

## STATISTICAL ANALYSIS OF THE SEASONAL VARIATION OF MOLDOVAN MIGRANTS' REMITTANCES DURING THE PERIOD 2003-2013

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### Abstract

*As a consequence of the increased number of Moldovan migrants, the volume of remittances inflows to Moldova raised steadily. Previous studies on labor migration and remittances in Republic of Moldova underline both the role of remittances in generating increased consumption of the population and its impact on the economic development of the country. In this paper, we aim to analyze the variation of money transfers of Moldovan migrants in order to estimate the trend of the remittances inflows and the seasonal variations under the impact of the global crisis. The data on remittances are available from the National Bank of Moldova, on a monthly basis, for the time span 2003-2013. The study's results highlight an upward trend and the seasonal variation of money transfer of Moldovan migrants for the considered time span.*

### Keywords

migration; remittances; economic growth; Moldova; trend; seasonal variation

### JEL Classification

F22; F24; O15; C22

### Introduction

International migration of labor force is a key issue of the European and global labor markets. A very important feature of the migration process is the money that migrants transfer to their families. Workers' remittances represent an important source of external development finance. The literature on migration underlined the positive and negative sides of remittances.

In developing countries, remittances represent a stable financial flow and have a counter-cyclical effect during the economic crisis (OECD, 2005). In some developing countries, the remittances flows are larger than public and private capital flows (OECD, 2005; Mushtaq, 2007). Remittances play a major role in reducing poverty and increasing economic growth (Pantiru et al., 2007; Goschin et al., 2011). The positive effect of remittances is highlighted either when they are used for supporting children's education or finance health expenses or when they are used for consumption or buying houses or other investments. Remittances stimulate demand

for other goods and services thus having a positive effect on the economy and have multiplier effects, especially in countries with high unemployment (OECD, 2005). Furthermore, remittance receipts imply foreign currency inflows that allow a country to pay for imports and repay foreign debt.

On the other side, Chami et al. (2008) argue that, despite their role in increasing households' disposable income, remittances do not lead automatically to higher investments and output growth. Remittances may also have some negative effects on a country's economy. They may reduce recipients' motivation to work, and thus slow down growth. Moreover, remittances may increase income inequality in the recipient country.

In the paper we aim to estimate the trend of the remittances inflows and the seasonal variations, for Republic of Moldova, during the period 2003-2013. The rest of the paper is structured as follows. Section 2 presents the characteristics of the remittance inflows and their importance for Republic of Moldova as described in previous studies on this topic. Section 3 explains both the data used in the analysis and the techniques applied for the decomposition of seasonal time series considering an additive model. Section 4 illustrates the main results of time variation analysis on remittances, underlying the seasonal pattern of transfers' inflows. Final section draws the main conclusions of the study.

### **Labor migrants' money transfers in Republic of Moldova**

The migration flows of Moldovan citizens increased in the last years due to the economic unfavorable situation in their own country. The economy of the Republic of Moldova faced important changes during the transition process that affected population in a negative way. The structural transformations implied by the market economy generated inflation, unemployment, economic crisis and, thus, determined a part of the population to look for better living and working conditions abroad (Cebotari et al., 2012). Estimations about the number of Moldovan migrants presented in IOM (2008a) and in Lücke et al. (2007) show that in mid-2006 approximately 345,000 individuals are migrant workers (25.4% of the economically active population in Moldova). However, IOM (2008a) show that other studies such as Schwartz (2007) estimates that the number of Moldovans abroad may exceed 800,000 persons. The Moldovan migrants are mainly qualified workers with secondary education or incomplete higher education (Moșneaga, 2000). The principal destination country for Moldovan migrants is Russia (65.8%), followed by Italy (8.1%), as shown by the results of the survey carried out by CBS-AXA in 2008 and presented in IOM (2008b). An important characteristic of the Moldovan migrant workers is the seasonality of the migration process especially for the workers in the construction sector, for example in Russia (Ghencea & Gudumac, 2004).

Due to the intensity of the migration phenomenon and the domestic economic situation, Republic of Moldova is one of the world countries with a very high dependence on remittances. The money transfers sustain consumption as they increase the disposable income of the labor migrants' families in the home country. The money transfers often surpass both the foreign direct investment and the development assistance (Kring, 2008, Siegel and Lücke, 2009). The money remitted is used mainly for daily needs or for buying apartments, used cars, housing or land (Sander et al., 2005). There are different methods to transfer money, either through formal channel (express transfer services and services offered by banks) or by informal channels. The formal channel is preferred by the majority of the migrants (75.8%) as shown in the report of IOM (2009). However, banks are attracting more of the volume of transfers in order to increase the banks' available capital for loans for entrepreneurs. The migrants' preference for the methods of remittances transfer is assessed by several

studies, such as Siegel and Lücke (2013), Lücke et al. (2009), Lücke et al. (2007), Kring (2008), Sander et al. (2005).

Pantiru et al. (2007) present both the economic and social effects of migration and highlight their positive and negative impact on the country's development. They argue that remittances have led to an increase of imports and stimulated inflation. The perception of the Moldovan population regarding the impact of remittances is mainly positive. More than half (51.6%) of the people surveyed on the issue of migration in Moldova in 2008 believe that migrants can contribute to Moldova's development by sending money home, thus ensuring subsistence incomes for families. However this positive consequence is limited only to consumption increase (IOM, 2009). In the same time, more than a quarter of the respondents (26.9%) consider that Moldovans' remittances may represent a source for the economic development through investments in business. The negative consequences of remittances are perceived less significant, as only 1% of the surveyed population believe that remittances have negative impact on inflation (IOM, 2009).

## Data and method

### Data

The data represent the money transfers from abroad in favor of individuals made via the national banking system of Republic of Moldova. The data are available from the National Bank of Moldova<sup>1</sup>.

The data on remittances sent home by migrants are available on a monthly basis for the period January 2003 – September 2013. The original currency amounts are expressed in US dollars at the official exchange rate of the National Bank of Moldova at the date of transfer. Data include settlements with banks from the Republic of Moldova, excluding the banks located in the Transnistrian region (National Bank of Moldova, 2013).

The persons that send/receive money can be of any nationality. The data on money transfers include both the money transferred by Moldovan migrants and other foreign exchange transfers.

The data concerns both the total inflows (US\$ millions) and the currency structure of inflows via international money transfer systems. The currency structure of inflows is presented according to the three currencies used to remit the money (US Dollar, Euro and Russian Ruble).

The most important international money transfer operators in Republic of Moldova, in 2013, are: Allure, Anelik, Avers, Blizko, Coinstar Money Transfer, Contact, InterExpress, Leader, Migom, MoneyGram, Poșta Rapidă, Privat Money, RIA Money Transfer, Smith&Smith, Strada Italia, Unistream, Western Union, Xpress Money, Zolotaya Korona, etc. (National Bank of Moldova, 2013).

### Method

The classical statistical analysis of time series implies the study of the changes in time in the evolution of a phenomenon due to the influence of specific factors. Thus, we can identify the time series' components, which are: the long term tendency, the seasonal component, the cycle component and the residual component. In order to

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<sup>1</sup>The authors would like to thank the Department of Balance of Payments from the National Bank of Moldova for making available the data on money transfers from January 2003 to September 2013 for this study. Data on *Money Transfers from Abroad in Favor of Individuals* from January 2007 to September 2009 are available on *BNM* webpage, in the *Statistics* section, *The International accounts of the Republic of Moldova* subsection at [http://www.bnm.md/en/external\\_operations\\_via\\_banc\\_system](http://www.bnm.md/en/external_operations_via_banc_system)

study the different components, the time series concerning the remittances inflows can be decomposed using an additive model (the appropriate model was chose after the graphical analysis of the data), such as:

$$y_t = C_t + f(t) + S_t + \varepsilon_t, t = 1, \dots, n.$$

where:

$C_t$ – cyclical component;  $f(t)$  – trend component;  $S_t$ – seasonal component;  $\varepsilon_t$ –error component. The seasonal component ( $S_t$ ) is characterized by constant periodicity,  $S_t = S_{t+d}, (\forall) t=1, \dots, n$ , where  $d$  is the period of the seasonal component (Jaba, 2002; Cormier, 2009).

The trend component represents the long term tendency of a time series, the law of evolution of a phenomenon and it is noted by  $f(t)$ . The trend component assesses the effect of factors with long term influence. The trend analysis implies the elimination of seasonal, cyclical and irregular variations from the time series (Pârțachi & Caraivanova, 2007). The trend is estimated by applying a moving average filter specially used to eliminate the seasonal component and to reduce the noise (Jaba, 2002; Brockwell & Davis, 2002). The moving average has the following expression, in the case of even period ( $d=2p$ ):

$$\bar{y}_t = \left( \frac{1}{2} y_{t-p} + y_{t-p+1} + \dots + y_{t-1} + y_t + y_{t+1} + \dots + y_{t+p-1} + \frac{1}{2} y_{t+p} \right) / d, \quad p < t \leq n-p$$

The moving averages are used to estimate the seasonal component, by calculating first the differences:  $y_t - \bar{y}_t$  (for the additive model). Then, the seasonal indices ( $i_k$ ) are computed as the average of the differences, using observations only for period  $k$ , where  $k = 1, \dots, d$ . By adjusting the seasonal indices, the seasonal factors are obtained, for the additive model, as the difference between the seasonal index and the

$$\hat{S}_k = i_k - \frac{1}{d} \sum_{k=1}^d i_k, k = 1, \dots, d$$

average of all seasonal indices:

$$\sum_{k=1}^d \hat{S}_k = 0, k = 1, \dots, d$$

The sum of the seasonal factors equals 0 ( ).

The seasonal component is removed from the original series in order to produce the deseasonalized time series (seasonally adjusted series):  $d_t = y_t - \hat{S}_t, t = 1, \dots, n$ .

The trend is re-estimated from the deseasonalized data in order to have a parametric form of the trend, such as the linear trend:  $\hat{y}_t = b_0 + b_1 t, t = 1, \dots, n$ , where the time variable  $t$  is the exogenous variable.

The cyclical component ( $C_t$ ) reflects the long term cyclical influence that is nonrandom.

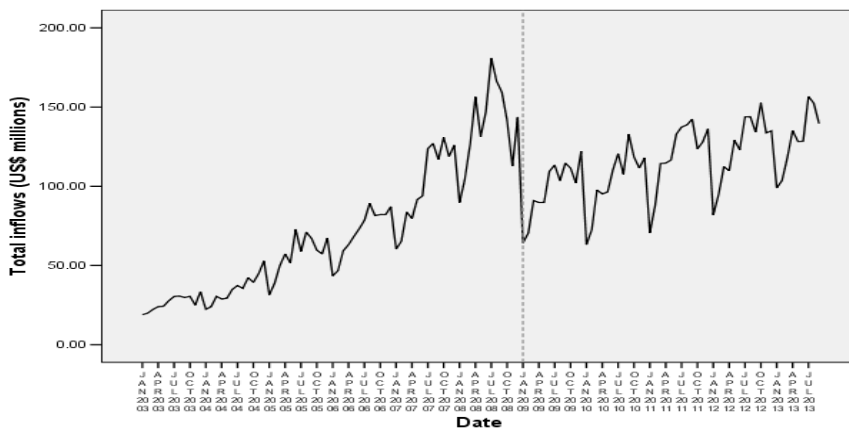
The random component ( $\varepsilon_t$ ) represent the residual or the noise component and it is stationary. It reflects the deviations from the ideal non-stochastic model. The expectation of the error variable equals 0. The residual component is estimated by:

$$\varepsilon_t = y_t - \hat{y}_t - \hat{S}_k, t = 1, \dots, n$$

The estimation of the seasonal component of the time series on remittances and the generation of the deseasonalized series are accomplished using the *Seasonal Decomposition* procedure in SPSS. The *Sequence* procedure is used to plot the original and the seasonal adjusted time series. In order to estimate the trend from the seasonally adjusted series, the *Curve estimation* procedure was applied. The results of the data treatment are presented in the following section.

**Results**

The evolution of transfers' inflows shows that the time series present an upward trend over the considered time span and that there is a strong seasonal variation of the transfer inflows (Figure 1). A number of peaks are evident, the increases and decreases in the transfers' inflows repeat almost in the same month every year, thus showing clear evidence of an annual pattern. Moreover, it can be noticed a break in the time series at the end of 2008. The sudden drop in money transfers of Moldovan migrants can be explained by the economic and financial crisis that had a negative impact on the remittances. Due to the break in series, the overall time span is split in two periods: before the crisis (January 2003 – December 2008) and after the crisis (January 2009 – September 2013). The data show that the magnitude of the time series is not increasing with the level of the series, therefore the decomposition model is considered to be additive.



**Figure 1 The evolution of monthly transfer inflows (US\$ millions) of Moldovan migrants during the period 2003 – 2013**

Source: Authors' results with SPSS package

In order to measure the variations due to seasonality in contrast with trend and cycle effects, we determine the seasonal component by removing other effects. The moving average filter is applied and the seasonal factors are obtained (Table 1). For both time spans, January is the month with minimum values of remittances along each year. January follows December which is a month with more important money transfers as compared to the previous months or the next following it. The reason for this seasonal pattern is that December is the period of winter holidays when persons have high expenses for the traditional winter celebrations; therefore, migrants send more money to their home families during this month.

**Table 1 Seasonal factors estimated for the two time spans: before the crisis and after the crisis**

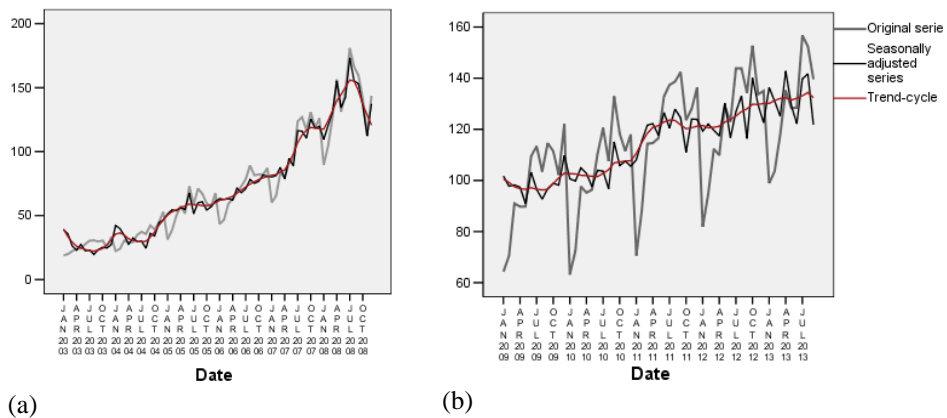
Month	Before the crisis	After the crisis
January	-19.89	-37.43
February	-15.89	-27.34
March	-3.99	-7.27
April	1.12	-7.57
May	-3.18	-1.14

June	5.19	6.26
July	7.39	16.90
August	11.04	10.81
September	6.30	17.80
October	5.28	12.57
November	0.41	3.99
December	6.23	12.41

Source: Authors' results with SPSS package

Before the crisis, the highest transfers' inflows are registered in August, followed by July and September. After the crisis, the money transfers become quite high in July each year and they reach a peak in September, while in August the transfers drop considerably, compared to the previous month. This may be explained by the fact that August is the period of summer holidays and the temporary employees are working less during this month. Therefore, we can notice a change in the seasonal pattern of transfers, before and after the crisis, regarding the months with peak amounts of money sent back home. The influence of the seasonal factors becomes more important during the after the crisis time span.

If the seasonal variations are removed from the periodic time series, the seasonally adjusted series or the deseasonalized series is obtained. The original series for the remittances inflows, the seasonally adjusted series and the smoothed trend-cycle component are plotted against the periods in Figure 2.

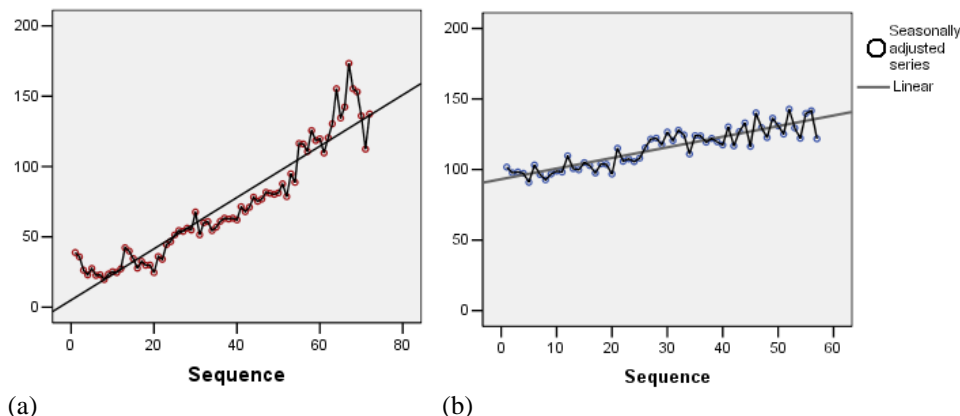


**Figure 2 The original series for remittances inflows, the deseasonalized series and the trend-cycle series before the crisis (a) and after the crisis (b)**

Source: Authors' results with SPSS package

Comparing the real transfers level and the seasonally adjusted level, we can notice that the adjustment process correct the variations due to seasonality within the years. The seasonally adjusted data are smoother than the actual data but it is still presents the same trend and cycle general effects as the original data. For both time spans, the graph of the deseasonalized data shows a clear upward trend and suggests the presence of a linear trend function. The seasonally adjusted series allows isolating the trend component and analyzing it independently of the seasonal component. Thus, the deseasonalized series is used for re-estimating the trend that can be extrapolated in order to make predictions or simulations.

The trend is re-estimated by a linear regression model and the intercept and the slope are estimated using the least squares method. The deseasonalized series and the linear trend are plotted in Figure 3 and the estimated coefficients are presented in Table 2.



**Figure 3** The seasonally adjusted series and estimated linear trend before the crisis (a) and after the crisis (b)

Source: Authors' results with SPSS package

For both time spans, the linear trend models are statistically significant. The slope is significant for both models, while the intercept is significant only for the model corresponding to the years after the crisis. The slope is higher for the before the crisis model, showing a more important increase in monthly remittances during the time span prior to the crisis. After the crisis, the monthly increase in money transfers is still significant but it is smaller compared to the period before 2009.

**Table 2** The regression coefficients for the two time spans: before the crisis and after the crisis

	Before the crisis	After the crisis
Intercept	5.019 (3.220)	93.173 <sup>***</sup> (1.728)
Slope	1.824 <sup>***</sup> (0.077)	0.752 <sup>***</sup> (0.052)
Adjusted R Square	88.8%	78.9%

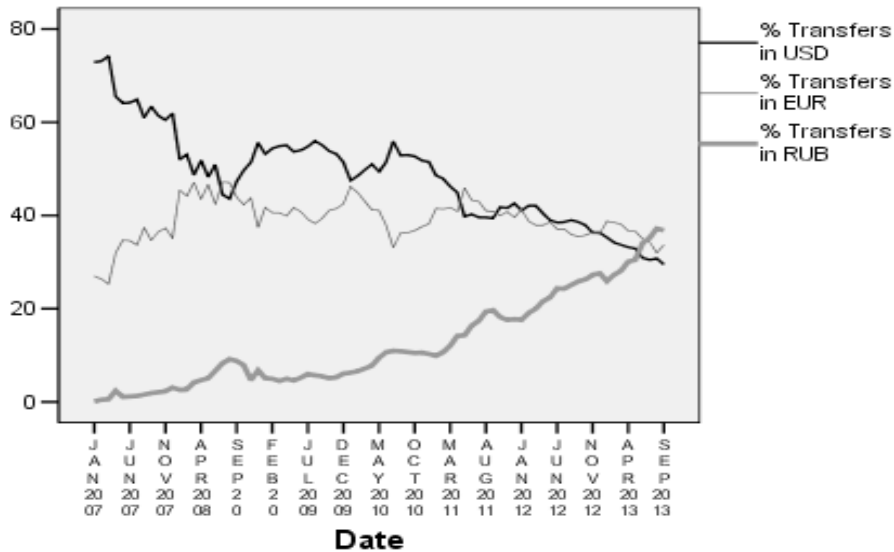
Note: <sup>\*\*\*</sup> (Sig. < 0.1%)

Source: Authors' results with SPSS package

The crisis impact on remittances is highlighted by the reduced pace of the increase of the money transfers. The global crisis had impact on trade, construction and manufacture sectors, thus Moldovan migrants experienced declining employment opportunities and wages beginning with 2009 (Lücke et al., 2009). Indeed, the remitted amounts during the period 2009-2013 are smaller than the remitted amounts in 2008.

The monthly transfers via international money transfer operators represent, on average, approximately 78% of the total monthly transfers. The maximum value is observed in October 2012 (90.45%) while the minimum value (46.88%) is noticed in March 2004. The share of money transfers via international money transfer operators increased persistently during the period January 2007 – September 2013.

The structure of the inflows via international money transfer operators shows different trend patterns according to the three currencies: US Dollar, Euro, and Russian Ruble (Figure 4).



**Figure 4 The currency structure of inflows via international money transfer systems**

Source: Authors' results with SPSS package

The money remitted in US Dollars shows a declining trend, while the inflows in Russian Ruble follow an upward trend. The trend for the inflows in Euro is constant though it is declining in the last three years. The divergence in the inflows' evolution by currency highlights the variation in the dynamics of the transfers' inflows and of the labor migration patterns.

### Conclusion

The paper aimed to analyze the money transfers of Moldovan migrants during the period 2003-2013 using monthly data. The remittances sent by labor migrants to important especially for sustaining consumption income of their families in the home country.

The global crisis had impact on sectors employing low-to-medium-skilled jobs, thus affecting Moldovan migrants. During the observed time span, the impact of the economic crisis on transfers' inflows is obvious. The trend pattern is similar before and after the crisis, but the slope is different between the two periods.

The remittances seasonality is shown by increases and decreases that repeat every year. The lowest level is registered in January each year, while the highest level of money transfers is registered in the summer months. The seasonal pattern of the time series changes under the impact of the crisis with respect to the amplitude of the seasonal variations. Therefore, after the crisis, the trend slowed down, while the seasonal variations increased.

The structural variation of the transfers' inflows by currency underlines important trend changes, the money transfers in Russian Ruble have raised, while the transfers in Euros and US Dollar have decreased.



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