

## **Cyclical Properties of Workers' Remittances: Evidence from Bosnia and Herzegovina**

**Nedžad ISAKOVIC**

Faculty of Economics and Social Studies,  
International Burch University,  
Francuske Revolucije bb, Bosnia and Herzegovina.  
Phone: +38763 10 29 86. Email: n\_isakovic@hotmail.com

**Erkan ILGUN**

Faculty of Economics and Social Studies,  
International Burch University,  
Francuske Revolucije bb, Bosnia and Herzegovina.  
Phone: +38762 73 63 58. Email: erkan.ilgun@ibu.edu.ba

**ABSTRACT:** Workers' remittances are proven to positively influence the receiving economies and to help the receivers of remittances to cope with currency constraints and unemployment in the receiving country. Remittances can also improve the capability of the receiving economies to mitigate the negative effects of economic downturns and crisis by having counter-cyclical relationship in accordance to the GDP of receiving countries. This is the general opinion, but the latest reports say that they could behave in pro-cyclical manner. In the light of these facts, this article investigates the nature of co-movement of cyclical components, thus investigating cyclicity, between remittance inflow and output or GDP of B&H. This article also investigates cyclical properties of Official Development Assistance and Foreign Direct Investment inflow between Bosnian output in order to determine whether one of other two external financial flows could be used as a mitigating tool of negative aspect of economic downturn in B&H.

**Keywords:** Remittances and B&H; Cyclical properties of workers' remittances

**JEL Classifications:** E32; F24

### **1. Introduction**

Workers' remittances have become major capital inflow into the developing countries over the last decades, changing the same nature and structure of capital inflows into these countries. Workers' remittances surpassed inflow of foreign direct investment (FDI) and official development assistance (ODA). The case of Bosnia and Herzegovina is not different in this segment either. From the independence of this country, which occurred in 1991, remittance inflow was much greater than foreign direct investment inflow. Role of remittances as most important external financial inflow into Bosnia and Herzegovina just proves the importance of investigation of this macroeconomic phenomenon in this country. Moreover, inflows of remittance are proven to be a less volatile source of external financing than foreign direct investment and private capital, which often move pro-cyclically to GDP.

Because of the importance of remittances in external financing many economists have been searching and investigating the consequences of workers' remittances today. Several authors proved that remittances can function as a counter-cyclical mitigation tool for the negative effects of the economic crisis in countries that receive them (Frankel, 2011). This may be the case because migrant workers would increase their financial support for families and relatives in home country during downturns in cycle, or recession.

According to some authors, the decision to remit is complex and it doesn't just depend on altruistic motives. Sayan (2004) argued that remittances may be a-cyclical or even pro-cyclical in some home countries, if different variables that affect remittance sending behavior are differently influenced by the economic situation over the business cycle. Due to differences in financial systems, migration patterns and the economic development of the home countries, the impact of remittances could be different and vary across countries. This emphasizes the importance of investigating the remittance impact of individual countries, and this becomes even more important when we face a fact that there weren't any empirical investigations about the cyclicity of remittances when it comes to the Bosnia and Herzegovina. This country survived the war in the period of 92' - 95', and there is a widely accepted opinion that people in Bosnia and Herzegovina wouldn't survive and recover from war if there wasn't help from their relatives from other, more economically developed, countries in the form of remittances.

The objective of this paper is the business cycle properties of workers' remittances. Country like Bosnia and Herzegovina, for which remittances are major external financial funding, needs to clearly understand the relationship of remittances with business cycles and GDP fluctuations. This article wants to determine the potential of remittances to reduce output volatility of Bosnia and Herzegovina.

In the next section of this paper theoretical background about migration patterns of Bosnia and Herzegovina will be provided, as long with determinants of remittances, and cyclical properties of remittances. This paper will also show some stylized facts about remittance inflow into Bosnia and Herzegovina. After that, in the section of empirical methodology this article will firstly estimate the cyclical component of remittances and the output of BiH, and after that the correlation between these cyclical components will be calculated. At the end, discussion and conclusion about results of empirical investigation will be provided.

## **2. Literature Review**

### **2.1. Migration from Bosnia during the 1990s**

Bosnia and Herzegovina was part of Yugoslavia before 1990s. This country consisted of three main ethnic groups, which included Bosnians (43%), Bosnian Serbs (33%), and Croats (18%), and all of these three nationalities were considered as constitutive nationalities in the Bosnia and Herzegovina. War and conflict in Bosnia and Herzegovina began in April 1992 and was forced to finish in December 1995 by US negotiators in Dayton, Ohio. This war has been characterized by massive destruction of physical capital and resettlement of people. In this war, 5% of the population of Bosnia and Herzegovina was killed, whereas 50% of the population was displaced because of its nationality. Half of them, or 25% of total population were displaced inside of B&H borders, whereas other 25% of the population emigrated to other countries (Ibreljić et al., 2006). It is estimated that today about 1.7 million people, which have roots from Bosnia and Herzegovina, live abroad (B&H Ministry of Security, 2012). New vulnerable groups in need of social transfers are created by the war, such as disabled war veterans and wives and children of killed soldiers.

The economy of Bosnia and Herzegovina is very dependable on remittances, which flow from the Bosnian diaspora spread all over the world. Inflows of foreign direct investment in this country are very low, its exports cover less than 50% of its imports, and only the steady inflow of remittances from the diaspora is keeping this country away from some severe economic crisis. There is a concern that inflow of remittances will decrease in the future. It is known fact that when diaspora loses touch with the home country, number of remittance sending falls (Sayan and Tekin-Koru, 2005), and because remittances are of such importance to Bosnian economy the government should increase its effort towards the Bosnian diaspora.

*Migration profile of Bosnia and Herzegovina:* According to the yearly report of the migration profile of the Ministry of Security of Bosnia and Herzegovina (B&H Ministry of Security, 2012), this is the number of emigrants from B&H and their descendants (second and third generation).

According to the Table 1 we can see that the biggest number of emigrants from Bosnia and Herzegovina lives in high developed European countries (Germany, Austria, Switzerland, Sweden, Italy) and North American countries (USA and Canada). A big number of people emigrated to neighborhood, ex Yugoslavian, countries such as Croatia, Serbia, Slovenia, and Montenegro.

**Table 1.** Number of Emigrants from B&H

<b>Host Country</b>	<b>Number</b>
USA	350,000
Germany	240,000
Croatia	300,000
Serbia	150,000
Austria	150,000
Slovenia	150,000
Sweden	80,000
Australia	60,000
Switzerland	60,000
Canada	50,000
Italy	30,000
Montenegro	25,000
The Netherlands	16,000
<b>Total</b>	<b>1,700,000</b>

*Source: BiH Ministry of Security, 2012*

## **2.2. Determinants of Workers' Remittances**

Because remittances represent big external financial inflow into developing countries, especially for the country like Bosnia and Herzegovina, it is important to understand which motives urge workers to remit money back to the home country. Available literature covers this subject in two main parts; first approach considers socio-demographic characteristics of immigrants and their families, whereas second approach relies on macroeconomic and political variables.

*Literature that relies on socio-demographic characteristics:*

Russell (1986) stated potential socio-demographic determinants of workers' remittances, which are: time emigrant passed abroad, the ratio of females in population of the host country, income level of emigrant's family, education level, work experience and material status of emigrant. Ilahi and Jafarey (1999) expanded his list, adding variables like the number of children and education level of those children.

Lucas and Stark (1985) investigated the determinants of remittances in Botswana. According to them, emigrants remit because they care about consumption of their families in the home country (altruism motivation). Also, they may expect to get home country family's inheritance, invest in his/her home country and because they expect that household to take care of them (self-interest motive).

Elbadawi and Rocha (1992), proved that the volume of remittance sending depends on the ageing phenomenon of workers abroad. Ameudo-Dorantes and Pozo (2006) stated that the amount of remittance sending increases as the level of education of emigrant increases.

*Literature that relies on macroeconomic variables:*

Literature argues that the income level in host country, most important variable when it comes to determining the reason to remit. Russell (1986) emphasized the importance of other macroeconomic variables such as the number of migrants, the economic situation of both host and home country, exchange rate fluctuations, institutional ambience at home country and supporting remittance infrastructure.

Glytsos and Katseli (1986) proved that remittance sending is negatively related to level of inflation in the home country, host country income and interest rate of the host country. El-Sakka and McNabb (1999) investigate macroeconomic variables of workers' remittances into Egypt. This study states out a positive relationship between domestic inflation and remittance sending, which tells us that altruistic motives dominate remitting decision into Egypt.

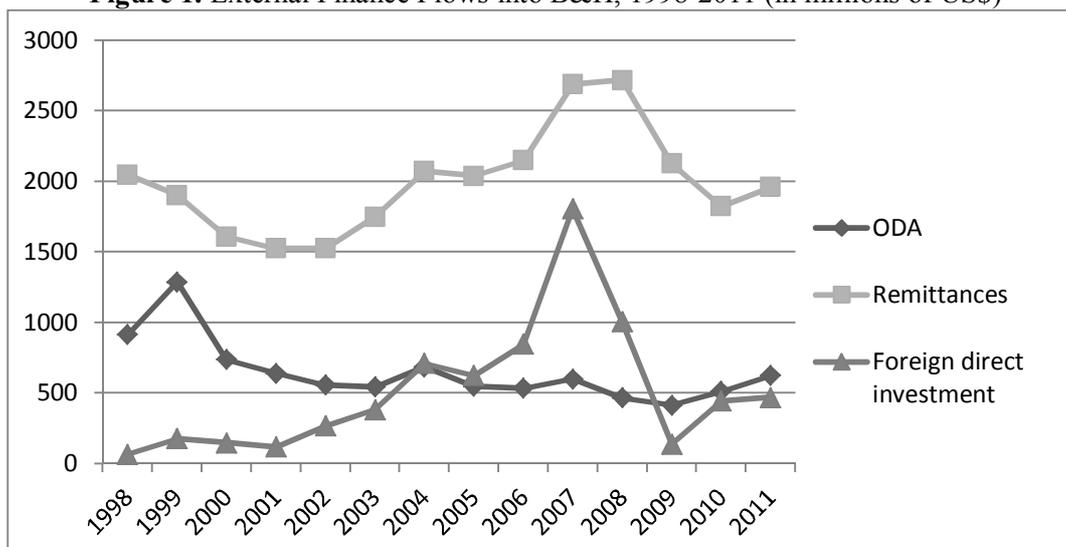
Faini (1994) investigated the effect of exchange rate fluctuation on remittances. He got to the conclusion that real exchange rate depreciation of the currency of the home country has a positive impact on remittance sending.

### 2.3. Stylized Facts about Remittances into Bosnia and Herzegovina

According to the World Bank data on remittance, foreign direct investment (FDI), and official development assistance (ODA) inflow into B&H we can conclude that remittances represent the most important external finance inflow into this country.

As we can notice from the Figure 1, the remittances and FDI inflow into Bosnia and Herzegovina recorded steady growth until year the 2007, which is the year of global financial crisis, and started to grow steadily from the year 2010. The story of ODA is a bit different, and it recorded decrease trend until year the 2009, after this year the ODA also started to grow. We can notice that remittance inflow amount was much bigger over time than the inflow amount of ODA and FDI, which confirms our statement, that remittances represent most important external financial inflow into B&H.

**Figure 1.** External Finance Flows into B&H, 1998-2011 (in millions of US\$)



*Source: Own collaboration of data retrieved from World Bank*

As we can notice from the Table 2 the remittances were taking a great portion of Bosnia and Herzegovina's GDP through a period of 1998-2011. Remittances took an astonishing 49.74% and 40.62% in years 1998 and 1999, respectively, which is almost half of GDP amount. Through years the portion of remittances to GDP was declining, reaching 10.73% in year 2011.

**Table 2.** Flow of Remittances into B&H (in thousands of \$)

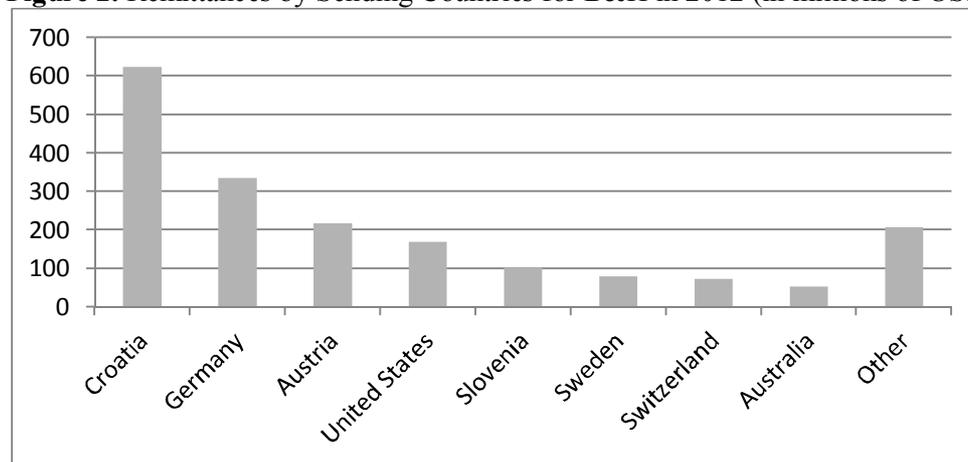
Year	Remittances (A)	GDP (B)	A/B
1998	2,047,749	4,116,699	49.74%
1999	1,903,437	4,685,729	40.62%
2000	1,607,281	5,505,984	29.19%
2001	1,524,921	5,748,990	26.53%
2002	1,525,774	6,651,226	22.94%
2003	1,749,033	8,370,020	20.90%
2004	2,072,042	10,022,840	20.67%
2005	2,037,731	10,948,051	18.61%
2006	2,148,940	12,400,102	17.33%
2007	2,686,415	15,280,615	17.58%
2008	2,717,663	18,543,289	14.66%
2009	2,127,033	17,082,889	12.45%
2010	1,822,304	16,775,469	10.86%
2011	1,958,230	18,252,421	10.73%

*Source: Own collaboration of data retrieved from World Bank*

#### **2.4. Demographic Aspect of Remittances into Bosnia and Herzegovina**

It is always important to detect from which sources external financial inflow of one country comes, so in this part of paper remittances by sending countries for Bosnia and Herzegovina for the year 2012 will be presented. The demographic aspect of remittance inflow to B&H according to *Bilateral Remittance Matrix 2012*, which is provided by the World Bank, is showed in Figure 2.

**Figure 2.** Remittances by Sending Countries for B&H in 2012 (in millions of US\$)



*Source: Migration and Remittances Factbook 2011, World Bank.*

As we can see from the Figure 2, the major part of remittance inflow into Bosnia and Herzegovina in 2012 comes from Croatia and it amounts approximately 625 millions of dollars (34% of total remittances). The countries that follow are Germany with an amount of 336 millions of dollars (18%), Austria with an amount of 218 millions of dollars (14%), United States with an amount of 168 millions of dollars (9%) and other. Remittance inflow is very widely spread through many European and world countries, with exception of few major sources which are mentioned above. We can conclude that remittance inflow follows the pattern of migration of Bosnian residents, and that amount of remittances sent from one country is usually proportional with the number of emigrants from Bosnia and Herzegovina in that country (see *Migration from Bosnia during the 1990s*).

#### **2.5. Overview of Literature about Cyclicity of Workers' Remittances**

There is a numerous number of literature and articles that cover this subject and this paper will try to mention most important works. Apaa and Anguyo (2006) investigate cyclical properties of worker's remittances to Uganda. They state that remittance inflow to Uganda tend to be counter-cyclical to the movements of GDP. They also state that financial efficiency through security and deepening play a role in determining remittance flows to Uganda.

Hossain and Anjum (2014) examined the effect of remittance inflow to Pakistani GDP. They came to conclusion that remittance inflow to Pakistan tends to be counter-cyclical to the GDP movements. They also stated that Pakistani government should increase GDP without decreasing remittance inflow and that Pakistani workers in Saudi Arabia and U.A.E., where approximately 74% Pakistani migrants reside, should be given remittances cards in order to encourage them to save money and send remittances.

Durdu and Sayan (2009) analyzed the effects of remittance fluctuations for several macroeconomic variables. They used two-sector model of a small open economy, representing Mexican and Turkish economies, which are two biggest remittance receivers with opposite cyclical characteristics of their remittances. Sayan and Duru came to a conclusion that remittances dampen the business cycles in Mexico, and amplify those cycles in Turkey. This means that remittance inflow in Mexico tends to make business cycles less strong or intense, because of their counter-cyclical nature; and remittance inflow in Turkey increases the magnitude of business cycles, making the impact of recessions even greater, because of their pro-cyclical nature. They argue that remittances have a mild impact on the economy in the long-run, but large impact in the short-run when the economy is borrowing constrained.

Sayan (2006) investigates cyclical characteristics of remittances in 12 different countries. Of those 12 countries six are low income countries and six are low-medium income countries. He came to a conclusion that there isn't a pattern when it comes to the cyclicity of workers' remittances in cross-country comparison. As for the whole group, remittances behave counter-cyclical with a lag of one period. He also states that the reasons for these different cyclical behaviors of remittances are hard to explain, and depend on situation from country to country.

Sayan et al. (2010) investigate behavior behind remittance sending of Mexican workers who live in the United States, considering the fact that the US and Mexican economies are highly integrated. His empirical investigation states that altruism effect dominates other mechanisms when it comes to Mexican workers, and that remittances they send are countercyclical with respect to the business cycles in Mexico.

Sayan and Tekin-Koru (2005; 2007; 2008) compared remittance cyclicity between Mexico and the United States, and Turkey and Germany. They came to a conclusion that remittances sent from the United States to Mexico tend to be counter-cyclical to Mexican output, and that remittances sent from Germany to Turkey tend to be pro-cyclical. They also came to conclusion that remittances sent to Turkey from Germany don't respond to cyclical changes in economic activity in Germany, while remittances sent from the United States to Mexico tend to be cyclical with economic activity in the United States.

Sayan and Tekin-Koru (2012) investigated the cyclical properties of workers' remittances with the Turkish and German output. They also investigated the poverty reducing capabilities of workers' remittance inflow in Turkey. They came to conclusion that workers' remittances, which come into Turkey, are pro-cyclical with Turkish output. The ability of remittances sent from Germany to Turkey to reduce poverty was bigger for the period before 1992, than for the period from 1992. to 2003. Smoothing of consumption expenditures of relatives back home ceased to be the main motivation behind remittances from Germany due to the passage of time.

### **3. Methodology**

The methodological and empirical approach of this article is separated into two parts. First part is comprised of assessing the cyclical components of variables (GDP, ODA, FDI, and Remittances) as suggested by Sayan and Tekin-Koru (2005). After that, this article investigates the contemporaneous and asynchronous correlations between the variables. The main goal is to conclude whether remittance inflow into Bosnia and Herzegovina is pro-cyclical, counter-cyclical or a-cyclical to GDP volume of Bosnia and Herzegovina. This article also accesses the differences between the cyclical proprieties of remittance inflows and the cyclical proprieties of foreign direct investment (FDI) and Official Development Assistance (ODA). For the assessment of cyclical components MATLAB software is used, and for the correlation analysis SPSS, software for statistical analysis is used.

#### **3.1. The Nature of Data and Data Sources**

Data set of this article covers the period from 2001 to 2013 on a quarterly basis. The data consist of GDP volume of B&H, and also FDI, ODA (Official Development Assistance), and Remittance inflow volume into B&H. The on GDP is obtained from the Agency for Statistics of Bosnia and Herzegovina, whereas the data regarding FDI, ODA, and Remittances is obtained from the Central Bank of Bosnia and Herzegovina. Because of the unavailability of the quarterly data from 2001 to 2007, this article used average quarterly distribution for the period 2008 – 2012 (quarterly data which was obtainable from the Agency for Statistics BiH) and applied that distribution to the yearly GDP amounts for the period 2000 – 2007<sup>1</sup>. Because all data needed to be converted to the natural logarithm, the data on FDI inflow into B&H for the two negative quarters in the year 2009 was changed to the value of one (1)<sup>2</sup>.

#### **3.2. Detrending the Data**

In order to determine how remittances, ODA, and FDI correlate and respond to periods of growth, boom, stagnation, crisis, or recession over business cycles in Bosnia and Herzegovina, this article

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<sup>1</sup> Calculated average quarterly distribution for the quartals from the period 2008 – 2012 were: 22.97658% for the 1<sup>st</sup> quartal, 25.28263% for the 2<sup>nd</sup> quartal, 26.26794% for the 3<sup>rd</sup> quartal, and 25.47286% for the 4<sup>th</sup> quartal.

<sup>2</sup> The data on FDI inflow for the 2nd and 3rd quarter in 2009 was -17.39 and -63.38 million KM, respectfully.

firstly must identify when is the mentioned economy actually in one of these phases in any given time period. In accordance to Kydland and Prescott (1990), this article looks at business cycles as deviations of output from its long-run trend, and afterwards determines in which phase of business cycle output is situated by looking at the direction of deviations relative to the trend. After that, the next step is examining the behavior of remittances, ODA, and FDI over the business cycles of Bosnia and Herzegovina. This article does that by analyzing the statistical properties of co-movements between remittances, ODA, and FDI with the business cycles of mentioned economy (Kydland and Prescott, 1990).

The idea is to remove the long-run trend within time series data on national output (GDP) first. When the trend is removed, the remaining cyclical components show the cyclical upturns and downturns during different time periods. The same procedure is applied to the remittance, ODA, and FDI of Bosnia and Herzegovina in order to obtain real values without long-run trend of these data. If cyclical components of the remittance receipts (or ODA and FDI) and the output (GDP) of Bosnia and Herzegovina tend to move in the same direction over time, then the remittances (or ODA and FDI) are said to be pro-cyclical with the output (GDP) of Bosnia and Herzegovina. If the stated data, on the other hand tends to move in the opposite direction, then remittances (or ODA and FDI) are said to be counter-cyclical with the national output (GDP) (Sayan and Tekin-Koru, 2005; 2007; 2008; 2012).

In the light of above stated definitions, this article tends to work with cyclical components,  $c_t$ , of seasonally adjusted series  $x_t \in \{y_t, x_t^{REM}, x_t^{ODA}, x_t^{FDI}\}$  where  $y_t$  represents GDP of Bosnia and Herzegovina,  $x_t^{REM}$  represents remittance inflow,  $x_t^{ODA}$  represents ODA inflow, and  $x_t^{FDI}$  which represents foreign direct investment inflow into this country. The data analyzed are in natural logarithm so the change in the growth component,  $x_t - x_{t-1}$ , corresponds to a growth rate (Kydland and Prescott, 1990).

This article begins with de-trending each series  $x_t$  to separate its trend (growth) component,  $\tau_t$ , from the cyclical components,  $c_t$ :

$$c_t = x_t - \tau_t \tag{1}$$

In this paper, the authors use the Hodrick-Prescott (HP) filter as a technique to de-trend the data.

*Hodrick-Prescott Filter (HP)*

Hodrick-Prescott (HP) filter is the most widely used filter by economists, and this article isn't going to be different from majority of economists' opinions. This filter is developed by Hodrick and Prescott in 1997, and other two widely filters used by economists are Baxter-King and polynomial filters. Hodrick-Prescott (HP) filter minimizes the variance of the cyclical component,  $c_t$ , subject to a penalty for variation in the second difference of the trend component,  $\tau_t$  (Hodrick and Prescott, 1997).

The problem then is:

$$\min_{\tau_t} \left\{ \sum_{t=-\infty}^{\infty} (x_t - \tau_t)^2 + \lambda \sum_{t=-\infty}^{\infty} (\tau_{t+1} - 2\tau_t + \tau_{t-1})^2 \right\} \tag{2}$$

yielding a linear time-invariant filter (Cogley and Nason, 1995). In this article the authors will use  $\lambda$  value equal to 1600, which is the  $\lambda$  value suggested for quarterly variables (Hodrick and Prescott, 1997). After the cyclical components of each time series is found using HP filter, this article conducts correlation analysis.

### 3.3. Correlation Analysis

This article uses cyclical components of remittances (or ODA and FDI) and output series of Bosnia and Herzegovina to identify cyclical characteristics of remittances (or ODA and FDI) by calculating contemporaneous and asynchronous cross correlations between those data.

A positive (negative) contemporaneous correlation is taken to demonstrate that the remittances (or ODA and FDI) are pro-cyclical (counter-cyclical) with the output series in question for Bosnia and Herzegovina. By definition, a variable is implied to be pro-cyclical (counter-cyclical) with -the movement of the cyclical component of- the output, if the contemporaneous cross correlation (cross correlation in time  $t = 0$ ) is positive (negative) in a statistically significant sense (Kydland and Prescott, 1990; Alper, 2002). Pro-cyclicality (counter-cyclicality) of remittances (or ODA and FDI) in this context relates to the propensity of remittance (or ODA and FDI) inflow to Bosnia and Herzegovina to move above its trend, whenever the corresponding output variable is above (below) its respective trend. In the absence of such propensity, remittances (or ODA and FDI) and output are implied to be a-cyclical.

In the calculation of asynchronous correlations between the cyclical components of relevant remittances (or ODA and FDI) and output variables, the remittances (or ODA and FDI) were shifted by one to four quarters in both positive and negative directions. The resulting cross correlation coefficients help to identify possible phase shifts by looking at how early or how late the highest significant correlation is stationed relative to the contemporaneous period (Pallage and Robe, 2001). The variable, in the case of this article remittance inflow (or FDA and ODA), is said to be leading (lagging) the cycle, if the largest absolute significant correlation between remittances (or FDI and ODA) and output of Bosnia and Herzegovina occurs when the series is shifted backwards (forwards). For example, if the largest absolute significant correlation coefficient between remittances (or FDI and ODA) and output of Bosnia and Herzegovina is obtained when remittances (or FDI and ODA) is shifted back (forwards) by  $q$  quarters, then it is understood that remittances (or FDI and ODA) have a tendency to peak about  $q$  quarters before (after) the real output peaks. The remittance inflow (or FDI and ODA) is said to lead (lag or follow) the output of Bosnia and Herzegovina by  $q$  quarters in that case.

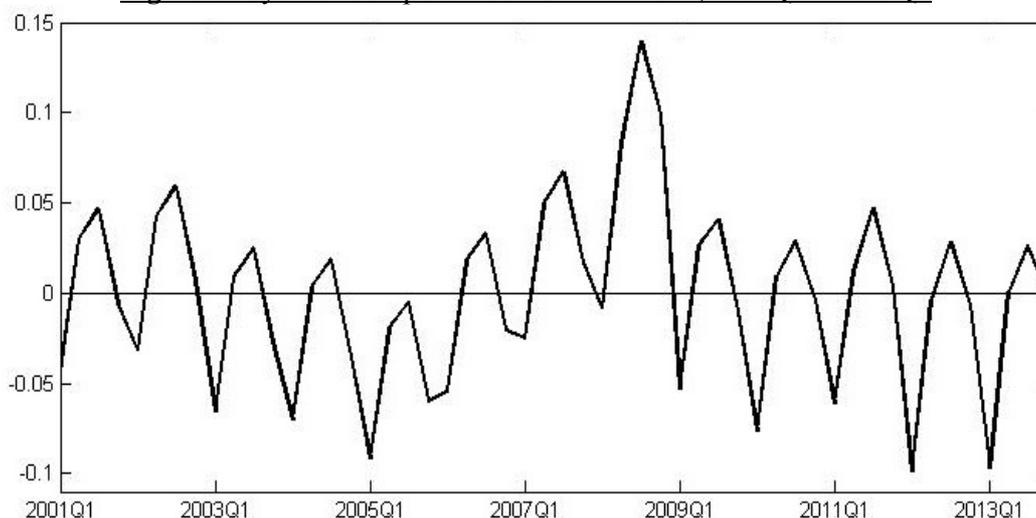
#### **4. Data Analysis and Results**

In this part of the article, mathematical and statistical data analysis will be conducted. First there will be a visual presentation of cyclical components regarding GDP, remittance inflow, ODA, and FDI of Bosnia and Herzegovina. Next there will be presented visual examination of relations between remittance inflow cycles and GDP cycles, ODA cycles and GDP business cycles, and FDI cycles and GDP cycles of Bosnia and Herzegovina. In the last part of data, analysis, contemporaneous and asynchronous cross correlations will be conducted regarding cyclical components of remittance inflow, ODA, and FDI versus GDP of Bosnia and Herzegovina.

##### **4.1. Cyclical Components of Data**

Figure 3 represents the cycles for the GDP of Bosnia and Herzegovina obtained using the Hodrick-Prescott filter for the time span from the first quarter of 2001 to fourth quarter of 2013. Since this article used all series in their logarithmic form, one can interpret the resulting cycles as percentage deviations from the long-run trend.

**Figure 3. Cyclical Components of GDP of B&H, 2001Q1 – 2013Q4**



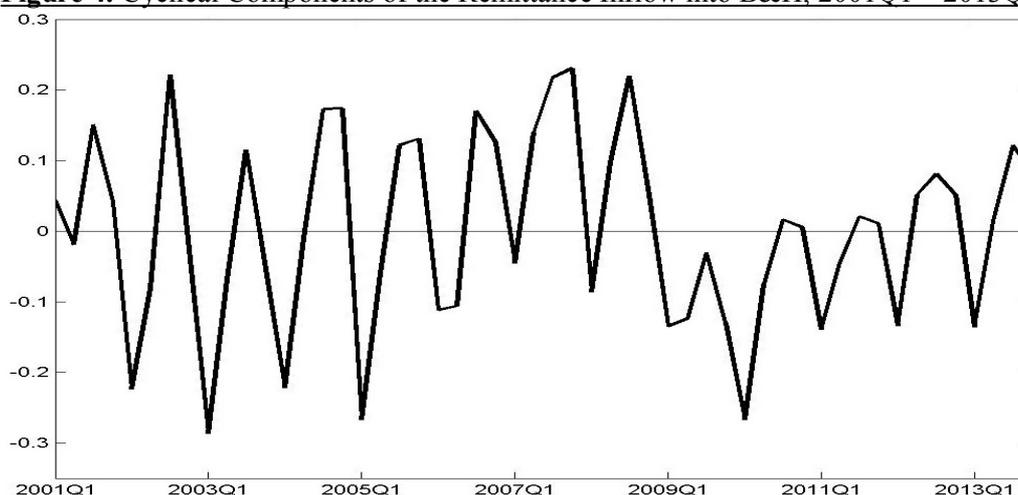
From the Figure 3, one can clearly see how much did GDP of Bosnia and Herzegovina deviate from its trend in percentages. One situation that clearly stands out is the period closely before and after the global financial crisis 2007-2008. The GDP was increasing in the years before the crisis, but in the fourth quarter of 2008 and especially in the first quarter of 2009, the GDP of Bosnia and Herzegovina records significant decrease. This decrease was clearly affected by the global financial crisis and in the period after the crisis GDP of Bosnia and Herzegovina records slow growth.

Broadly speaking, if the remittances sent by Bosnian workers abroad were counter-cyclical to the business cycles in Bosnia and Herzegovina, one would expect to observe increases in the amounts

sent shortly after each decrease of Bosnian GDP in Figure 3. The reason behind this logic lies in expectation that workers living abroad will increase their sending and financial support to their family members which are still living in Bosnia and Herzegovina in order to prevent sharp drops in their living standards which were induced by the economic crisis in Bosnia and Herzegovina. On the other hand, Bosnian workers who live abroad could have lost touch with their family members who are still living in Bosnia and Herzegovina, or they would perceive that placing funds into Bosnia and Herzegovina is too risky, and because of these reasons remittances from Bosnian workers may respond pro-cyclically in accordance to the Bosnian GDP. The last possibility would be the situation in which there isn't a systematic and significant relationship between remittances and output cycles in Bosnia and Herzegovina. In that case one would understand that remittances and Bosnian GDP behave a-cyclically.

In order to identify the relationship between remittances and output cycles of Bosnia and Herzegovina, this article is going to use cyclical components of Bosnian GDP and remittance inflow and conduct contemporaneous and asynchronous cross correlation analyzes between these data. The same logic follows the relationship between FDI (or ODA) and output of Bosnia and Herzegovina, and the same mathematical analysis is used to determine and identify the nature of their relationship. Figure 4 represents the cyclical behavior and components of remittance inflow into Bosnia and Herzegovina for the period 2001 – 2013.

**Figure 4. Cyclical Components of the Remittance Inflow into B&H, 2001Q1 – 2013Q4**



As the Figure 4 shows, the cyclical component remittance inflow into Bosnia and Herzegovina is more volatile than the business cycle of the country. Once again one can notice a different pattern in the year after the global economic crises when looking into the behavior of remittance inflow. One can notice that the remittance inflow cycle decreased, the same as the GDP of Bosnia and Herzegovina, in the first quarter of 2009. It then slightly rose, and experienced a great decrease again. It seems that emigrants from Bosnia and Herzegovina didn't care too much for the decreased standard of living and economic crisis in their home country and they decided to send less to their family members living in Bosnia and Herzegovina. One can conclude that remittance inflow tends to behave pro-cyclically in accordance with the GDP of this country, but the visual interpretation isn't enough to make conclusions. This article will need to employ cross correlation analysis in order to make conclusions which are significantly certain.

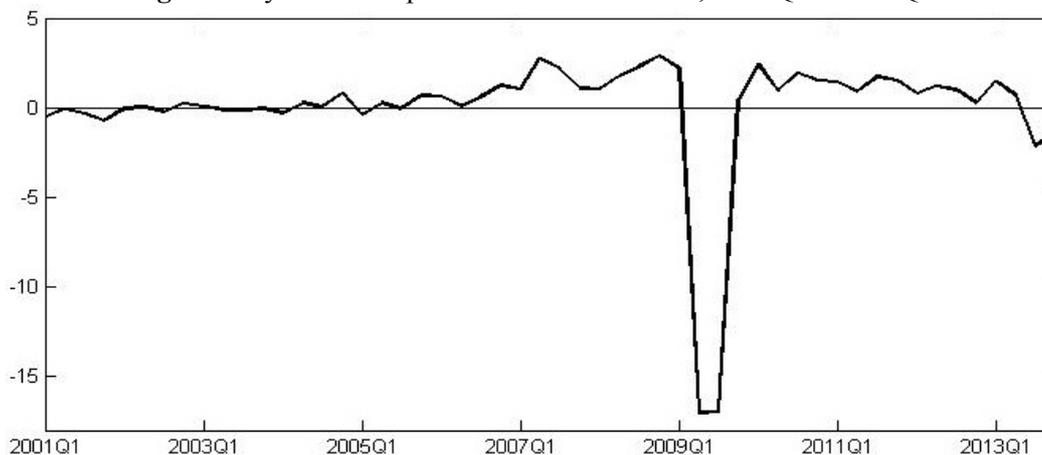
*Cyclical Components of ODA and FDI:*

In this section the authors of the article will provide the cycles and cyclical components of Official Development Assistance (ODA) and Foreign Direct Investment (FDI) into Bosnia and Herzegovina. In the Figure 5 the cyclical component of FDI is presented.

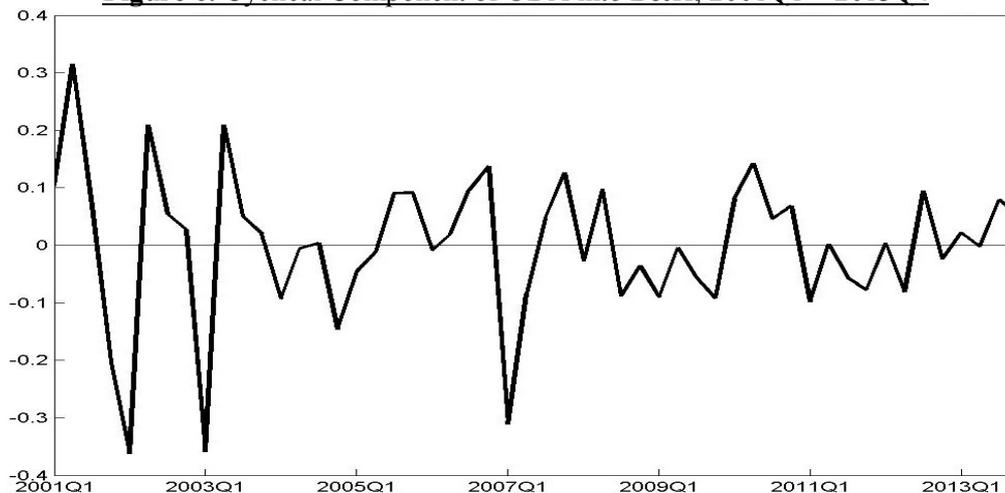
The Figure 5 shows that FDI cycle decreased sharply in year 2009, which corresponds to the year after the financial crisis. As we could see before, output of Bosnia and Herzegovina also dropped in this period, which tells us that FDI inflow could behave pro-cyclically with the output of Bosnia and Herzegovina. The behavior of the FDI isn't surprising because foreign investors tend to decrease and

hold back their investment and money during severe economic crisis, as we had in the year 2007 – 2008. This was indeed the case with Bosnia and Herzegovina, who reported negative FDI inflow in second and third quarter of 2009, which amounted -17.39 and -63.38 million KM, respectively. Of course, sole visual interpretation of the variables isn't enough, and mathematical analysis must be implemented again for the cyclical components of FDI inflow. Next, cyclical component of ODA inflow into Bosnia and Herzegovina will be presented.

**Figure 5** Cyclical Component of FDI into B&H, 2001Q1 – 2013Q4



**Figure 6.** Cyclical Component of ODA into B&H, 2001Q1 – 2013Q4



As one can notice from the Figure 6, the Official Development Assistance inflow into Bosnia and Herzegovina cycles reported several dips. First decrease occurred at the end of 2001, second decrease occurred at the beginning of 2003, and third decrease occurred in the beginning of the financial crisis of 2007. ODA inflow was very helpful, and still continues to be one of the helpful factors for the stability of the Bosnian economy, especially shortly after the war. The dip in 2007 could be explained the negative effects of the crisis, where the senders of financial assistance perceive high risk and believe that their money would be lost. ODA cyclicity cannot be easily identified when one looks solely at the figures. It is apparent that mathematical analysis of the relationship between ODA and output cycles of Bosnia and Herzegovina is needed.

#### **4.2. Co-movements between Remittances and Output Variables**

This is the most important section of the article, where authors apply cross correlation coefficients and measures contemporaneous and asynchronous correlations between remittances (ODA and FDI later) and output variables. The Table 3 shows volatility of the cyclical components as measured by standard deviations.

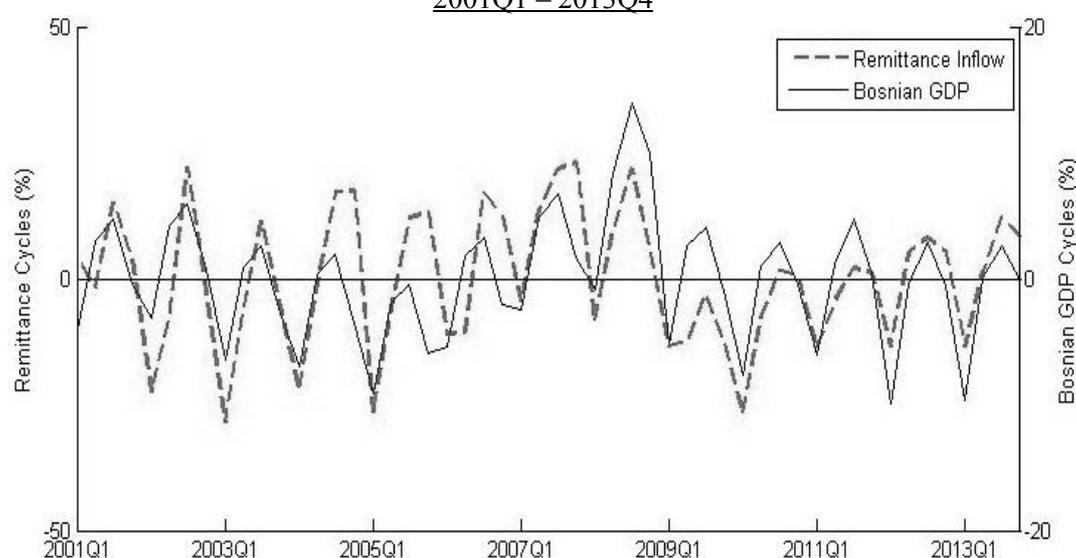
**Table 3.** Volatility of Cyclical Components

GDP	Remittances	ODA	FDI
4.93	13.51	12.74	357.95

The Table 3 shows that GDP cycles have the lowest level of volatility, followed up, after sizable distinction, by cyclical components of ODA and Remittances. One can notice that FDI has very large volatility, primary because of the negative levels in the two quarters of 2009 year.

In the next section the authors of this article investigate the nature of co-movements between the cyclical components of remittances (ODA and FDI later) and the relevant Bosnian output series. The analysis will start firstly by visually inspecting all cycles and then the correlation analysis is conducted to formally decide about the pro- or counter-cyclicality of these cycles. Figure 7 presents a comparative look at the cyclical components of the Bosnian GDP and the remittance inflow in this country.

**Figure 7.** Comparison of Cyclical Components of GDP and Remittance Inflow into B&H, 2001Q1 – 2013Q4



As the Figure 7 represents, there is a great co-movement of the cyclical component of remittance inflow and cyclical components of Bosnian GDP. The difference is only in the volatility of the data, as the remittance cycles are more volatile than the GDP cycles of B&H. In order to formally decide whether the Bosnian workers' remittances tend to be counter-cyclical or pro-cyclical with the business cycles in Bosnia and Herzegovina the cross correlation is conducted, with the coefficient represented in the Table 4.

**Table 4.** Correlations between Cyclical Components of the GDP and Remittance Inflow of B&H

Lag, $i$	$y_t, x_{t-i}^{REM}$	$y_t, x_{t+i}^{REM}$
0	0.636**	
1	0.314*	-0.110
2	-0.480**	-0.292*
3	-0.382**	0.409**
4	0.379**	<b>0.682**</b>
<i>Memorandum</i>		
<i>Volatility</i> ***	Bosnian Output: 4.93	Remittances: 13.51
Notes:	* Coefficients which are statistically significant at 5% level. ** Coefficients which are statistically significant at 1% level. *** Percentage standard deviation of the cyclical component of the series.	

The Table 4 shows that remittances sent to Bosnia and Herzegovina appear to move in the same direction as the output or GDP of Bosnia and Herzegovina, given the positive sign and statistical significance of the contemporaneous correlation coefficient. This means that remittance flow to Bosnia and Herzegovina tends to be pro-cyclical with the GDP or output of this country. Contemporaneous correlation coefficient is 0.626 and it is significant at 0.01 level of significance, which gives it very good significance level. The contemporaneous correlation coefficient is very high, which tells us that there is a strong positive correlation between remittances inflow to Bosnia and Herzegovina and Bosnian output level. In other words, workers of this country don't pursue altruistic motives to help family members and relatives back home to smooth their consumption (Sayan and Tekin-Koru 2005). Results from the table before show that remittance inflow and the GDP of Bosnia and Herzegovina are asynchronous, because the largest absolute value of significant correlation coefficient of 0.682 is located in the last column, which represents a lag of remittance inflow by four quarters. On the basis of this information, one can conclude that remittance flows into Bosnia and Herzegovina lag or follow output of this country by one year (four quarters).

Based on this strong co-movement between remittance inflow and the GDP of Bosnia and Herzegovina, we can conclude that Bosnian migrant workers closely watch economic development in their home country and follow with their remittances one year after. In this situation, it is appropriate to use the phrase "when it rains, it pours" for the economy of Bosnia and Herzegovina: Remittance inflow increases after the output (and hence income) of this country increases, leaving the households very happy in the periods of economic growth. However, this relationship between remittance inflow and output level is very hard to overcome in the times of economic recession, and in fact Bosnia and Herzegovina suffered additionally from the global economic crisis in 2009 because of this relation between remittances and output. Economic crisis happened in 2007-2008, but the economy of Bosnia and Herzegovina didn't suffer as much in the beginning. One year after, in 2009, Bosnian economy downturned very fast, which was induced by one year lagged decrease in remittance inflow by Bosnian migrants abroad.

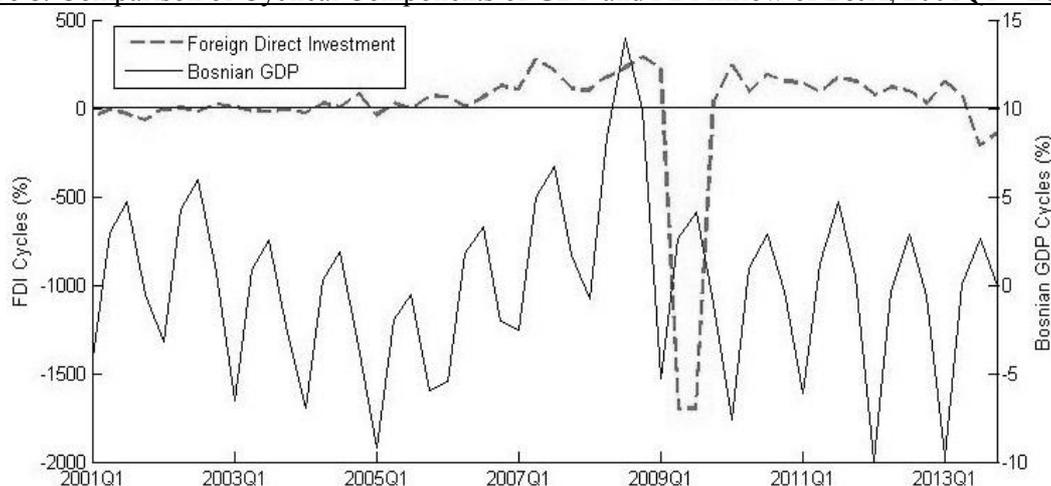
*Co-movements between FDI/ODA and Output Variables:*

In this section the relationship and co-movements between cyclical components of FDI/ODA and output of Bosnia and Herzegovina (GDP) is analyzed. It is important for the economy of Bosnia and Herzegovina to know whether some other external financial flows such as ODA and FDI could be used to mitigate the consequences of economic recession, knowing that remittance inflow won't. First, the authors will present visual movement of mentioned variables, and after that the authors will also present contemporaneous and asynchronous correlations.

*(a) Relationship between Cyclical Components of FDI and Bosnian Output*

Figure 8 represents a comparative look at the cyclical components of the Bosnian GDP and the FDI inflow in this country.

**Figure 8.** Comparison of Cyclical Components of GDP and FDI Inflow of B&H, 2001Q1 – 2013Q4



It is very difficult to conclude whether the FDI and the GDP move together merely looking at the Figure 8. The only trend noticeable is that in the first quarter of 2009, where both GDP and FDI of Bosnia and Herzegovina record great drop in their values. In order to formally decide whether the FDI into Bosnia and Herzegovina tend to be counter-cyclical or pro-cyclical with the business cycles in Bosnia and Herzegovina the cross correlation is conducted, with the coefficient represented in the Table 5.

**Table 5.** Correlations between Cyclical Components of the GDP and FDI Inflow of B&H

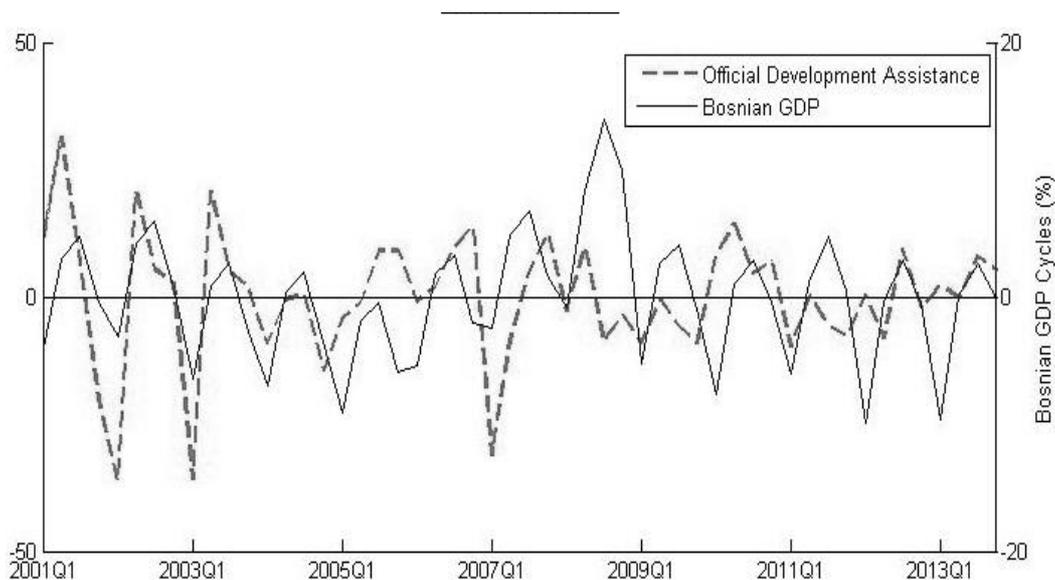
Lag, $i$	$y_t, x_{t-i}^{FDI}$	$y_t, x_{t+i}^{FDI}$
0	-0.076	
1	0.125	-0.010
2	-0.013	0.211
3	-0.421**	0.180
4	<b>-0.453**</b>	-0.037
<i>Memorandum</i>		
<i>Volatility***</i>	Bosnian Output: 4.93	Remittances: 13.51
Notes:	* Coefficients which are statistically significant at 5% level. ** Coefficients which are statistically significant at 1% level. *** Percentage standard deviation of the cyclical component of the series.	

The Table 5 shows that FDI flows into Bosnia and Herzegovina appear to move in the opposite direction as the output or GDP of B&H, given the negative sign and statistical significance of one of the asynchronous correlation coefficient. This means that FDI flows into B&H tend to be counter-cyclical with the Bosnian output or GDP. Results from the table above show that FDI inflow and GDP of Bosnia and Herzegovina are asynchronous, because the largest absolute value of significant correlation coefficient of 0.453 is located in the last column, which represents a lead of FDI inflow by four quarters in accordance to output. This information is very important for the economy of this country, because FDI could be treated as mean of mitigating the consequences of economic recession in this country. The fact that FDI leads output of Bosnia and Herzegovina by one year (four quarters) means that if there is forecast of economic downturn or recession next year in Bosnia and Herzegovina its consequences could be mitigated by increasing the FDI inflows today.

*(b) Relationship between Cyclical Components of ODA and Bosnian Output*

Figure 9 represents a comparative look at the business cycles of the GDP of Bosnia and Herzegovina and cycles of ODA inflow into this country represented in percentage deviations from their trends.

**Figure 9.** Comparison of Cyclical Components of GDP and ODA Inflow of B&H, 2001Q1 – 2013Q4



There are some observable relations and trends between ODA cycles and Bosnian GDP cycles merely looking into the Figure 9. As the ODA recorded large drop in the beginning of 2007, the drop in GDP was much smaller at that time. The situation was reversed in 2009 where GDP recorded large drop, but the drop of ODA inflows was much smaller. In order to formally decide whether the ODA flows to Bosnia and Herzegovina tend to be counter-cyclical or pro-cyclical with the business cycles in Bosnia and Herzegovina the cross correlation is conducted, with the coefficient represented in the Table 6.

**Table 6.** Correlations between Cyclical Components of the GDP and ODA Inflow of B&H

Lag, $i$	$y_t, x_{t-i}^{ODA}$	$y_t, x_{t+i}^{ODA}$
0	0.241	
1	-0.139	0.038
2	-0.352*	-0.180
3	-0.104	-0.034
4	0.212	<b>0.406**</b>
<i>Memorandum</i>		
<i>Volatility***</i>	Bosnian Output: 4.93	Remittances: 13.51
Notes:	* Coefficients which are statistically significant at 5% level. ** Coefficients which are statistically significant at 1% level. *** Percentage standard deviation of the cyclical component of the series.	

Table 6 shows that ODA flows into Bosnia and Herzegovina appear to move in the same direction as the output or GDP of Bosnia and Herzegovina, given the positive sign and statistical significance of one of the asynchronous correlation coefficients. This means that ODA flows into Bosnia and Herzegovina tend to be pro-cyclical with the Bosnian output or GDP. Results from the table above show that ODA inflow and the GDP of Bosnia and Herzegovina are asynchronous, because the largest absolute value of significant correlation coefficient of 0.406 is located in the last column. This represents a lag of ODA inflow by one year (four quarters) in accordance to output of Bosnia and Herzegovina. This means that ODA flows of external finance into Bosnia and Herzegovina cannot be used as tools or means to fight the negative effects of the economic crisis. In fact, given the strong positive correlation coefficient, ODA flows tend to worsen the economic downturn in Bosnia and Herzegovina.

### 5. Conclusion

This paper investigated the nature of co-movements between remittance inflow into Bosnia and Herzegovina and the Bosnian output. After that, this paper also investigates the co-movements of ODA and FDI with output or GDP of Bosnia and Herzegovina. The series of mathematical analysis were conducted in order to gain information, whether the relations between mentioned variables tend to behave pro-cyclically, counter-cyclically, or a-cyclically.

The results of this article indicated very strong positive cross correlation between remittance inflow and a GDP of Bosnia and Herzegovina. From this information comes the conclusion that remittance inflow and Bosnian GDP tend to behave pro-cyclically. It is implied that the workers from this country don't pursue altruistic motives to help family members and relatives back home to smooth their consumption. Because the cross correlation coefficient is located in the column with positive lag of four quarters, it is concluded that remittance inflow into Bosnia and Herzegovina follows or lags after the Bosnian GDP for about one year (four quarters). In this situation it is appropriate to use the phrase "when it rains, it pours" for the economy of Bosnia and Herzegovina: Remittance increase after the output (and hence income) of this country increases, leaving the households very happy in the periods of economic growth. However, the negative aspect of this kind co-movement between cyclical components of remittance inflow and Bosnian GDP is that workers' remittances can in fact worsen the negative effects of economic downturn, creating even bigger fall in this country's GDP.

One possible explanation of this pro-cyclical co-movement between remittance inflow and output of Bosnia and Herzegovina is the fact that the majority of workers and migrants abroad left the country right after the war, which was approximately 20 years ago. This could lead to loosening the ties between family members home and abroad and hence inducing pro-cyclical co-movement of

workers' remittances and the GDP of Bosnia and Herzegovina. Another reason may be the fact that Bosnia and Herzegovina didn't expect high levels of inflation and decrement in exchange rates, which are one of the major macroeconomic determinants of remittance sending, and thus made Bosnian migrants abroad thinking that their relatives back home don't need as much help as they needed shortly after the war (Glytsos and Katseli, 1986).

In the next part of the paper, the nature of co-movement between cyclical components of Official Development Assistance (ODA) and Foreign Direct Investment (FDI) inflows in response to the cyclical components of GDP of Bosnia and Herzegovina was analyzed. ODA and FDI, as two other external financial inflows besides the remittance inflow, can be used as tools and means for fighting the economic recession and worsening effect of remittance inflow on economy of Bosnia and Herzegovina. Analysis and results indicated that FDI behaves counter-cyclically to Bosnian output, and that ODA behaves pro-cyclically in accordance to the GDP of this country. Both co-movements were asynchronous, FDI leads the Bosnian output cycle by one year, whereas ODA lags the output cycle of this country by one year. From the nature of co-movement between these two variables and the GDP of Bosnia and Herzegovina, it is safe to conclude that only the FDI can be used as a tool for mitigating the consequences of economic recession in this country. The fact that FDI leads output of Bosnia and Herzegovina by one year (four quarters) means that if there is forecast of economic downturn or recession next year in Bosnia and Herzegovina its consequences could be mitigated by increasing the FDI inflows today. The ODA inflow cannot be used as mean of mitigating the negative effects of economic downturn in Bosnia and Herzegovina, due to its pro-cyclically relationship with the latter.

This article can be extended in several ways. First, one could analyze co-movements of cyclical components between major remittance sending country's output, in the case of Bosnia and Herzegovina it is Croatia, and remittance inflow into Bosnia and Herzegovina in order to determine whether the positive or negative co-movements of remittance inflow into this country and its GDP are induced by the strong economic ties between two countries. It is also possible to apply Structural VAR model in order to resolve the issue of causality involve the potential endogeneity between the variables.

At the end it is safe to say that this topic is surely going to be researched even more in the future in the Bosnia and Herzegovina. To conclude, this paper came to results indicating that remittance and ODA behave pro-cyclically with Bosnian output, whereas FDI inflow in this country tends to be counter-cyclical in accordance with the output of Bosnia and Herzegovina.

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