su sa rezultatima sprovedenih sličnih istraživanja u tranzicionim zemljama Centralne i Istočne Evrope. Naši nalazi potvrđuju postojanje značajnih pravilnosti u kretanju analiziranih ekonomskih vremenskih serija u odnosu na kretanje agregatne ekonomske aktivnosti. Pri tome, utvrđene ciklične karakteristike makroekonomskih varijabli u Srbiji ne odstupaju značajno od do sada dokumentovanih karakteristika u drugim evropskim zemljama u razvoju, čak ni u pogledu razlika u odnosu na razvijene zemlje.

***Ključne reči**: poslovni ciklusi, makroekonomske varijable, stilizovane činjenice, volatilnost, korelacija, perzistentnost*

1. Introduction

The analysis of the cyclic fluctuations of the aggregate economic activity has always been central concern of the economists. In the USA, the empirical research on the subject of characteristics of the business cycles emerged back in 1946 with the paper of Burns and Mitchell under the title „*Measuring business cycles*". According to these authors, „*Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own*" (p. 3). The methodology developed by these authors, with reference business cycles with four phases in the center, is known as the classic approach in the analysis of the business cycles.[2]

However, instead of classic cycles of Burns and Mitchell, the empirical researches, especially those recent, mainly use the growth cycle concept, i.e. deviation cycles presented by the Robert Lucas in paper „*Understanding Business Cycles*" (1977) with the methodology developed by the representatives of the theory of real business cycles. According to Lucas's definition the business cycles represent „*movements about trend in gross*

[2] However, in beginning Burns and Mitchell have been criticized that the "measurement without theory" in fact has "limited value for economic science and policymakers" (see primarily Koopmans, T. (1947)). Nonetheless, further development of the empirical approach in the analysis of business cycles not only enabled implementation of economic forecasts, which has special importance for defining of economic policy, but it also enabled examining of the validity of certain theories of business cycles.

national product" (p. 9). In the process, the expansion represents a series of positive deviations from the trend in real GDP which culminate in the peak, while the recession represents a series of negative deviations from the trend which culminates in the troughs. These fluctuations are not deterministic in nature and the only regularities which are noticed are those in movements of other economic time series compared to movements of the GDP (Lucas, 1977, p. 9).

In that sense, in macroeconomic theory and policy for analysis of business cycle characteristics is mainly directed to the research of behavior of certain macroeconomic variables in three areas. First, the movement direction of the macroeconomic variables is determined in relation to the movement of aggregate economic activity, where procyclical macroeconomic variables are differentiated which move in the same direction as the aggregate economic activity, countercyclical macroeconomic variables moves in the opposite direction compared to the aggregate economic activity and acyclical variables whose movement compared to the aggregate economic activity is not clear (Abel, Bernanke & Croushore, 2014, p. 290).

The second characteristic is the timing, i.e. time when the certain variables reach the turning point (peaks and troughs) compared to the aggregate economic activity, and classification is done to leading variables moving forward compared to the cyclical movement of the aggregate economic activity, coincident variables which have their extreme values (peaks and troughs of the cycle) at the same moment as the aggregate economic activity and lagging variables which reach their extreme values after they reach the turning points of the business cycle (Praščević, 2008, p. 15). Knowledge of regularities in the leading/lagging relations between economic variables can be very useful for needs of macroeconomic forecasts and creating of the economic policy. In other words, leading variables can help in predicting of the future pattern of the real GDP, while on basis of the pattern of the real GDP it is possible to predict the future pattern of the lagging economic variables.

Third, the economists also research the volatility of the macroeconomic variables and compare it to the volatility of the aggregate economic activity (of the GDP). Information on amplitudes of fluctuation are obtained in this way. Finally, besides these three characteristics, a great number of authors also states the fourth, and that is retaining economic variables in the recession or expansion. Specifically, when the recession starts, the economic activity usually follows the declining pattern for a certain period of time. The same applies in case of expansion. This tendency, that the decline of aggregate economic activity is followed by a further decline, and growth with further growth, is usually called persistence.

Following the growth cycle approach, a great number of researches have been conducted with the goal to identify the business cycle characteristics, i.e.

cyclic characteristics of macroeconomic variables in the USA, but also in, primarily developed, European countries. On the other side, the concept of business cycles in former socialist countries of Central and Eastern Europe is still a novelty and the researches dealing with this subject are rare. Generally, all empirical facts on business cycles are not yet identified in Serbia, even though after the transition was completed aggregate economic activity is going thru cyclical fluctuations characteristic for capitalist countries. In that sense, the purpose of this paper is to research and document characteristics of business cycles on Serbia. In the process, the intention is not to lean toward any known theory of business cycles. In fact, the main goal is to determine if there is a clear behavior pattern of the macroeconomic variables during the business cycles in Serbia and if there are any similarities with other countries of Central and Eastern Europe in this respect. Therefore, obtained results, of course in combination with the results of other similar researches, can represent useful information for creators of the economic policy in Serbia.

In the context of the above, the paper consists of three parts. The first part provides the review of similar empirical researches in the USA and Europe. After that, applied research methodology is explained, as well as the data which has been used. The third part shows the results of research on cyclical characteristics of macroeconomic variables in Serbia in context of their volatility, comovements with the GDP, and persistence with the appropriate discussion. The paper ends with conclusions, and recommendations for following researches.

2. Literature review

Analysis of the behavior of the macroeconomic variables during the business cycles is important for several reasons. Primarily, understanding the cyclic fluctuations is a crucial presumption for the creation of an adequate economic policy. This specifically becomes prominent in case of big declines in the aggregate economic activity, when the actions of the automatic stabilizers are not sufficient for stabilization, but it is also necessary to undertake certain measures of monetary and fiscal policy, as well as the measures in the labor market policy. Secondly, identifying stylized facts is very important for the building of the new theoretical models, but also for verification of the validity of the existing theories of business cycles. Finally, knowledge of characteristics of the business cycles in different countries is a precondition for further progress in the process of economic and monetary integration in Europe.

Lucas was the first to present the idea of business cycle regularities, i.e. on the existence of the regularities in the movement of other economic time series compared to the movement of the GDP (Lucas, 1977, p. 9). Exactly

that idea has, in combination with the development of appropriate methodology under influence of the representatives of the neoclassical economy, incited many empirical researches on the behavior of the macroeconomic variables during the business cycles. Those researches have in some cases provided different results due to the application of different methods of detrending, selected time period, specificities of the analyzed economies, but also due to the fact that certain variables do not behave the same during each cycle. The majority of early papers was dealing with business cycles in the USA, and one of the most significant is certainly the paper of Kydland and Prescott „*Business Cycles: Real Facts and a Monetary Myth*" (1990). In the selection of variables for the analysis, the authors have guided by the neoclassical growth theory, while in respect of the time period they have limited it to the period after the Korean War, i.e. from 1954 to 1989. The research results were usual for the GDP components – private consumption, investments, export and import as procyclical variables, while only for the government consumption it was not clearly determined if it was procyclical or countercyclical. Therefore, all of these variables are coincident, with exception of the export, which lags behind the business cycle. Also, the authors have determined that the income from labor and capital are procyclical and coincident variables, and employment is procyclical and lagging variable. However, the especially important result of this research is countercyclicality of the prices, regardless of the prices are measured thru the GDP deflator or Consumer Price Index, which went in favor of the at the time the actual theory of real business cycles. On the other hand, the authors have determined that the monetary aggregates M_1 and M_2 are procyclical, where the M_2 is also the leading variable, which is contrary to the mentioned theory (Kydland, & Prescott, 1990).

A very important paper on characteristics of the business cycles in the USA in the postwar period (from the first quarter of 1953 to fourth quarter of 1996) was written by Stock and Watson (1998). Specifically, they have examined the connection between the aggregate economic activity and as much as 71 economic time series, such as production, investments, consumption, interest rates, prices, productivity, employment, revenue etc. In respect of the cyclical character of the GDP components and employment, Stock and Watson got approximately the same results as the Kydland and Prescott. These authors have, also, determined that the unemployment is countercyclical and that the changes of the real wages index are poorly connected to business cycles. Considering the prices, Stock and Watson have shown that the prices measured with Consumer Price Index and GDP deflator (level) are countercyclical and leading variables, but the cyclical component of the inflation rate, as the first difference of the Consumer Price Index, is procyclical and lagging variable. Further on, the results of this research have shown that the nominal interest rates, stock prices, and monetary aggregates are

procyclical and leading variables. Finally, a significant contribution of this paper is also emphasizing of the leading indicators, which can be used for forecasting of the aggregate economic activity, but also of the other economic time series. So, the authors single out the issued building permits as the indicator of future costs of dwelling, new orders as the indicator of future consumption for durable goods etc. (Stock & Watson, 1998).

Inspired by studies in the USA, the European economists have started dealing with this issue, and some of the first were certainly Brandner and Neusser who researched the characteristics of business cycles in Austria and Germany (1992), Hasler, Persson, Lundvik and Söderlind in Sweden (1992) and Blackburn and Ravn in United Kingdom (1992). Brandner and Neusser have determined that, in despite to the difference in size and institutional framework, empirical facts on business cycles of Austria and German are similar to those in the USA, especially in respect of components of GDP and prices. Certainly, some differences also were revealed. Primarily, cyclic fluctuations in Austria are more damped than in Germany and the USA. Then, the government consumption is countercyclical in Austria and acyclical in Germany, while in the case of the real money supply it is the opposite, in the sense that it is strongly procyclical in Germany and unconnected with the aggregate economic activity in Austria. Finally, real interest rates are countercyclical in Germany and acyclical in Austria (Brandner & Neusser, 1992). The study on Swedish business cycles by Hasler, Persson, Lundvik and Söderlind is especially significant because it covers the time period of 130 years for the majority of 42 analyzed variables. These authors have shown that cyclical behavior of real variables is quite stable during the entire observed period, so all of the GDP components are procyclical in despite to significant differences in volatility during certain sub-periods (prewar period, interwar and postwar period). This is contrary to the fluctuation of nominal variables, whose pattern is not stable during the sub-period, especially in case if money and prices. So, for example, when the inflation is observed as lagging variable compared to the GDP the correlation is significantly negative, in the current period it is moderately positive, and when the inflation is a leading variable than it is significantly positive. The authors consider that this is the confirmation of the countercyclicality of prices. Further on, nominal interest rates are procyclical and lagging variable, while, under influence of countercyclicality of the inflation, real interest rates are also countercyclical. Nominal and real money supply is procyclical and leading variables, according to this research, but only in the postwar period. Another interesting empirical fact about business cycles of Sweden is significant countercyclicality of real wages, which is characteristic only of this country. Finally, the authors have determined that there is a connection between the Swedish export and industrial production and the foreign demand, but there is no connection between the Swedish GDP (business cycles) and the foreign demand (Hasler,

Persson, Lundvik & Söderlind, 1992). Blackburn and Ravn have documented stylized facts on business cycles of the United Kingdom in the period from 1956-1990 and compared them to the same ones in the USA. The GDP components have the same cyclical characteristics as in the USA, including also the government consumption, whose pattern also in the United Kingdom is not unambiguously determined. The procyclicality of the monetary aggregates and countercyclicality of prices (measured by GDP deflator) were also confirmed in the United Kingdom, as well as the procyclicality of real wages and labor productivity. The significant difference compared to the other countries is relatively high volatility of the consumption and net export and relatively low volatility of employment in the United Kingdom (Blackburn & Ravn, 1992).

With the increasingly intensive process of economic, as well as the monetary integration in Europe, new papers have emerged dealing with the characteristics of the business cycles of the European Community countries (i.e. the European Union). This is the case because the crucial factor for the success of the monetary union is synchronization of the business cycles, i.e. uniformity of the characteristics of the member countries' economies. In this sense, one of the first and significant studies on the characteristic of the business cycles of the European Community countries was conducted by the Christodoulakis, Dimelis and Kollintza, (1995). These economists were guided by the methodology developed by the representatives of the theory of real business cycles and they have analyzed the cyclic fluctuations in the period from 1960-1990. In respect of the individual variables, they have determined that the private consumption is procyclical and coincident in all of the countries, except in Luxemburg and Portugal where it lags behind the aggregate economic activity, and that the investments are procyclical, coincident variable and more volatile compared to the GDP. The government consumption does not have a clear pattern in relation to the business cycle, with exception of Spain where it is strongly procyclical. Net export is a more volatile variable than the GDP, procyclical (except in Luxemburg where it is countercyclical) and coincident in the majority of the countries. Cyclical characteristics of the money supply have significant differences among the countries. Specifically, money supply is leading and countercyclical variable in France, Greece, and Italy, leading and procyclical in Denmark, Germany and Netherlands, and lagging and procyclical in Belgium and Spain. Both price indices (GDP deflator and Consumer Price Index) are countercyclical and/or coincident or leading variables. The employment is procyclical, and coincident or lagging variable in all of the countries, except in Portugal where it is not statistically significant. In the end, the authors, considering that the cyclical characteristics of consumption, investments, prices and in smaller degree of the net export are similar in all countries, while the cyclical characteristics of government consumption, money supply, and terms of trade are different,

concluded that only variables under direct control of the government are behaving differently. They consider this as the evidence that there is a significant compatibility in the pattern of business cycles in these countries, i.e. similarity in shocks and transmission mechanisms, and that the process of European integrations with establishing of joint institutions and policies will not lead to losses for the member countries (Christodoulakis, Dimelis & Kollintza, 1995).

Another interesting paper is the one of the German economist Döpke (1998), who examined the characteristics of European business cycles using the aggregated data for all countries (Germany, France, Italy, Spain, Portugal, Ireland, Austria, Luxemburg, Finland, Belgium) in the time period from 1980-1997. The analysis of the aggregated values of variables provided similar results as the previously explained paper. Specifically, all GDP components, with exception of net export, are procyclical and mainly coincidental. Further on, monetary variables do not register a clear cyclical pattern, and the prices are countercyclical. In respect of the labor market indicators, the unemployment is countercyclical, while the employment and real wages are procyclical. Finally, cyclical component of the industrial production in all member countries points to a positive and growing correlation with other countries (Döpke, 1998).

In respect of the analysis of business cycles in European countries, there should be mentioned the textbook of Sørensen and Whitt-Jacobsen *„Introducing Advanced Macroeconomics: Growth and Business Cycles"* (2005). Specifically, in Chapter 14 they have conducted a detailed research on the behavior of macroeconomic variables during the business cycles in six countries: Denmark, Finland, Netherlands, Belgium, United Kingdom, and the USA, in sense of volatility, the direction of movement, reaching turning points and persistence. On basis of the obtained results, they have formulated several significant stylized facts (pp. 409-421):

- *Investment is many times more volatile over the business cycle than GDP. It is the most unstable component of aggregate demand;*
- *Foreign trade volumes are typically two to three times as volatile as GDP;*
- *Employment and unemployment are considerably less volatile over the business cycle than GDP;*
- *Private consumption, investment, and imports are strongly positively correlated with GDP;*
- *Employment (unemployment) is procyclical (countercyclical) and more strongly correlated with GDP than real wages and labor productivity. Labour productivity tends to be procyclical;*
- *In most countries inflation tends to be positively correlated with GDP, although the correlation is not very strong;*

- *Employment is a lagging variable; short-term nominal interest rates also tend to be lagging variables;*
- *There is considerable persistence in GDP and about the same degree of persistence in private consumption;*
- *Employment and unemployment are even more persistent than GDP.*

After finalization of the transition process, identification of the characteristics of the business cycles becomes important even in the former socialist countries of Central and Eastern Europe. So, Benczúr and Rátfai (2005), under patronage of the Hungarian Central Bank, have conducted the research on economic fluctuations in twelve countries of the Central and Eastern Europe (Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia) in period from the first quarter of 1993 to the fourth quarter of 2003. They have determined that in the case of these countries private consumption is also procyclical, with exception of Latvia where this variable proved to be countercyclical and Lithuania where it is acyclical. The investments are strongly procyclical and coincidental, again with exception of Latvia, and they are also the most volatile component of aggregate consumption in all the countries. It is interesting that in the countries in transition the government consumption is mainly procyclical, with exception of Croatia and Latvia where it is countercyclical, and Hungary and Estonia where it is acyclical. Import, export and net export are procyclical in the countries of Central and Eastern Europe, except in Romania whose trade balance is acyclical. Labor market variables are very volatile, and this is the consequence of the transition. However, their pattern is similar to one of the developed countries, so the employment is mainly procyclical and lagging variable. Real wages are, also, in the majority of the countries procyclical, while the labor productivity is procyclical and typically coincidental, except in case of Slovakia where it is acyclical. Monetary aggregate M_1 is mainly procyclical and/or leading or coincidental variable (with exception of Slovenia and Bulgaria). Prices, measured with Consumer Price Index, are procyclical and/or slightly leading or coincidental, while the cyclical character of inflation is not clear, but it is interesting that its relative volatility is low. Nominal interest rates do not register significant oscillations and they are mainly persistent, while the nominal and real effective exchange rate are significantly volatile in the majority of the countries (Benczúr & Rátfai, 2005). These two authors repeated the same research in 2010 for the Central and East Europe countries including the period from the first quarter 1993 until the fourth quarter 2005. Results are very similar to previous with minor differences by countries (Benczúr & Rátfai, 2010).

With joining the European Union, and thus also possible membership in the monetary union, the matter of characteristics of the business cycles in former socialist countries is becoming even more important, and the Carmignani (2005) besides examining the cyclical character of macroeconomic variables

in these countries, specifically Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, but also in Russia and Turkey, made comparison with euro area and certain countries of the Western Europe, as reference economies. As the result of the conducted research, the author singled out seven stylized facts (pp. 10-15):

- *Cyclical output fluctuations in the European EME are more volatile and frequent than in the euro area;*
- *Private consumption and investment are procyclical and more volatile variables, in absolute terms, but relative to the GDP equally volatile as in the developed countries;*
- *Cyclical pattern of the government consumption is more erratic in the European developing countries than in the euro area. Government consumption is acyclical on average, but it is also procyclical in several countries;*
- *In the European developing countries the export is acyclical, but it registers positive and statistically significant correlation with business cycles of euro area;*
- *Employment is procyclical in the countries of Central Europe and acyclical in the other emerging market economies. Labor productivity is strongly procyclical variable;*
- *Several European emerging market economies are characterized by very high volatility of prices, inflation and real interest rates. Discerning of the cyclical character of prices and inflation is difficult, but it seems that they are not procyclical. On the other side, real interest rates are dominantly acyclical;*
- *Business cycles of European emerging market economies, with exception of Poland and Hungary, are not synchronized with business cycles of the euro area as a whole*.

The above-presented researches, as well as some other dealing with the developing countries, do not include Serbia[3], mainly due to its falling behind on the road to joining the European Union. The only related research was conducted by Radović-Stojanović (2014) about the cyclical character of economic policy in Serbia, but only from the aspect of comovement, where it was determined that budget expenditures are countercyclical and leading variable, and budget revenues are procyclical variable. Also, the prices are procyclical and leading, while the cyclical pattern of monetary aggregate M_2 is unclear (Radović-Stojanović, 2014). However, taking into consideration that Serbia also passed a transition to the market economy, and active economic

[3]Morys and Ivanov (2009) have researched the characteristics of business cycles in countries of Southeast Europe in the period from 1899-1989, including the business cycles of the Yugoslavia. However, taking into consideration that during the major part of that period centrally planned economy prevailed in those countries, the use value of the results of this research is questionable.

policy is being kept, it is necessary to identify cyclical characteristics of macroeconomic variables.

3. Data and methodology

For needs of analysis of the cyclical fluctuations of the economy in Serbia thirteen economic variables are to be used: private consumption, investments, government consumption, export, import, industrial production, employment, real and nominal wages, monetary aggregates M_0 (monetary base), M_1 and M_2, prices (Consumer Price Index). Aggregate economic activity will be approximated with the real quarterly gross domestic product (chain linked volumes, the reference year 2010, in millions of dinars), which is usual practice. It should be mentioned here that here is the same problem as the majority of researchers in the transition countries, and that is the short duration of the analyzed time series. So, for the GDP, private consumption, investments, government consumption, export and import there are a time series from the first quarter of 1996 to the first quarter of 2017, i.e. the third quarter of 2016 for industrial production and prices. In case of employment data from the first quarter of 2000 to the first quarter of 2017 are used, and for real and nominal wages, and monetary aggregates from the first quarter of 2002 to the first quarter of 2017. However, taking into consideration that theory of political business cycles was based on the researches which showed that the average duration of one business cycle is approximately four years (which matches the duration of election period), for the analysis of the cyclical fluctuations the time period of twelve years can be considered as acceptable, but the results should be interpreted carefully. Finally, data quality have to be addressed as well. Namely, in respect of employment, quarterly data on employment and unemployment according to the Labour Force Survey are available only from 2014 (before that they were published twice a year– in April and October), and that is the reason data of registered employment are used, even though the difference between the number of formal and informal employed can be significant, but also quite arguable (Petrović, Brčerević, Minić, 2016b). Also, out of the financial variables, the interest rates were not analyzed due to change in the reporting method of the National Bank of Serbia. Specifically, until 2011 the interest rates according to maturity were divided to long term and short term, and from 2011 they were divided into three categories and in general, there was a change in classification of interest rates on loans to household and non-financial sectors. Sources of the mentioned data are Statistical Office of the Republic of Serbia, National Bank of Serbia and International Monetary Fund.

In the analysis of the business cycles, the approach of growth cycles or deviation cycles have been followed, and research methodology developed by

Kydland and Prescott. The first step is deseasoning the data, and this was done with help of the method X-13 ARIMA (*Autoregressive Integrated Moving Average*) which evaluates the trend and seasonal component by applying the Box-Jenkins autoregressive moving average model for integrated time series. Initially, it was developed by the US Census Bureau and it is one of the most frequently used methods for removal of usual seasonal fluctuations and typical influences of the calendar within the movement of analyzed time series. After that, logarithms of the data are taken.

On deseasonalized data the Hodrick-Prescott filter have been applied, which is used for decomposition of time series to long-term component (trend) and cyclical component (deviation from trend). „*If the long-term component of time series X_t we designate with μ_t, t = 1,...., T, than the estimation of that component is obtained from the condition:*

$$\sum_{t=1}^{T}(X_t - \mu_t)^2 + \lambda \sum_{t=2}^{T-1}[(\mu_{t+1} - \mu_t) - (\mu_t - \mu_{t-1})]^2 = \min, \lambda > 0 \qquad (1)$$

If λ=0, than $X_t = \mu_t$, which means that there are no random variations in the series. If, however, $\lambda \to \infty$ than the minimum of the function above is reached for $(\mu_{t+1} - \mu_t) = (\mu_t - \mu_{t-1})$, i.e. $\Delta\mu_{t+1} = \Delta\mu_t$, which is met only by the linear function. According to this, the parameter λ determines the smoothness level of long-term component and as higher this parameter is, the function μ_t gets the higher level of linearity" (Mladenović & Nojković, 2015, p. 35). For quarterly time series, the standard practice was to use the value λ=1600, which was originally proposed by Hodrick and Prescott. It is considered that the biggest shortcoming of the application of this filter is that the obtained estimations of the trend are imprecise at the end-points of time series, and because of that during the analysis it is common to exclude several first and last observations of the estimated cyclical component (Kaiser& Maravall, 2001, p. 77). However, this is not done in this paper due to the insufficient duration of the time series. In order to verify if the estimated cyclical components of time series are stationary, the augmented Dickey-Fuller test of the unit root has been conducted. The results have confirmed that the mentioned components, in case of all macroeconomic variables, stationary around zero at the level of significance of 5%.

In the context of cyclical characteristics of macroeconomic variables, first will be analysed their volatility in the absolute and relative sense. Absolute volatility is measured with standard deviation in percentage (coefficient of variation) which represents the deviation percentage of the cyclical component of the analyzed variable from its mean value and gives the information about amplitudes of fluctuation. Relative volatility represents the ratio between the volatility of concrete economic variable and volatility of the aggregate economic activity, i.e. GDP. According to this, if the value of this

coefficient is 1 the variable has the equal cyclical amplitudes as the GDP. The value of the coefficient higher than 1 shows that the variable has higher amplitudes than the GDP and it is reverse for the coefficient lower than 1.

The synchronization of the cyclical component of the analyzed economic variable and business cycle (GPD) will be measured with help of the correlation coefficient $\rho_{(Xt,\ BDPt)}$. If the value of the contemporaneous correlation coefficient ρ is positive the variable is procyclical, if the value of the coefficient is negative than it is countercyclical and acyclical if the value is close to 0. However, movement of all economic variables is not synchronized with the business cycle, since some of them can reach their extreme values before and after business cycle. Therefore, the correlation coefficient between the shifted values of the cyclical component of each variable t+k, i.e. t-k, where $k \in \{\pm 1, \pm 2, \pm 3, \pm 4\}$) will also be calculated with cyclical component GDP in period t=0. In this sense, it could be said that the concrete economic variable is leading for k periods if the highest correlation coefficient is achieved for negative k, synchronized with business cycle if the highest correlation coefficient is achieved for t=0 and lags behind the cycle by k periods if the highest correlation coefficient is achieved for positive k.

Persistency of cyclical components of the macroeconomic variables, i.e. retaining in expansion or contraction, will be analyzed with help of autocorrelation function, as a series of autocorrelation coefficients which are ordered in relation to time. If the value of autocorrelation coefficient for a significant number of lags significantly above 0 this means that the analyzed variable is characterized with significant persistence. Statistical significance of persistence will be tested with Box-Ljung statistical test, where will be observed that if the associated p value is higher than 0.05 the calculated autocorrelation coefficient is not statistically significant. Data processing was done with help of the program package eViews9.

4. Empirical results

4.1. Volatility of the macroeconomic variables

Observed in general, business cycles of Serbia, approximated with cyclical component of the real GDP, are characterized by high volatility, i.e. high amplitude of fluctuations, considering that the standard deviation (in %) is 3.73%. By applying the same methodology, Benczúr and Rátfai (2010) have, for example, determined that the average volatility of business cycles in countries of Central and Eastern Europe, measured by standard deviation, is 2.22% (p. 3284). Similarly, Hloušek (2006) has calculated that the absolute volatility of business cycles of Czech Republic is 1.26% (p.14). In respect of

the GDP component, import, export and then investments were found as most volatile. Even though it is generally considered that the investments are the most unstable component, in case of small and open economies similar results were reached, so Mail (2010) determined that in Hungary, Romania, Latvia, Slovakia and Slovenia, import and export are more volatile than the investments (p.14). Private consumption in Serbia is quite volatile than GDP which is not in compliance with the theory on permanent income. The same deviation from this theory are, for example, has been determined by Alp et. al. (2012) in case of Turkey (p. 8). However, recent researches show that higher volatile of personal consumption in relation to GDP is considered as more significant characteristic of business cycles of development countries, which is explained by trend shocks and interest rate shocks, which have to be amplified through inherent frictions to capture this regularity with realistic calibrations (like informational frictions in expectation formation and search-matching frictions in the labor market) (Durdu, 2013, p. 198). Government consumption is less volatile than the GDP, and this can be connected to the fact that the level of government consumption is primarily set in advance and limited to the available budget funds, and this narrows the oscillation margin.

Table 1. Volatility of macroeconomic variables in Serbia

Variable	Standard deviation (in %)	Relative standard deviation (ratio of SD of variable and SD of GDP)
Gross Domestic Product	3.73	1.00
Private Consumption	4.06	1,09
Investments	13.33	3,57
Government Consumption	3.33	0.89
Export	14.40	3.86
Import	16.98	4.55
Industrial Production	8.28	2.22
Employment	1.03	0.28
Real Wages	6.22	1.67
Nominal Wages	6.91	1.85
Monetary base M_0	10.74	2.88
Money supply M_1	7.33	1.97
Money supply M_2	7.14	1.91
Prices (Consumer Price Index)	10.36	2.78

Source: Author's calculation

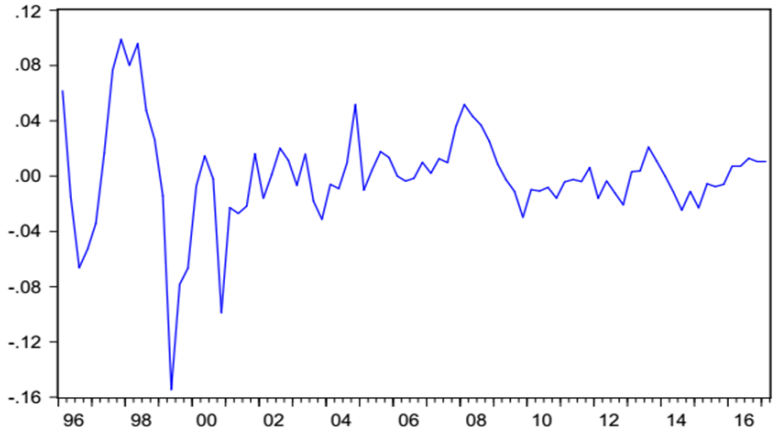
The employment is the most stable macroeconomic variable in Serbia, and this is partially a consequence of the fact that this is the registered total employment, and hiring and terminations require significant funds according to the legal procedure. However, employment is usually one of the most stable variables, so, for example, its percentage deviation from trend 1.15% in United Kingdom, 0.85% in Finland (Sørensen & Whitta-Jacobsen, 2005, pp.

410-411), 0,81% in Slovenia, 0.82% in Czech Republic, 0,87% in Hungary (Benczúr, Rátfai, 2010, p. 3286) etc. On the other side, real and nominal wages are more volatile than the GDP, which could be a consequence of frequent changes of wages in public sector due to the need for lowering costs and this is a frequent case in the transition countries. Industrial production is, also, more volatile than the GDP and its percentage of deviation from the trend is 8.28%. This result is above the average of the Central and Eastern European countries, which according to the Benczúr and Rátfai (2010) is 4,04%, even though in the analyzed group of countries there are outliers such as Romania (7.09%) and Bulgaria (5.87%) (p. 3284). However, relative in relation to the GDP Serbia does not deviate from the countries of Central and Eastern Europe. Monetary aggregates and prices are significantly more volatile than the GDP in Serbia, but that is also the case in the majority of countries in transition with inflationary monetary history. For example, money supply M_1 shown as the most volatile variable of economic policy in Croatia with standard deviation of even 8.18% (Benazić & Tomić, 2014, p. 87).

4.2. Connection of macroeconomic variables to business cycle

It can clearly be seen in the Fig. 1 that, after the transition to market economy, economic activity in Serbia registers cyclical fluctuation. Therefore, it is necessary to move to the next step, and that is examining how each macroeconomic variable behaves during the business cycle in the context of synchronization and comovements.

Figure. 1. Cyclical fluctuations of the GDP



Source: Prepared by the author

Table 2 shows the results of research on synchronization and comovements of cyclical components of the selected thirteen economic variables and cyclical component of the real GDP. For each variable in the first column the calculated correlation coefficients are shown, and in the second column corresponding p values. In purpose of visibility, highest recorded, statistically significant correlation coefficients are were bolded. In respect of the GDP components, private consumption emerges as strongly procyclical and coincidental variable. Significant procyclicality of the consumption was determined by Christodoulakis, Dimelis and Kollintza (1995) in case of developed European countries (average correlation coefficient 0.90) (p. 6), but also Carmignani (2005) in the case of Turkey, Croatia, Romania and Bulgaira (p. 11), and Benczúr and Rátfai (2010) in case of Slovenia, and again Romania and Bulgaria (p. 3285). This partially confirms the claims from the South East Europe Regular Economic Report that „*consumption, a primary engine of growth immediately after the crises*" (World Bank, 2016, p. 3). Export and investments are, also, strongly procyclical and coincidental variables. Investments are usually strongly procyclical in all countries. For example, Christodoulakis, Dimelis and Kollintza (1995) have calculated that the correlation coefficient between investments and GDP in developed countries amounts to 0.91 (p. 6), while according to Carmignani (2005) this coefficient in euro area is 0.89, i.e. 0.64 in the analyzed developing countries (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Turkey) (p. 11). The high correlation coefficient in developed countries suggests that the investments are crucial for initiation of economic activity, and their importance was confirmed in case of Serbia. Strong procyclicality of export is usually the characteristic of developed countries, and according to Benczúr and Rátfai (2010) also of the Baltic countries Estonia, Latvia and Lithuania, and of Poland (p. 3285). Import is moderately procyclical and comoves with the business cycle. Procyclicality of import could be connected to significant import dependence of Serbia. Government consumption in Serbia is, also, moderately procyclical. Even though the developed countries are characterized with acyclicality of government consumption, in the majority of former socialist countries the government consumption is procyclical due to the large public sector.

Cyclical component of industrial production is synchronized with cyclical components of the GDP, with the value of correlation coefficient of 0.857. This result is expected considering that also the industrial production is often used as an approximation of the business cycles, especially in case of developed western countries when the business cycles are analyzed for the very long time period for which the data on GDP is not available. The employment in Serbia is moderately procyclical and coincidental variable. Even though employment is, especially in developed countries, usually strongly procyclical variable, such findings are in accordance with the results of Petrović,

Brčerević and Minić (2016a) that the elasticity of employment in relation to GDP in Serbia is low and that in period 2012-2015 it was 0.65 (p. 65). Real and nominal wages are, also, moderately procyclical and leading variables for four, i.e. one quarter. The property of wages to reach the extreme values earlier can be connected to strong procyclicality of private consumption because growth-decrease of wages certainly affects the growth-decrease of private consumption. Benczúr and Rátfai (2010) have shown that also in the majority of Central and Eastern European countries there is a positive correlation between real wages and GDP, but not also a clear pattern in respect of their co-movement (p. 3286).

Table 2. Cross-correlations of cyclical components of macroeconomic variables and GDP

Variables	t-4	t-3	t-2	t-1	t=0	t+1	t+2	t+3	t+4
GDP	-0.251	0.051	0.356	0.631	1.000	0.625	0.357	0.101	-0.154
	0.028	0.662	0.002	0.000	0.000	0.000	0.001	0.383	0.182
Private consumption	-0.160	0.132	0.394	0.600	0.864	0.560	0.386	0.123	-0.077
	0.164	0.253	0.000	0.000	0.000	0.000	0.001	0.287	0.508
Investments	-0.156	0.044	0.301	0.405	0.671	0.383	0.225	0.228	0.092
	0.175	0.702	0.008	0.000	0.000	0.001	0.049	0.046	0.427
Government consumption	-0.068	0.058	0.185	0.467	0.534	0.238	0.028	-0.227	-0.253
	0.559	0.616	0.107	0.000	0.000	0.037	0.809	0.047	0.026
Export	-0.119	0.039	0.250	0.554	0.796	0.463	0.353	0.140	-0.027
	0.303	0.739	0.029	0.000	0.000	0.000	0.002	0.226	0.815
Import	0.143	0.345	0.493	0.565	0.597	0.371	0.310	0.295	0.004
	0.213	0.002	0.000	0.000	0.000	0.001	0.006	0.009	0.969
Industrial production	-0.175	0.057	0.346	0.535	0.857	0.459	0.188	-0.011	-0.214
	0.133	0.624	0.002	0.000	0.000	0.000	0.106	0.928	0.065
Employment	0.170	0.299	0.421	0.494	0.533	0.491	0.432	0.378	0.254
	0.191	0.019	0.001	0.000	0.000	0.001	0.001	0.003	0.049
Real wages	0.424	0.417	0.390	0.304	0.216	0.055	-0.049	-0.153	-0.276
	0.002	0.002	0.004	0.027	0.119	0.697	0.729	0.275	0.046
Nominal wages	0.271	0.423	0.511	0.513	0.430	0.237	0.081	-0.118	-0.305
	0.049	0.002	0.000	0.000	0.001	0.087	0.562	0.398	0.026
Monetary base M_0	0.281	0.263	0.222	0.203	0.166	0.171	0.203	0.238	0.259
	0.042	0.057	0.109	0.146	0.235	0.222	0.144	0.087	0.061
Money supply M_1	0.218	0.359	0.456	0.494	0.476	0.428	0.364	0.326	0.239
	0.117	0.008	0.001	0.000	0.000	0.001	0.007	0.017	0.085
Money supply M_2	0.084	0.209	0.321	0.395	0.443	0.424	0.428	0.469	0.434
	0.552	0.133	0.019	0.003	0.000	0.001	0.001	0.000	0.001
Prices (Consumer Price Index)	0.263	0.184	0.100	0.007	-0.144	-0.171	-0.199	-0.201	-0.288
	0.021	0.111	0.389	0.955	0.214	0.140	0.084	0.081	0.012

Sources: Author's calculation

In respect of the monetary variables, the cyclical pattern of the prices (Consumer Price Index, the base year 2010), is unclear, since the prices are mildly procyclical when they are the leading variable, and mildly countercyclical when they are the lagging variable. This matter is all the more important because it is usually considered that the countercyclical prices are

confirmation of the supply shocks and procyclical of the demand shocks. For example, Radović-Stojanović (2014) has, for a short time period from 2001-2012, determined that the prices are mildly procyclical, but with lagging from four to nine quarters (pp. 174-175). The majority of researches for the developing countries have shown that there is no clear cyclical pattern of the prices. So, the Mail (2010) reached the results that the prices are countercyclical in eighteen, acyclical in six and procyclical in eight developing countries (p. 23). The similar results were obtained also by Carmignani (2005), but he gave the advantage to the claim on countercyclical to acyclical prices in developing countries (p. 14). According to the Benczúr and Rátfai (2010), the prices in the countries in transition are mostly countercyclical (p. 3290). It is interesting that Kollintzas, Konstantakopoulou and Tsionas (2011) also determined that there is a negative correlation between prices and GDP at both leads and lags for the majority of developed OECD countries (p. 1748). On the other hand, monetary aggregates M_1 and M_2 are moderately procyclical variables, where M_1 is leading for one quarter, and M_2 comoves with the business cycle. Monetary base M_0 is only mildly procyclical and the leading variable. Compared to the results of Radović-Stojanović (2014) which were quite ambiguous, results here suggest that there was an increase in credibility of the monetary policy in Serbia, and that the changes in monetary policy are quickly transferring to the real sector, practically within one or two quarters, but the direction of the connection should be certainly examined with causality test. However, these findings are in accordance with the conclusion of Benczúr and Rátfai (2010) that the monetary aggregates in countries of Central and Eastern Europe are procyclical and/or leading or coincidental variables (p. 3290). Moreover, recent researches, even for developed OECD countries, show that monetary aggregates are dominantly procyclic variable and have a tendency to move forward in relation to aggregate economic activity (Kollintzas, Konstantakopoulou & Tsionas, 2011, p. 1738). Therefore, money is definitely important.

4.3. Persistency of the cyclical fluctuations

Table 3 shows the autocorrelation coefficients (with associated p values), as the measure of persistence of cyclical fluctuations of the analyzed variables, for four lag. Positive values of autocorrelation coefficients indicate to the tendency that the registered growth in one quarter, is followed with growth in following quarters, i.e. that the decline is followed by the decline, while the negative values show that after growth comes a decline and vice versa. Mail (2010) has determined that in case of industrial countries cyclical fluctuations of the GDP are very persistent, where the autocorrelation coefficient on first lag amounts in average to 0.84, and on fourth lag to 0.146, while in the developing countries persistence is weaker with average autocorrelation coefficient on first lag of 0.59 and 0 or below 0 in the fourth (p. 10). In case of

Serbia the similar tendency can be noticed since the autocorrelation coefficient on first lag amounts to 0.608, falls to 0 on the third lag, and registers negative value on the fourth. In this sense, the conclusion is that the Serbia has more frequent shifts of rises and declines in the aggregate economic activity than in the developed countries, and this could have been expected considering that this is a small and open economy. In general, Calderón i Fuentes (2014) have determined that the recessions in developing countries are deeper, steeper and costlier while recoveries are faster and stronger in relation to industrial countires, including the last global economic crisis (p. 101).

Table 3. Persistency of cyclical fluctuations

Variable	t+1	t+2	t+3	t+4
Gross Domestic Product	0.608	0.303	0.018	-0.239
	0.000	0.000	0.000	0.000
Private Consumption	0.564	0.365	0.077	-0.119
	0.000	0.000	0.000	0.000
Investments	0.552	0.351	0.226	0.047
	0.000	0.000	0.000	0.000
Government Consumption	0.214	-0.048	-0.181	-0.248
	0.045	0.121	0.066	0.012
Export	0.553	0.250	0.006	-0.090
	0.000	0.000	0.000	0.000
Import	0.660	0.490	0.282	0.079
	0.000	0.000	0.000	0.000
Industrial Production	0.467	0.174	-0.024	-0.222
	0.000	0.000	0.000	0.000
Employment	0.894	0.710	0.487	0.259
	0.000	0.000	0.000	0.000
Real Wages	0.706	0.343	0.063	-0.101
	0.000	0.000	0.000	0.000
Nominal Wages	0.720	0.385	0.161	-0.027
	0.000	0.000	0.000	0.000
Monetary base M_0	0.846	0.684	0.472	0.248
	0.000	0.000	0.000	0.000
Money supply M_1	0.822	0.598	0.421	0.286
	0.000	0.000	0.000	0.000
Money supply M_2	0.837	0.628	0.486	0.374
	0.000	0.000	0.000	0.000
Prices (Consumer Price Index)	0.911	0.747	0.534	0.326
	0.000	0.000	0.000	0.000

Source: Author's calculation

In respect of the GDP components, it is interesting that the highest persistency is exhibited by import, which again points to significant import dependence of Serbian economy. Also, significant persistency is also exhibited by investments since they have a slower shift of rises and declines, i.e. the effects of rises/declines of investments are being retained longer.

private consumption and export in respect of persistency follow the pattern of the GDP, and this is in accordance with their strong procyclicality. Government consumption registers weak persistence since the autocorrelation coefficients are low or statistically insignificant, so the conclusion could be that the change of government consumption over time does not have a clear pattern, and this is the consequence of the fact that the decisions on government consumption are being made within the long and complex political process. Benczúr and Rátfai (2010) have, also, determined that in case of the Central and Eastern European countries persistency of government consumption is moderate (p. 3288).

Industrial production exhibits the lower level of persistence compared to the GDP and already on third lag, there is a change of direction. Employment is strongly persistent[4] and also the wages are registering significant persistence, even somewhat higher than the GDP. Monetary base M_0 and monetary aggregates M_1 and M_2 are strongly persistent, with the value of autocorrelation coefficient significantly over 0 on the fourth lag, which points to time consistency in conducting of the monetary policy. Finally, the prices are exhibiting the highest level of persistence out of all analyzed variables, so the conclusion is that they remain the longest in expansion or contraction (the prices are "sticky").

5. Conclusions

After the transition to the market economy, aggregate economic activity in Serbia registered cyclical fluctuations characteristic for capitalist countries. This paper is focused on identification of crucial characteristics of those business cycles following the approach of growth cycles by Robert Lucas and standard methodology developed by Kydland and Prescott in paper „*Business Cycles: Real Facts and a Monetary Myth*" from 1990. On basis of the conducted empirical research, several significant cyclical characteristics of macroeconomic variables in Serbia are highlighted in the context of their volatility, synchronization and co-movements with business cycles, and persistence.

Firstly, import and export are several times more volatile than the GDP and they are also most unstable components of the aggregate consumption. The investments are, also, several times more volatile than the GDP. The employment exhibits a low level of volatility during business cycles and it is the most stable macroeconomic variable in Serbia.

[4]. It would be very useful to determine how persistent is the unemployment, but unfortunately, we do not have quarterly data on unemployment in Serbia.

Private consumption, export, and investments are strongly procyclical and coincidental variables. Government consumption in Serbia is moderately procyclical. Industrial production is firmly positively correlated to, and comoves with the business cycle. Employment, nominal and real wages are procyclical, where in case of employment the correlation with GDP is stronger. Nominal and real wages are leading variables. It is difficult to determine the clear pattern for movement of prices, but it seems that they are not procyclical. On the other side, monetary aggregates M_1 and M_2 are procyclical and leading, i.e. coincidental variables. The monetary base is only mildly procyclical.

Aggregate economic activity (GDP) in Serbia retains for a shorter time in phases of the business cycles than that is the case in developed countries. The employment is more persistent than the GDP. Price and monetary aggregates retain the longest in certain phases of the business cycle.

Determined characteristics of economic fluctuations in Serbia do not deviate significantly from the so far documented empirical facts for former socialist countries of Central and Eastern Europe. However, the majority of similarities in respect of cyclical pattern of macroeconomic variables Serbia shares with most undeveloped countries of the European Union, such as Romania, Bulgaria, and Croatia, which is probably the consequence of higher similarity between economies in these countries. Also, characteristics of business cycles in Serbia are different from those in developed countries in sense of higher volatility, lower persistency, procyclicality of government consumption and import, and unclear cyclical pattern of prices. These differences are noticed also in other developing countries. However, in case of Serbia, the interdependence of import and GDP should be examined, in order to determine the direction of causality. It is possible that the procyclicality of import comes from great import dependence of Serbia, but that procyclicality could also be the result of foreign investments (primarily in the automotive industry). Similarly, since it was proved that in Serbia the monetary policy by means of interest rate, i.e. lending activity, can have a significant role, and also in this case it is necessary to examine the direction of dependence with Granger causality test.

The knowledge on the behavior of the macroeconomic variables during business cycles is of great importance for creators of the economic policy in Serbia, not only for defines the stabilization and adjustment policy but also for development policy. The results of this research can in this sense provide important information, but certainly not sufficient for that purpose since the focus here is only on some of the crucial economic variables. The best solution would be to make the list of cyclical indicators of Serbian economy which would include all significant economic variables, and even certain variables which would be measured with surveys, as it is the case in the

European Union and the USA. Therefore, that should be in the competence of some of the official institutions, such as Ministry of Finance of the Republic of Serbia or National Bank of Serbia, which have the necessary statistical data, and also the material and human resources, of course with the certain support of the academic community.

References

Abel, A., Bernanke, B., & Croushore, D. (2014). *Macroeconomics – 8th edition*. New Jersey: Pearson Education

Alp, H, Başkaya, Y., Kılınç, M., & Yüksel, C. (2012). *Stylized Facts for Business Cycles in Turkey*. Ankara: Central Bank of the Republic of Turkey. Retrived from: https://www.researchgate.net

Benazić, M., & Tomić, D. (2014). The evaluation of fiscal and monetary policy in Croatia over a business cycle. *Zbornik radova Ekonomskog fakulteta u Rijeci*, 32(1), 75-99. Retrived from: https://www.efri.uniri.hr/sites/efri.uniri.hr/files/cr-collections/2/06-benazic-tomic-2014-1.pdf

Benczúr, P., & Rátfai, A. (2005). *Economic fluctuations in Central and Eastern Europe - the facts*. Budapest: The Central Bank of Hungary. Retrived from: http://www.mnb.hu/letoltes/wp2005-2.pdf

Benczúr, P., & Rátfai, A. (2010). Economic fluctuations in Central and Eastern Europe: the facts. *Applied Economics*, 42, 3279-3292. doi: 10.1080/00036840802112380

Blackburn, K., & Ravn, M. (1992). Business Cycles in the United Kingdom: Facts and Fictions. *Economica*, 59(236), 383-401. doi: 10.2307/2554886

Brandner, P., & Neusser, K. (1992). Business Cycle in Open Economies: Stylized Facts for Austria and Germany. *Review of World Economics (Weltwirtschaftliches Archiv)*, 128(1), 67-87. doi: https://doi.org/10.1007/BF02707246

Burns, A. & Mitchell, W. (1946). *Measuring Business Cycles*. New York: National Bureau of Economic Research. Retrived from: http://papers.nber.org/books/burn46-1

Calderón, C., & Fuentes, R. (2014). Have business cycle changed over the last two decades? An empirical investigation. *Journal of Development Economics*, 109, 98-123. doi: http://dx.doi.org/10.1016/j.jdeveco.2014.03.001

Carmignani, F. (2005). *The Characteristics of Business Cycles in Selected European Emerging Market Economies*. Geneva: United Nations. Retrived from: https://www.unece.org/fileadmin/DAM/oes/disc_papers/ECE_DP_2005-7.pdf

Christodoulakis, N., Dimelis, S.,& Kollintza, T. (1995). Comparisons of Business Cycles in the EC: Idiosyncracies and Regularities. *Economica*, 62 (245), 1-27. doi: 10.2307/2554774

Durdu, B. C. (2013). Emerging Market Business Cycle: Recent Advances. *International Economic Journal*, 27(2), 183-199. doi: http://dx.doi.org/10.1080/10168737.2013.796110

Döpke, J. (1998). *Stylized Facts of Euroland's Business Cycle*. Kiel: Institute of World Economics. Retrived from: https://www.econstor.eu/bitstream/10419/47106/1/258359676.pdf

Hasler, J., & Persson, T., Lundvik, P. & Söderlind, P. (1992). *The Swedish Business Cycle: Stylized Facts Over 130 Years*. Minneapolis: Institute for Empirical Macroeconomics. Retrived from: https://m.minneapolisfed.org/research/dp/dp63.pdf

Hloušek, M. (2006). *Czech Business Cycle Stylized Facts.* Brno: Research Centre for Competitiveness of Czech Economy. Retrived from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.499.3016&rep=rep1&type=pdf

Kaiser, R., & Maravall, A. (2001). *Measuring Business Cycles in Economic Time Series*. New York: Springer-Verlag

Kollintzas, T., Konstantakopoulou, I., & Tsionas, E. (2011). Stylized facts of money and credit over the business cycles. *Applied Financial Economics*, 21, 1735-1755. doi: 10.1080/09603107.2011.583215

Koopmans, T. (1947). Measurement Without Theory. *The Review of Economics and Statistics*, 29(3), 161-172.Retrived from:http://www.jstor.org/stable/1928627

Kydland, F., & Prescott, E. (1990). Business Cycles: Real Facts and Monetary Myth. *Federal Reserve Bank of Minneapolis Quarterly Review*, 14(2), 3-18. Retrived from: https://www.minneapolisfed.org/research/qr/qr1421.pdf

Lucas, R. E. (1977). Understanding Business Cycles. In *Carnegie-Rochester Conference Series on Public Policy*. 5(1), 7-29. Retrived from:http://icm.clsbe.lisboa.ucp.pt/docentes/url/jcn/mabes/LucasUnderstanding.pdf

Mail, R. (2010). *Developing Country Business Cycles: Revisiting the Stylised Facts*. London: Queen Mary University of London. Retrived from:http://www.econ.qmul.ac.uk/media/econ/research/workingpapers/archive/wp664.pdf

Mladenović, Z., & Nojković, A. (2015). *Primenjena analiza vremenskih serija*. Beograd: Ekonomski fakultet

Petrović, P., Brčerević, D., & Minić, S. (2016a). Post-crisis Growth in Serbia: Export, Competitivness and Public Expenditure Containment. *Ekonomika preduzeća*. No. 1-2, 53-75. doi:10.5937/ekopre1602053P

Petrović, P., Brčerević, D., & Minić, S. (2016b). Fish that fly do exist, but are rare: are the official labour market data misread or unreliable? *Ekonomika preduzeća*. No. 5-6, 315-332. doi:10.5937/ekopre1606315P

Praščević, A. (2008). *Poslovni ciklusi u makroekonomskoj teoriji i politici*. Beograd: Ekonomski fakultet

Radović-Stojanović, J. (2014). The Cyclical Character of Economic Policy in Serbia 2001-2012. *Economic Annals*, 59(202), 157-182. doi:10.2298/EKA1402157R

Sørensen, P. B., & Whitta-Jacobsen, H. J. (2005). *Introducing Advanced Macroeconomics: Growth and Business Cycles*. London: McGraw-Hill

Stock, J., & Watson, M. (1998). *Business Cycle Fluctuations in U.S. Macroeconomic Time Series*. Cambridge: National Bureau of Economic Research. Retrived from: http://www.nber.org/papers/w6528

World Bank. (2016). *South East Europe Regular Economic Report No.10: Resilient Growth Amid Rising Risks*. Washington: Author. Retrived from: http://pubdocs.worldbank.org/en/521981474898709744/SEE-RER-Report-Fall-2016.pdf