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The role of remittances in times of socio-political unrest: Evidence from Tunisia¹

Farid MAKHLOUF² & Refk SELMI³

Abstract: The Tunisian political system is still in process of transitioning, causing high uncertainty and political instability. As remittances have long been perceived as a buffer against uncertainty surrounding unusual events, this study seeks to assess the role of remittances in times of rising socio-political unrest. To do so, we conduct an in-depth analysis of the behavior of remittances during troubled political transition. Specifically, detailed investigation of rescaled range(R/S) analysis to test whether remittances follow a long-memory process is carried out. Our findings tend to confirm the stable behavior of remittances. We can therefore characterize Tunisian migrants as regular customers in the future. This would affect positively both the balance of payments and the families who receive them. But this situation seems to be exogenous and is not related to the implementation of any policy to attract remittances. Hence the paramount importance of designing a comprehensive strategy that enables remittances to play a more potential role in post-revolution periods and that renders emigration an integral part of growth strategies.

Keywords: *R/S* analysis, Hurst Exponent (*H*), Fractal Analysis, Extensive remittances, Tunisia.

JEL Classification: F24.

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1. Introduction

Remittances- income received from abroad as a consequence of international migration (Lianos, 1997; Yang, 2011) - can be a lever for development in countries of origin as long as this phenomenon is well understood. It is true that remittances *per se* constitute a complex and multidimensional phenomenon (Makhlouf, 2013). In 2019, remittances to low- and middle-income countries are expected to reach \$550 billion, putting them in first place compared to foreign direct investment and development assistance flows (WorldBank, 2019). In the Tunisian case, remittances have a non-negligible effect on the Tunisian economy (Chnaina and Makhlouf, 2015; Edelbloude et al., 2017). According the World Bank data, the share of remittances in the GDP represents 4.77%, more it has been shown that remittances played a positive role in the successful Jasmine revolution (Edelbloude et al., 2017). One the crucial issues for remittances theory is the fact that remittances are linked only to the income of migrants and their families. In addition, remittance behavior may depend on other personal and social factors. Moreover, the motivations of migrants to send money are multiple (Cohen, 2011). For example, Edelbloude et al. (2017) show that remittances increased significantly after the Arab spring.

The reaction of remittances to the outbreak of social unrest is becoming one of the major issues of concern to economists (Edelbloude et al., 2017; Makhlouf et al., 2019). Political instability is changing migrants' behavior. Since the onset of this event, the political upheavals have brought enormous changes and uncovered anxiety regarding the country's future. In retrospect, Tunisia was neither an economic miracle nor a successful story, but it was doing better than its potential neighbors. During the 15 last years prior to the Arab Spring, its economic growth reached 5 percent as average, outpacing other Middle Eastern and North African and lower-middle-income countries' averages. The economic growth achieved was driven by a development model based on

prudent macroeconomic management and drastic government involvement in productive decisions through unrivaled system of incentives and “ad hoc” interventions. Tunisia made significant progress in ensuring a competitive environment for domestic enterprises and products. Regardless the effectiveness of this model to spur growth, the Arab Spring came to recall that despite a great economic progress, the system cannot stay without real democracy and an equitable wealth distribution. As such, remittances might have a significant impact on the economic development of Tunisia. Representing one of the main sources of foreign currency and national saving for Tunisia, the remittance inflows are playing a vital economic role during the hardship periods (Bouoiyour et al., 2019).

After then years of the Arab Spring, no economic changes can be seen. In fact, the country’s most serious economic challenge is still to maintain macroeconomic stability and to manage its economic transition regardless of the presence of heightened political uncertainty. There is also a need to consider the potential for counter-cyclical financing mechanisms to boost the economy and to explore other tools of development such as migrant remittances, which can be central to sustaining consumption in the face of income shocks. In fact, in times of crisis, remittance flows to Tunisia remain resilient (see inter (see inter alia Edelbloude et al., 2017; Bouoiyour et al., 2019). Nevertheless, these financial flows have not attracted much attention from successive Tunisian governments. At present, their economic potential is seemingly under-exploited in Tunisia.

Following the Arab Spring, Tunisian migrants have significantly increased their remittances (Edelbloude et al., 2017). Remittances can also respond to shocks that are not directly connected to the host or the origin country (Makhlouf and Kasmaoui, 2017). The central issue is to understand the behavior of remittances and to be able to predict them in order to best funnel them to development projects. In that way, (Makina, 2014) confirms the predictability of remittances in

17 developing countries and Mughal and Makhoul (2011) find that inflows of funds from Europe to Pakistan are stable.

Even though a wide strand of literature has concentrated on how remittance inflows are associated with economic growth and investment (see for instance, Barajas et al., 2009; Fayissa et al., 2010), very limited literature has focused on the capacity of remittances to serve as a buffer against unforeseen events or shocks (see for example, Chami et al., 2005; Lueth and Ruiz-Arranz, 2007; Bouoiyour et al., 2019). The present research is the first, to our best knowledge, that uses Rescaled Range analysis to estimate the H exponent for remittances in Tunisia. In the economic field, H exponent is used for financial data (see, for instance, Raimundo and Okamoto Jr, 2018; Gu and Huang, 2019; Garcin, 2017; Jin, 2016; Liu et al., 2019; Luo and Huang, 2018). Studying the dynamics of long-term memory in remittances behaviors is important for understanding the evolution mechanism of migrant collective behaviors and ties formation between migrants and their relatives in the origin country. Since the existence of the memory in the process of sending money could implicate the rejection of altruism assumption. The altruism hypothesis supposes that migrants send more money when the income of the beneficiaries decreases and vice versa (Stark and Lucas, 1988; Lucas and Stark, 1985; Antoniadis et al., 2017; Bouhga-Hagbe, 2006)). Migrants from the same country of origin have a tendency to behave similar. The main reason is that people tend to behave in the same way with other people who are similar to them (Guo et al., 2018). Consequently, the migrant may have a mimetic behavior, i.e. he will tend to send money when another migrant from the same country of origin sends money. In this case the altruism hypothesis is excluded because the action of sending money is not inherent to the variation of the migrant's income or the income of their relatives but rather from another migrant. Statistically the long-term memory is the level of dependence between two points in time series (Beran, 2017). An increasing

number of studies consider that Hurst exponent as a reliable indicator to measure the long-term memory (Beran, 2017; Yu et al., 2015; Guo et al., 2018; Raimundo and Okamoto Jr, 2018).

The rest of this paper is organized as follows: section 2 presents methodology used and empirical investigations. Section 3 concludes this paper by given the political and economic implications of this paper.

2. Empirical strategy and data

Empirical studies on the long memory of time series date from the 1950s, particularly in hydrology (Raimundo and Okamoto Jr, 2018; Luo and Huang, 2018). The first engineer who proposed H index was an English engineer in hydrology (Hurst, 1951). The idea of building a dike for the Nile. His Harold Hurst in 1951 proposed an index that measures the nature of the accumulation of above- or below-average values. Inspired by the random process proposed by Einstein (Raimundo and Okamoto Jr, 2018). The Rescaled Range Analysis (R/S) method is used in this paper to estimate the value of H exponent. This value moves from 1 to 2 and Hurst Exponent moves from 0 to 1.

- $1/2 < H < 1$ involves trend persistent. This implies that if remittances increase, which implies that if remittances increase, they are more likely to be followed by another uptrend in the close-up horizon and vice versa.
- $0 < H < 1/2$ involves mean reverting: in this case remittances are anti-persistent which means if remittances increasing it is more likely to be followed by a decrease in the close-up horizon and vice versa
- H near to $1/2$ there is no correlation between values of remittances involves random walk.

The value of $H = 1/2$ involves that remittances are not predictive, otherwise the other cases are so predictive. The idea behind these values are explained below following :

let a X_t a sequence of values i.i.d. independent and identically distributed.

Where: $t = \{1, 2, \dots, T\}$, with $E(X) = \mu_X$ and the variance $V(X) = \sigma_X^2$

$$Z = X_1 + X_2 + X_3 + \dots + X_T$$

under i.i.d. assumption

$$E(Z) = T \times \mu_X \text{ and } V(Z) = V(X_1) + V(X_2) + V(X_3) + \dots + V(X_T) = T \times \sigma_X^2$$

The standard deviation of the Z , $S_Z = T^{(1/2)}\sigma_X$. In the case of Remittances, the R/S used to test the exponent of T . If the exponent of T equals $\frac{1}{2}$, we can conclude that the variable is random and that there is no memory effect therefore remittances are not predictable. This exponent is called H exponent (Raimundo and Okamoto Jr, 2018). To estimate the value of H , I use the R/S analysis following the approach presented by (Raimundo and Okamoto Jr, 2018) and adapted to the case of remittances in Tunisia.

The R/S analysis mainly consists of:

- (i) A segmentation of a series of N observations into M sub-period of t observations for each sub-period equal length ($N = t \times M$), t is the number of observations for each sub-period;
- (ii) The calculation of the standard deviation S for each sub-period:

$$S_M = \sqrt{\frac{1}{t} \sum (Remit_t - \overline{Remit})^2} \text{ where}$$

$$\overline{Remit} = \frac{1}{t} \sum_{t=1}^t R emit_t;$$

(iii) The transformation of series for each sub-period as follows:

$y(t) = \sum_{t=1}^t (Remit_t - \overline{Remit})$. $y(t)$ is the cumulative deviation from the mean. See figure1 show the original data and $y(t)$ for for two extreme cases the left one for $t=3$ and $M=59$ and the right one for $t= 34$ and $M 5$ sub-period. In this paper I use according to the strategy of (Raimundo and Okamoto Jr, 2018) ; $t : 3; 5; 8 ;13 ;20$ and 34 , which corresponds to $M: 59; 35; 22; 13; 8; 5$.

(iv) The calculation range for each sub-period $R = Max[y(t) - Min(y(t))]$, and then computing the value of mean of R/S for all sub-periods as follows:

$$=(R/S)$$

for given t , for example for $t =3$, We calculate R for each segment that consists of three months (because the data used is monthly) and We average over 59 sub-periods which makes the size of the remittances series 177 values (see table 1), and We do the same calculation again for $t=5,...,34$. Table 2 gives the results of the calculations;

(v) The estimation of H exponent denoted as:

$$R/S = t^H c \Rightarrow \log(\overline{R/S}) = H \times \log(t) + \log(c) \quad (1)$$

The value of H can be estimated by ordinary least squares; $\hat{H} = \frac{cov(\log(\overline{R/S}), \log(t))}{var(\log(t))}$. If the

remittances are unpredictable, the value of H must be equal to $\frac{1}{2}$

$$\widehat{\log(c)} = \overline{\log(\overline{R/S})} - \hat{H} \times \overline{\log(t)}$$

This paper uses remittances in millions of Tunisian Dinar (local currency). Data set was provided by Central Bank of Tunisia. We consider monthly data for the period spanning between November 2004 and June 2019. Table1 reports a summary statistic for remittances.

Table 1: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Remit	177	1,355.163	670.101	484.300	866.500	1,665.400	3,194.200

3. Discussion of the main findings

Figure 1 shows that the overall trend in remittances to Tunisia is upwards, with a significant drop in the early 2007s. A more pronounced variation is seen after the Arab Spring. Table A1 (Appendix) represents the details of the calculation of H exponent; it gives the periods and segments using the R/S technique.

Figure 1: R/S Process (left for $t=3$ and right for $t=34$)

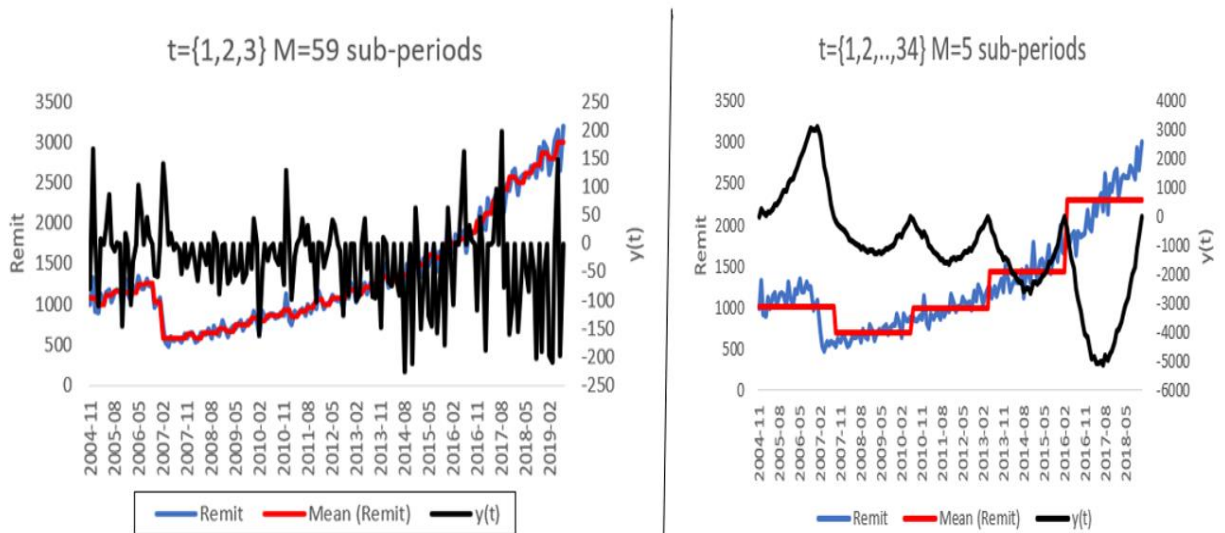
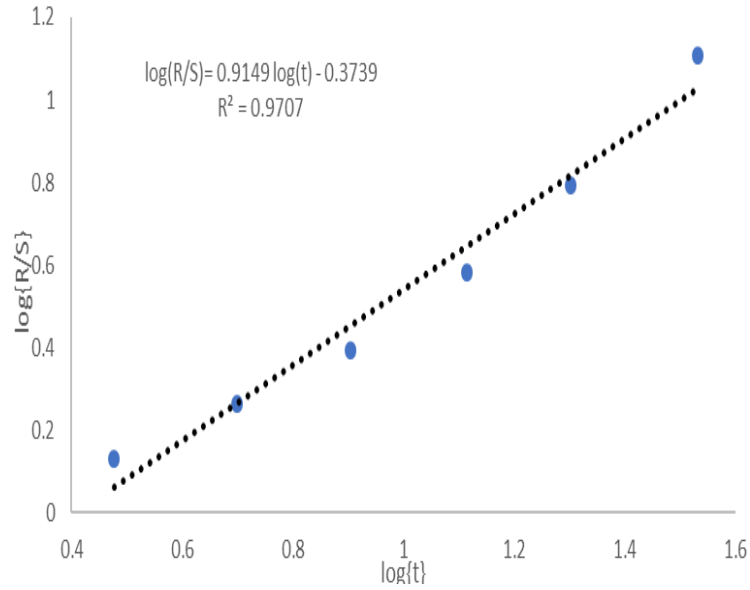


Figure 2 depicts the relationship between t and RS for the full period under study (for the periods prior to- and post-Arab Spring, see Figure A1 in Appendix), with the OLS method estimates the fit line. It also shows that the goodness of fit is relatively good.

Figure 2: Scatter Plot $\log\{t\}$ and $\log\{R/S\}$ and Trend line



Our results displayed in Table 2 reveal that the value of H exponent is close to 1 which means that remittances have a long memory process, which means that there is positive feedback. The remittance memory process has two sources: intensive remittances and extensive remittances. The volume of remittances can be seen as a result of supply and demand.

Table 2: H exponent estimation

	<i>Dependent variable: $\log(\overline{R/S})$</i>
logt	0.915*** (0.079)
Constant	-0.374** (0.085)
Observations	6
R ²	0.971
Adjusted R ²	0.963
Residual Std. Error	0.069 (df = 4)
F Statistic	132.501*** (df = 1; 4)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Overall, our findings robustly reveal that remittances follow a long memory process, and even they will raise further for the case of Tunisia. In the following, we advance some potential elements of explanation of this outcome.

a) Intensive remittances “tug-of-war” between senders and receivers

There is a mimetic behavior of remittances. For example, if a family member receives money from a relative abroad, he or she can talk to other friends and neighbors, which can have a positive effect on the demand for remittances from those who have friends or family members abroad. In this case, remittances are not a result of an increase in migrants but only of an increase in demand for remittances from the families and friends of migrants as a result of economic or environmental shocks (see for instance, Makhoulf, 2013). In other words, an increase in remittances due to the demand of migrants’ families.

Migrants have access to information from their countries of origin, the volume of remittances can reflect the migrants’ opinions on the social and economic situation of their respective countries of

origin. Tunisian migrants around the world were simultaneously behave in the same manner independently of the economic and social characteristics of the host countries in which they are resident. The example of the Arab Spring in Tunisia is the most meaningful one. Tunisians around the world have been sending more money to invest because the democratic process has raised hope in the minds of Tunisian migrants and they also wish to contribute to the success of this process (Edelbloude et al., 2017). In this case, an increase in remittances due to the supply of migrants. Another example that can illustrate this idea is the following: a migrant who buys a house in his home country for him during his holidays to rent it out may encourage other migrants to do the same. Accordingly, Acosta et al. (2009) and Bahadir et al. (2018) differentiate between two types of remittances, namely endogenous to the conditions of countries of origin and exogenous remittances. Lower remittance costs can also have a positive effect on increasing the volume of remittances (Ahmed et al., 2020). Exchange rate depravity also plays a significant role in remittances. In this context, Makhlouf (2014) shows an appreciation of the exchange rate of the host country increases remittances. Moreover, Makhlouf and Kasmaoui (2017) find that oil prices also have an effect on remittances. Last but not least, a series of factors from both host countries and countries of origin can have significant impact on intensive remittances.

b) Extensive remittances

Remittances may increase simply because the stock of migrants increases. Sending money can induce and encourage others to migrate and send money. Arguably, George et al. (2005) highlight the strong correlation between remittances and the decision to migrate. There is, therefore, a bi-causal relationship between remittances and migration.

4. Conclusions and some possible policy responses

Despite Tunisia's democratic success, democracy is never the sole response to endemic issues such as economic stagnation. Any government, whatever its model, must be able of resolving socioeconomic problems. If a democracy is not capable to deal with these prominent issues, then political legitimacy might be severely harmed. After the Jasmine revolution, Tunisia was economically destabilized. Indeed, the tourism sector declined markedly, FDI collapsed, foreign trade decreased, and the dinar depreciated. However, remittances unusually survived and even increased. This study seeks to test whether the behavior of remittances changes from its pre-revolutionary period to its present circumstances, and if it follows a long memory process or a random walk. More specifically, it investigates if remittances follow a stochastic process and whether structural break like Arab spring and financial crisis of 2008 have any impact on the long memory process in remittances. This study provides concrete solutions on the nature of remittance behavior. It shows that remittances is a process with a long memory and will increase further. Accordingly, governments should encourage Tunisians to use more formal money transfer channels and take into consideration in their development policies by channeling remittances for productive investment by the Tunisian diaspora.

It would be necessary to mobilize more Tunisians living abroad to participate in productive investments in Tunisia. Given these benefits, policymakers must design a comprehensive strategy that allows remittances to play a more dominant role in post-revolution periods and that renders emigration an integral part of growth strategies. We must point out that in recent years, some sense of recovery has come but this process has been slow. Add to this that the contributions from private investment have been weak. For the last years, Tunisia's GDP growth was around 2.4%, whereas inflation is at high pace of 7%. Much more pressing is the fact that individuals classified as not in

employment, education or training have attained critical highs, according to the World Bank. These current circumstances underscore severe problems that have substantially weakened the legitimacy of Tunisia's democratic institutions. It seems, therefore, urgent to alter its current economic model and to adopt a new economic model that is based on efficiency and productivity by encouraging investment in innovative sectors and in sectors with more value-added properties and through the enhancement of export capacity and technological content of the Tunisian economy. This would undoubtedly help boost the national economy's competitiveness while limiting the unemployment rate and regional disparities harming the country. In the same vein, to strengthen the role of the Tunisian diaspora in the country's development, the government could institute diaspora days.

As the COVID-19 crisis stretches into 2021 and in a context of deep social and political instability, Tunisia's growth and fiscal outlook become much more moderate than before. The recovery will necessitate more stability and a joint national effort to steer the economy to the right path.

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Appendix

Table A1. Estimation Values of the H Exponent Using the R/S Analysis

$N = t \times M$	M	t	$\frac{\sum_1^M R/S}{M}$	$\log\{t\}$	$\log\{\overline{R/S}\}$
177	59	3	1.345163	0.477121	0.128775
175	35	5	1.842	0.69897	0.26529
176	22	8	2.472355	0.90309	0.393111
169	13	13	3.807343	1.113943	0.580622
160	8	20	6.211511	1.30103	0.793197
170	5	34	12.83608	1.531479	1.108432

Figure A1. H Exponent before and after Arab Spring

