Time-Varying Casual Nexuses Between Remittances and Financial Development in MENA Countries

Ilham Haouas
Abu Dhabi University
College of Business Administration
P.O.box : 59911, UAE
Email : ilham.haouas@adu.ac.ae

Naceur Kheraief
Business School of Tunis, Tunisia
Email: nkhraief@gmail.com

Syed Jawad Hussain Shahzad
Montpellier Business School, Montpellier France
E-mail : jawad.kazmi5@gmail.com;
j.syed@montpellier-bs.com

Abstract

This paper examines the causality between remittances (REMs) and *financial sector development* (FD) in MENA countries. We seek to fill a gap in the extant literature by exploring the *inward REMs-financial development* nexus across the MENA region via the bootstrap rolling Granger non-causality approach. To identify the changes in the interplay among variables, we apply a series of time-varying rolling window tests based on annual-frequency data from 1980 to 2015. Our findings revealed that any shock (demand, supply, or policy-induced) will have permanent long-run effects on selected indicators. The analysis also pointed out episodes of directional predictability from FD indicators to REM inflows. However, the results evidenced significant windows of directional predictability from inward REMs to financial development.

Keywords: remittances, financial development, MENA countries, time-varying causality.
JEL classification: F24, F41, O16

1- Introduction

Global remittances (REMs) have become a substantial source of external finances for developing nations. Particularly, the Middle East and North Africa (MENA) region accounts for one of the largest REMs recipients at $73 billion remittances (Hamma, 2016). Therefore, researchers and policymakers are concerned with the impact of REMs on financial sector development. Causality varies by country, financial terms and overall macro environment. Further, various historical episodes add context to analyzed data, which provides a starting point for discussion on methods to enhance financial sector quality in the MENA region.

Recent analyses emphasize substitutability between REMs and the quality of the financial system in enhancing growth in the sense that REMs compensate for inefficient credit markets (inter alia, Calderon et al., 2008 ; Giuliano and Ruiz-Arranz, 2009 ; Brajas et al., 2009). There is also potential to decrease volatility in economic growth, augmenting loanable funds and stabilizing financial shocks. Credit sector development can result in tight or loose terms, which can either enhance or dilute broader financial quality. For this reason, we must consider the impact of REMs, in many forms, with regards to policy.

REMs can facilitate financial flows, which can provide positive or negative effects on the evolution of credit markets in the MENA region. Decreased spending costs is one result of rising REMs, while relaxed financing constraints of recipients presents contractor avenues on the development impact of REMs (Aggarwal et al., 2011).

We prefer country-specific time series analysis to a cross-sectional panel study. Empirical analyses conducted at the aggregate level are unable to capture and account for the complexity of the economic environment and histories of each individual country. For this reason, we employ annual-frequency data from 1980 until 2015 of MENA countries, corresponding to all selected variables from the World Bank data warehouse. REM flows are described as personal financial resources that include transfers and compensation of employees.

A rolling-window bootstrap Granger causality test approach is used for empirical analysis. The approach is based on rich literature articulating the importance of change detection in the manifestation of systemic risk (Billio et al., 2012 ; Chen et al., 2013 ; Diebold and Yilmaz, 2013). Analysis using this methodology seeks to determine if there is predictability between REMs and financial sector development, with regards to specific country data. The role of domestic policy and financial institutions will be defined as agents of improving the quality of finance in the MENA region. Through various means, the historical impact of REMs as a source of external finances can be examined more precisely using our methodology.

In this paper we seek to investigate the interaction between REM inflows and growth in the MENA region, particularly the causalities among remittances and financial development, as a solid financial market can enhance the positive REM impact on economic progress. The remainder of this article is organized as follows. Section 2 reviews some major studies on the relationship between remittances and financial development. Section 3 details the econometric methodology underlying our analysis ; Section 4 describes the data to be used ; Section 5 presents the empirical findings, and Section 6 concludes and provides some policy recommendations.

2- Literature Review

2-1- Theoretical considerations

This section seeks to present some theoretical considerations on the relationship between REMs and economic growth, with particular emphasis on financial development. After some brief notes on the economic impact on REMs, we investigate how macroeconomic parameters in the home country influence REM flows.

Given the upward trend of international REM activity over the recent years, scholars have produced an extensive body ok knowledge on the attached economic implications. The work of Chami et al. (2003) is the first to explore the REM-economic growth nexus. As REMs manifest under asymmetric information and have a high likelihood of moral hazard (Beck et al., 2009), the authors created a theoretical framework to demonstrate the associated negative effect on the economic progress of recipients. Furthermore, other academics highlight potential disturbing consequences for the economic growth via the Dutch disease phenomenon (Amuedo-Dorantes and Pozo, 2004 ; Acosta et al., 2009).

Over the recent past, statistics reveal a dramatic increase in global REMs sent to the developing world. This has raised passionate debates within the scientific community about their impact on various development dimensions, including the financial arena. Some analyses mention a bidirectional causal link among REMs and financial development (e.g. Orozco and Fedewa, 2005 ; Aggarwal et al., 2011), as inward remittances can boost FD via extended credit to recipients or loanable funds, and at the same time, REMs can dilute credit sector development via less difficult financial terms for receiving countries. Conversely, a strong financial market can attract more REMs by enabling higher flows or by diminishing the attached costs (Aggarwal et al., 2011).

According to Chami et al. (2003), the case of Sub Saharan Africa (SSA) is particularly interesting, since massive REM flows are directed to beneficiaries with a very low level of financial development. In addition, previous researches that examine the interaction between REM and FD in the region do not consider country specific factors, but work with the assumption of parameters' homogeneity (Gupta et al., 2009 ; Aggarwal et al., 2011). Furthermore, these studies only explored the causality from REMs to financial development. However, as mentioned by Coulibaly (2015), the homogeneity assumption could lead to false conclusions ; the author highlights that the causality between the two variables differs across Sub Saharan African countries and finds no strong evidences that REMs boost financial development in the region. Furthermore, the latter does influence REM inflows.

Given the information asymmetry and economic uncertainty, REMS could pose a significant moral hazard risk, which translates into a chain of negative effects on the growth of a nation. Based on panel methods that include a large number of countries, Chami et al. (2003) documented a negative REMs impact on economic evolutions, which underlined the severity of the moral hazard issue.

The magnitude of migration flows has made REMs an essential source of capital in most developing nations ; on average, lower-middle income states are the largest recipients, with the highest ratio of REMs to GDP (Beck et al., 2009). However, Chami et al. (2005) noted that REMs may not be intended to serve as a capital source for economic progress, a finding in contrast to the positive relation between profit-driven flows and GDP growth.

It might be important to consider the influence of home country specific factors on inward REMs, as some authors indicate REMs are stable or counter cyclical in case of shocks (natural, economic, political) affecting recipients (Bettin et al., 2014 ; Couharde et al., 2011 ; Mitrut and Wolff, 2014 ; Mohapatra et al., 2009 ; World Bank, 2016). Nevertheless, REMs may also decrease if the infrastructure is affected by such shocks (Amuedo-Dorantes et al., 2007 ; World Bank, 2016). According to Edelbloude et al. (2017), the number of migrants and REMs are also influenced by the quality of the institutions, political environment, or the democracy.

There is a large literature articulating the positive effects of REMs on home-country financial development (e.g. Aggarwal et al., 2011 ; Beck et al., 2007 ; Gupta et al., 2009 ; Demirguc-Kunt et al., 2010; Ambrosius and Cuecuaha; 2016), but this potential growth-stimulating impact would depend on the state of the domestic financial market. Giuliano and Ruiz-Arranz (2009) claimed that REMs could be a substitute of financial progress by offering alternative options to finance investments and elude credit constraints. Hence, inward remittances enable growth in regions with less developed financial markets. However, the theoretical model of Mundaca (2009) evidences that financial intermediaries augment REMs effects on economic growth, given they can direct such flows to agents with most pressing investment needs. Hence, the complementarity between REMs and financial progress (Nyamongo et al, 2012(.

2-2- Review of empirical literature

This section explores major literature studies corresponding to the theoretical considerations presented above. Based on a panel smooth transition regression model using data for 87 developing states between 1980 and 2008, Ahamada and Coulibaly (2011) argued that REMs negative effects could be counteracted by a well-functioning financial market via flows directed to non-receiving agents with urgent investment needs. Another study by Ahamada and Coulibaly (2012), that used a panel Granger causality testing model based on apparently unrelated regressions and Wald tests with country-specific bootstrap critical values for the 1980-2007 period, showed no relation between REMs and growth across SSA countries. An explanation would be that the causality tests reveal REMs do not increase physical capital investment.

Contrary to this result, employing a homogeneous panel framework with annual data from 25 Latin American and Caribbean states over the 1970-2002 time window, Mundaca (2009) findings confirm the theoretical assumptions that REMs enable growth in the context of a properly-working financial system. Based on a homogeneous panel model that uses annual data for 36 Sub Saharan African states during 1990-2000, Lartey (2013) outcomes validate

Mundaca's (2009) work. In addition, Bettin and Zazzaro (2011) also obtained a similar result via the estimation of a homogeneous panel with annual data series from 66 developing nations (including 10 SSA countries) for the period 1970–2005.The authors identified a negative (positive) REMs effect on economic progress in beneficiaries with a low (high) degree of financial development.

To explore the causality from financial development to REMs, Bettin et al. (2012) forecast a micro-behavioral model of REMs of legal emigrants to Australia for the 1993-1995 time window, and indicated no FD influence on the propensity to remit to home countries.

Boubtane et al. (2013) investigate the interplay between immigration, unemployment and economic growth of the host based on the panel Granger causality testing approach of Kònya (2006) using annual series for the 1980-2005 timespan for 22 OECD members and emphasize that, generally, immigration does not cause unemployment, but for one exception (Portugal). Furthermore, the authors identified a positive causality among growth and immigration in only four countries, whereas, for the rest of the sample, immigration does not influence growth.

Chowdhury (2011) study of REMs impact on financial development in Bangladesh, using the single equation approach of Aggarwal et al. (2011) based on annual data from 1971 to 2008, evidenced REMs positive outcomes for the national financial market. However, the author has not discovered any effect of the financial system on inward REMs.

By using a sample of six high REM recipients (Albania, Bulgaria, Macedonia, Moldova, Romania, and Bosnia Herzegovina) for the period 1999-2013, where REMs are the major source of foreign exchange revenues, Meyer and Shera (2016) also found a positive impact of remittances on growth, which increases at higher levels of REMs to GDP.

Coulibaly (2015) explored REMs-financial development link across SSA countries via the panel Granger causality testing model based on *seemingly unrelated regressions* (SUR) multivariate systems and Wald tests with country specific bootstrap critical values, and annual data for the 1980-2010 timeframe. When using liabilities as a representation for financial market development, the results show a positive REMs influence on the degree of financial development only in four countries subjected to analysis and a causal relation from FD to propensity to remit only in the case of Gambia. As opposed, when credit is used as proxy for financial development, the outcomes reveal positive REM effects on FD only in Sudan, and neutral interaction for the rest of the countries in the sample. Therefore, Coulibaly (2015) indicate no causality between REM flows and financial development in the SSA region ; in addition, FD is not a relevant driver of REM inflows towards SSA countries.

Because the extant literature on REMs has mainly focused on the microeconomic aspects and rigorous studies on their macroeconomic implications are still scarce, Acosta et al. (2009) employed a dynamic stochastic general equilibrium model (DSGEM) of a small open economy to explore REMs impact on resource allocation and the real exchange rate. Data analysis for El Salvador via Bayesian techniques indicate that irrespective of REMs motivation, an increase in such flows drives a decrease in the labor supply, coupled with a growth in consumption demand, particularly for non-tradable. The attached higher prices enable the expansion of the sector, leading to a reallocation of labor away from the tradable segment (the Dutch disease). According to Acosta et al. (2009) quantitative findings, REMs improve household welfare by smoothing income flows and increasing consumption.

REMs to the developing world rank second after foreign direct investment in the hierarchy of flows. Agarwal et al. (2011) used data on REMs to 109 developing states from 1975 to 2007 to explore the connection between REMs and financial sector development, proxied by the aggregate deposits and credits intermediated by local banks, and highlighted a significant REMs-financial development nexus in developing countries.

Edelbloude et al. (2017) empirically analyze the behavior of Tunisian migrants towards the Arab Spring in terms of REMs send in Tunisia during 2000-2013, and documented an increase in inward flows associated with the social unrest in the region. Remittances have a strong potential to absorb economic shocks driven by political upheaval in home countries, which means that governments can benefits from migrants' propensity to remit under such circumstances.

An empirical analysis of REMs stabilizing impact by Chami et al. (2008), based on cross-sectional data of 70 countries from 1970 to 2005, emphasized lower macroeconomic volatility in regions with high REMs to GDP. Similarly, Bugamelli and Paternø (2009) confirmed the stabilizing effect of REM flows by employing a cross-sectional data of about 60 developing economies. The authors worked with annual variations in rainfall to identify the implications of exogenous income shocks on REMs for a sample of 41 SSA nations between 1970 and 2007, and underlined insignificant consequences of average rainfall shocks on REMs. However, the marginal effect is largely declining in the proportion of domestic credit to GDP ; hence, at high levels of credit to GDP, these shocks have substantial implications on REM flows, while at low levels, the impact of rainfall on REMs is significant and positive.

Williams (2009) also focused on REMs-financial development nexus in SSA countries and used 5-year non-overlapping panel data for the 1970-2013 timeframe to investigate the role of democratic institutions in mediating remittances' effects on FD. The findings pointed out a significant positive interplay between REMs and FD ; specifically, a 10% increase in REM leads to a 0.43% growth in private credit, with a cumulative impact of approx. 1.84%. Furthermore, there was no substantial role of domestic institutions in mediating the relation between REMs and financial development in the region. Overall, Williams (2009) advocated the importance of REMs in sustaining the smooth-functioning of the financial system, a vital finding for policy makers, who should reap the benefits of REMs by encouraging such flows to the SSA.

Given their role as a reliable source of funds for the developing world, recipient countries make significant efforts to attract more REMs, particularly via formal channels, which proved less expensive and less risky than informal ones. One approach would be to increase the financial openness, but this could lead to additional costs driven by macroeconomic volatility. Beine et al. (2012) reviewed the interaction between REMs and financial openness in the context of 66 developing nations for the 1980-2005 period. Based on a dynamic generalized ordered logit framework that addressed the nature of financial openness policy and a two-step model similar to the stage least squares to manage REMs endogeneity and potential errors, the scientists evidenced a large positive statistical and economic REMs impact on financial openness.

Asatryan et al. (2017) examined the implication of inward remittances on tax revenues and policy by instrumenting REMs with fluctuation in the price of oil with a state's distance to oil producers and evidenced a major positive consequence on VAT revenues, but no impact on income-tax revenus. This means that REMs often elude income taxes, but are subjected to tax via consumption. In addition, the authors underlined the sensitivity of the tax policy to shocks in inward REMs ; they generate a decline in VAT rates and are likely to favor a VAT introduction. However, Asatryan et al. (2017) found no impact of REMs on income-tax rates.

Similar to Giuliano and Ruiz-Arranz (2009), Catrinescu et al. (2009) explained the emergence of contradictory results on REMs-growth relationship as driven by an omitted fact, namely that REMs favor longer-term growth in states with higher institutional and policy quality (economic, social, political). Frometin (2017) also examined the link between REMs and financial development for a sample of emerging and developing states during 1974-2014 via a *pooled mean group* (PNG) approach. Based on three panels segmented according to income levels, the findings revealed a positive long-run REMs-financial development relation that coexists with a significant slightly positive short-run connection, except for low-income sub-sample. The author presented strong arguments on a long-term positive connection between REMs and financial development in the case of developing countries, but highlighted that in the short-term, the implications could be different.

3- Econometric Methodology

We apply *the bootstrap rolling* Granger non-causality test first developed by Balcilar et al. (2010) to explore the time-varying nexus between inward remittances and financial development across the MENA countries. This framework, independent of the variables' level of integration, will be used to check the stability of both short and long-term parameters. According to Balcilar and Ozdemir (2013a, 2013b), researchers should always consider the potential cointegration among variables when running stability tests. In case of no cointegration, scholars examine only short-term stability and carry out causality verifications supported by standard VAR methodologies. The rolling windows model is based in the lag augmented VAR (LA-VAR) model of Toda and Yamamoto (1995) that considers inferences with trending parameters. The following equation describes the LA-VAR technique :

$$y_t = \Phi_0 + \Phi_1 y_{t-1} + \dots + \Phi_p y_{t-p} + \varepsilon_t, \qquad t = 1,2,3,\dots,T$$

where : $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ is a zero mean independent white noise process with nonsingular covariance matrix $\sum$. We determine the lag length p via the Akaike Information Criterion (AIC). For simplicity purposes, y_t is segmented in two sub vectors, as noted below :

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \phi_{10} \\ \phi_{20} \end{bmatrix} + \begin{bmatrix} \phi_{11}(L) & \phi_{12}(L) \\ \phi_{21}(L) & \phi_{22}(L) \end{bmatrix} \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{27} \end{bmatrix}$$

Where y_{1t} and y_{2t} denote the natural logarithms of remittances and financial development variables, respectively. $\phi_{ij}(L) = \sum_{k=1}^{p} \phi_{ij,k} L^k, i, j = 1,2$ and L is the lag operator defined as $L^k x_t = x_{t-k}$. In this setting, the null hypothesis that y_{2t} does not Granger cause y_{1t} can be tested by imposing zero restrictions $\phi_{12,i} = 0$ for $i = 1,2, \dots, p$. Analogously, the null hypothesis that y_{1t} does not Granger cause y_{2t} can be tested by imposing the restriction $\phi_{21,i} = 0$ for $i = 1,2, \dots, p$. The Wald statistic, which follows a standard chi-squared distribution (Toda and Yamamoto 1995), is used to test this null hypothesis.

To include the changes in the interplay between selected variables, we apply a series of time-varying Granger causality tests, namely rolling window variations of this approach, due to their superiority in revealing asymptotic distributions (Zapata and Rambaldi ; 1997).

Hacker and Hatemi-J (2006) worked with Monte Carlo simulations and argued that the modified Wald (MWALD) test with a bootstrap distribution indicates diluted size distortions. Furthermore, this model is less sensitive to sample dimensions, orders of integration, and error term processes such as homoscedasticity or ARCH.

As noted by Granger (1996), structural instability is one of the most challenging issues investigated by the scientific community. Particularly, structural changed could lead to variations in parameters and, thus, reshape causal interactions over time. To analyze the shift in causal connections driven by structural changes we apply a rolling window approach based on the modified bootstrap test.

The rolling window MWALD causality test first estimates the MWALD statistics for a pre-established subsample. The associated estimator relies on subsamples rolled with a fixed window size. Further, we build a VAR model and run a bootstrap Granger causality test. The application of the rolling-window estimator helps us determine the appropriate window size. Nevertheless, there is no clear criterion researchers could use to decide on the number of windows. Larger sizes could mean more accurate parameters, but fail to address heterogeneity. By contrast, a small window size may increase the variance levels of our estimations. Pesaran and Timmermann (2005) used a Monte Carlo simulation to identify the optimal window size under structural changes in terms of the root square error and suggested that the bias in autoregressive (AR) parameters are minimized with window size around 10–20 in case of repeated breaks.

To address any potential change in the causality interactions, we model the bootstrap *p*-value of observed LR-statistics rolling over the whole sample. We estimate the bootstrap *p*-values of the null hypothesis that remittance (REM) does not Granger cause the financial development variable (FD) by imposing $\phi_{12,i} = 0$ for $i = 1,2, \dots, p$ and that the residential property price does not Granger cause the oil price by imposing $\phi_{21,i} = 0$ for $i = 1,2, \dots, p$ by applying the residual-based bootstrap method (Balcilar *et al.*, 2010). Furthermore, we explore the magnitude of REMs-FD variable nexus. The cumulative effects of REM flows on financial development is captured by the mean of all bootstrap estimates, that is $\phi_{12}^{*} = N_b^{-1} \sum_{k=1}^{p} \phi_{12,k}^{*}$, where N_b^{-1} equals the number of bootstrap repetitions and $\phi_{12,k}^{*}$ equal the bootstrap estimates from the VAR model. Likewise, the cumulative effect of REM on FD variable is added by $\phi_{21}^{*} = N_b^{-1} \sum_{k=1}^{p} \phi_{21,k}^{*}$. We calculate the 95-percent confidence interval, and the corresponding lower and upper limits as 2.5 and 97.5 quantiles of each of $\phi_{12,k}^{*}$ and $\phi_{21,k}^{*}$, respectively.

4- Data

To perform the empirical analysis, we use annual-frequency data from 1980 to 2015 covering MENA countries. The data corresponding to all selected variables is collected from the World Bank data warehouse (World Development Indicators). The start date of our sample is dictated by the data availability. REM flows are described as personal financial resources that include transfers and compensation of employees. Transfers refer to all current cash/similar transactions made or received by resident households to/from non-resident households (e.g. personal transfers might indicate all current releases between resident and non-resident individuals).

Employees' compensation is mainly related to income of border, seasonal, and other short-term workers employed in a country that is not their home country and of residents working for non-resident entities. We use GDP per capital in constant 2000 USD dollars to measure real GDP growth. Financial development is proxied by two indicators, namely, *liabilities*, calibrated by the ratio of money and quasi money (M2) to GDP and *domestic credit* to private sector as a share of GDP. Remittances, M2, and credit variables are all considered as percentage of GDP.

The descriptive statistics of the data series are presented in Table 1. Oman has the lowest average amount of remittances received by person compared to other MENA countries. We note that personal remittances received are less volatile than GDP per capita and FD indicators, which suggests that inward REMs were stable from 1980 to 2015 in MENA countries. Economic growth is highly volatile compared to financial development indicators. The data shows an asymmetric distribution (see Skewness) and Jarque-Bera statistics reveal the non-normal distribution of the series highlighted the necessity of relying on asymmetric approach as we do in our present analysis.

Table 1 : Country-wise descriptive statistics of the variables.

	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Probability
a). Personal remittances, received (% of GDP)						
Algeria	1.148	1.022	0.621	2.000	3.816	[0.148]
Egypt	7.137	3.233	0.639	2.328	3.124	[0.210]
Israel	0.822	0.690	0.713	2.023	4.481	[0.106]
Jordan	18.515	4.059	-0.199	1.957	1.869	[0.393]
Malta	2.090	1.237	0.106	2.378	0.647	[0.724]
Morocco	6.305	1.076	0.055	2.015	1.475	[0.478]

Oman	0.271	0.177	0.350	1.855	2.699	[0.259]
Tunisia	4.181	0.548	-0.458	2.150	2.343	[0.310]
b). Domestic credit to private sector (% of GDP)						
Algeria	27.586	24.846	0.727	1.745	5.534	[0.063]
Egypt	35.082	11.588	0.464	1.998	2.800	[0.247]
Israel	67.064	7.184	-0.024	2.352	0.634	[0.728]
Jordan	67.943	10.651	0.215	3.145	0.308	[0.857]
Malta	84.214	27.548	-0.647	2.312	3.224	[0.200]
Morocco	37.536	19.647	0.389	1.723	3.353	[0.187]
Oman	31.385	11.969	0.537	2.992	1.733	[0.420]
Tunisia	60.897	14.043	-0.335	2.171	1.706	[0.426]
c). Broad money (% of GDP)						
Algeria	84.141	8.437	-0.186	2.634	0.408	[0.815]
Egypt	95.466	32.932	0.652	2.835	2.590	[0.274]
Israel	113.895	17.164	-0.267	1.892	2.268	[0.322]
Jordan	--	--	--	--	--	--
Malta	70.915	30.382	0.398	1.599	3.896	[0.143]
Morocco	32.084	7.477	0.610	4.841	7.316	[0.026]
Oman	62.566	8.069	0.449	2.680	1.365	[0.505]
Tunisia	52.015	8.358	0.848	2.523	4.657	[0.097]
d). GDP per capita (constant 2010 US$)						
Algeria	3860.067	471.888	0.386	1.874	2.799	[0.247]
Egypt	1883.395	465.463	0.364	1.820	2.883	[0.237]
Israel	24572.740	5053.661	0.141	1.768	2.398	[0.301]
Jordan	3081.826	397.231	0.050	2.004	1.504	[0.471]
Malta	15915.260	4970.251	0.047	1.735	2.414	[0.299]
Morocco	2076.092	572.859	0.532	2.069	3.002	[0.223]
Oman	16390.060	2391.199	-0.987	3.431	6.120	[0.047]
Tunisia	2938.422	808.742	0.423	1.638	3.856	[0.145]

Note : This table reports the descriptive statistics of the data from 1980 until 2015. J-B stands for Jarque-bera test of normality. P-values are in big brackets

5- Empirical Findings

5-1- Unit Root testing

We start by checking for unit roots in each of the selected macroeconomic series based on Perron's (1997) unit root approach with a break in both the intercept and trend. We endogenously determine the break data via the computation of the unit root test statistic for all identified break points and decide for the data that minimizes these statistics. In the case of macroeconomic time series data, structural changes can be caused by many factors, *inter alia,* economic tensions, policy shifts or regime changes. Perron (1989) highlighted that unit roots issues in time series could generate structural changes and that traditional tests might offer biased results. The unit root framework that allows for the possible presence of structural breaks has two major advantages (Perron, 1989). First, it avoids biases results towards non-rejection ; second, as it helps one identify possible structural breaks, it offers important insights on the link between structural break on certain variables and a particular government measure, economic crises, social upheaval, regime shifts, etc. The empirical findings returned by Perron's (1997) unit root tests indicate non-stationarity for most MENA states in the context of structural breaks identified in different dates according to the variable and the country (see table 2). Therefore, any shock (demand, supply, or policy-induced) will have a permanent long-run impact on selected variables. After being differenced once or integrated at order 1, the variables are found to be stationary. The results of the unit root tests also show that most of the structural breaks of personal remittances received occurred during two periods 1984-1994 and 1995-2005. The former correspond to macroeconomic reforms in these countries ; however, the latter is associated with a financial reform in depth particularly in Jordan and Tunisia.

Table 2: Results of unit root test with break - Perron (1997)

	Level		First difference	
	Test statistics	Break date	Test statistics	Break date
a). Personal remittances, received (% of GDP)				
Algeria	-3.817	2004	-7.388***	2005
Egypt	-5.357***	1992	-6.073***	1994
Israel	-6.389***	1994	-7.887***	1984
Jordan	-4.011	2007	-5.549***	1992
Malta	-2.969	2003	-12.77***	2004
Morocco	-4.407	1999	-8.166***	2001
Oman	-2.646	1986	-7.355***	1990
Tunisia	-4.301*	2009	-5.671***	1987
b). Domestic credit to private sector (% of GDP)				
Algeria	-11.13***	1991	-11.31***	1992
Egypt	-5.080***	1992	-5.423***	2007
Israel	-3.277	1997	-7.535***	1985
Jordan	-3.822	1992	-7.471***	2005
Malta	-4.173	1995	-6.111***	2011
Morocco	-2.391	1996	-5.104***	2012

	Level		First difference	
	Test statistics	Break date	Test statistics	Break date
Oman	-1.334	2014	-5.144***	2014
Tunisia	-1.780	2009	-5.621***	2000
c). Broad money (% of GDP)				
Algeria	-3.937	1995	-5.585***	2003
Egypt	-5.324***	2006	-7.851***	2013
Israel	-3.436	2002	-6.965***	1989
Jordan				
Malta	-2.363	1996	-6.221***	2007
Morocco	-2.581	2014	-7.085***	2014
Oman	-3.937	2011	-7.143***	1987
Tunisia	-2.440	2006	-4.092***	1998
d). GDP per capita (constant 2010 US$)				
Algeria	-2.340	2001	-4.151***	1994
Egypt	-1.725	2005	-3.886***	2003
Israel	-1.129	2004	-5.655***	2002
Jordan	-4.088	2003	-5.680***	1989
Malta	-1.942	2014	-5.134***	2013
Morocco	-1.527	2002	-13.58***	2001
Oman	-3.530	1995	-5.300***	1985
Tunisia	-1.792	1995	-6.038***	1989

Note: *** and ** and denote significance at 1%, 5% and 10% level, respectively. The null hypothesis of Perron (1997) is that a series has a unit root with a break in both the intercept and trend.

5-2- Analysis of the results

Figures in the appendix displays the time-varying Wald test statistic sequences and their corresponding 5% critical values for the bootstrap rolling procedure in panel (A) assuming homoskedasticity and panel (B), assuming heteroskedasticity. The results given in panels A and B show detected episodes of directional predictability from financial development indicators to inward remittances. In general, the findings under the homoscedasticity and heteroscedasticity assumptions are dissimilar. Thus, it seems judicious to conclude that more attention should be paid to the heteroskedastic-consistent tests in interpreting the results. For example, in the case of Jordan (see figure 4), the directional predictability from remittances to FD indicators cannot be identified by the homoscedastic version that lies below its critical value ; however, the heteroscedasticity-consistent version depicts significant directional dependence during the 1990-1998. This period was characterized by a decline in personal received remittances. Likewise, for the case of Egypt (figure 2), where the maintained assumption is that of either homoskedasticity or heteroskedasticity, we detect no causality from domestic credit to REMs at all over the entire period. Nevertheless, for the same country, the results under the heteroscedasticity assumptions show major episodes of directional predictability from REMs to domestic credit to private sector running from 1992 to 1996 and 2009. Similarly, the hypothesis of no Granger causality from personal remittances to liabilities is rejected. The finding, in the context of heteroskedasticity hypothesis, identifies a number of shorter bursts of causality during 2006-2009. Overall, for the case of Egypt, inward REMs cause the financial development variable. The main window of predictability detected by these test is 2009. Considering *liabilities* as an indicator of financial development, the interplay between M2 and remittances shows evidence of causality in some isolated instances for the 1996-1998 and 2000-2002 periods.

Our results for Israel, Jordan and Morocco (figures 3, 4, 6) indicate that the hypothesis of no Granger causality from the FD variable to received remittances cannot be rejected, except for some shorter duration episodes. However, for these same countries, the findings highlight significant timeframes of directional predictability from REMs to financial development. However, for Oman (figure 7), the heteroscedasticity version shows a very different picture from an unequivocal failure to reject the null hypothesis of no predictability. Therefore, the heteroscedasticity version fails to identify directional predictability running from remittances to FD. Instead, in hydrocarbon-rich countries, oil price explains the financial development variable, whereas inward REMs are not significant. In the case of Jordan, the heteroscedasticity assumption returned no significant episodes of directional predictability flows from remittances to FD. This result is contrary to our expectations and to all existing evidence of the usefulness of REMs in boosting financial development in this country.

The outcomes of our analysis also emphasize that the directional predictability from FD to remittances depends on the indicator of financial development. The domestic credit as a proxy of FD indicates no evidence of directional predictability in Egypt and Israel, except for Morocco, implying that domestic credit, as proxy of FD, provides no evidence of causality from financial development to REM inflows. The use of *liabilities* as proxy of financial depth, under the heteroscedastic assumption identifies directional predictability from FD to remittances in all countries, except for Jordan and Morocco.

In the case of Algeria and Tunisia (figure 1 and 8), we find some prolonged episodes, namely 1990-1996 and 2003-2014, of significant directional predictability from REMs to financial development. In Malta, inward remittances cause FD variable in different periods : 1991, 1995, 1998-2000 and 2010-2012. For these countries, the heteroscedasticity version identifies significant directional predictability running from financial development to remittances. Overall, REMs play an important role and represent a major source of external financing.

Consequently, our results provide some highlights about the directional predictability between remittances and financial development. First, if we use the same proxy for financial development, the causality among remittances and FD varies across MENA states. If we consider domestic credit as proxy for FD, the findings indicate significant directional predictability from financial development to inward REMs only in five countries (Algeria, Jordan, Malta, Oman, and Tunisia). If we treat liabilities as proxy for FD, the time-varying Wald test statistics for causal effects running from financial development to REM flows provide evidence of causality in all countries, except for Jordan and Morocco. However, the heteroscedasticity version depicts substantial directional predictability from remittances to FD in different periods, but for Jordan and Oman, which means that the REMs transfer to these two countries is not a determinant of financial development.

6- Conclusion and Policy implications

This paper seeks to fill a gap in the extant literature by exploring the causal interactions between *inward remittances* and *financial development* across MENA states. To identify the changes in the interplay among selected variables, we apply a series of time-varying Granger causality tests, namely rolling window variations of this approach, due to their superiority in revealing asymptotic distributions. We apply a bootstrap rolling Granger non-causality test first to investigate REMs-FD nexus based on annual-frequency data from 1980 to 2015. We use *liabilities* and *domestic credit* to private sector as proxies for financial development variable.

Our findings highlight that Oman has the lowest average amount of inward REMs of all MENA countries. Furthermore, these inflows are less volatile than GDP per capita and FD indicators, which suggests that inward remittances were stable during 1980-2015 in the MENA region. Economic growth is highly volatile compared to financial development variables.

The empirical outcomes obtained by applying Perron's (1997) unit root tests reveal non-stationarity for most MENA members in the context of structural breaks identified at various moments. Thus, any shock (demand, supply, or policy-induced) will have permanent long-run effects on selected variables. The results of the unit root tests also showed that most of the structural breaks of inward REMs occurred during two periods, namely, 1984-1994 and 1995-2005. The former correspond to macroeconomic reforms MENA countries ; however, the latter is associated with financial reforms particularly in Jordan and Tunisia.

Our analysis also pointed out episodes of directional predictability from FD indicators to REM inflows. For example, in Jordan, the directional predictability from remittances to FD indicators cannot be identified under the homoscedasticity assumption ; however, the heteroscedasticity-consistent version shows significant directional dependence during 1990-1998, a period marked by a decline in inward REMs. Similarly, in Egypt, we detect no causality from domestic credit to REMs at all over the entire timeframe. Overall, inward REMs cause the financial development variable in this country.

The results also underlined that the hypothesis of no Granger causality from the FD variable to received remittances cannot be rejected in the case of Israel, Jordan and Morocco, except for some shorter duration episodes. However, the findings highlight significant windows of directional predictability from REMs to financial development.

We note contrary evidences to our expectations in the case of Jordan, where the heteroscedasticity assumption returned no significant episodes of directional predictability flows from remittances to FD.

The outcomes of our analysis emphasized that directional predictability from FD to remittances depends on the indicator of financial development. The domestic credit as a proxy of FD indicates no signs of directional predictability in Egypt and Israel, except for Morocco, implying that domestic credit, as proxy of FD, provides no evidence of causality from financial development to REM inflows. The use of *liabilities* as proxy of financial depth, under the heteroscedastic assumption identifies directional predictability from FD to remittances in all countries, except for Jordan and Morocco.

To summarize, this research emphasize a complementary interplay between inward REMs and financial development to enhance economic growth. Our analysis highlighted that REM flows stimulate growth in MENA states with a powerful financial system.

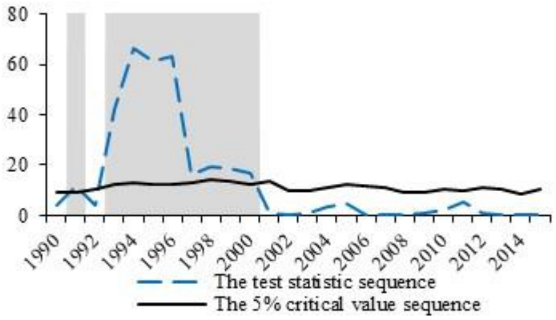
Given the role of remittances as essential source of external financing for the developing world, this research provides valuable insights into REMs-growth nexus during the process of financial development. Our work suggests that policy-makers in recipient MENA states should be more focused on supporting the financial system so they can fully benefit from the positive REM inflows impact on growth. Because inward flows can help relax the financing constraints of individuals, REMs may decrease demand for credit and dilute credit market development.

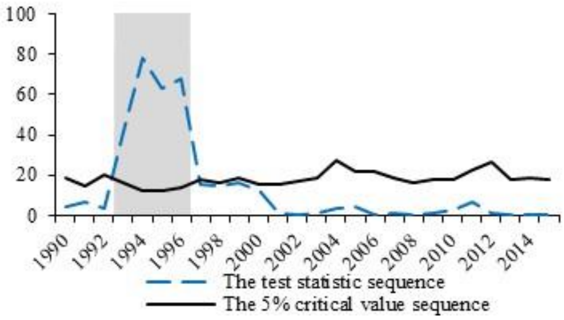
Appendix

Figure 1: The Granger causality results for Algeria

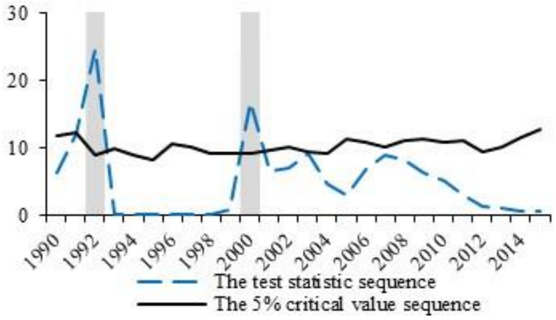
Panel A: Rolling - Homoscedasticity **Panel B:** Rolling -heteroscedasticity

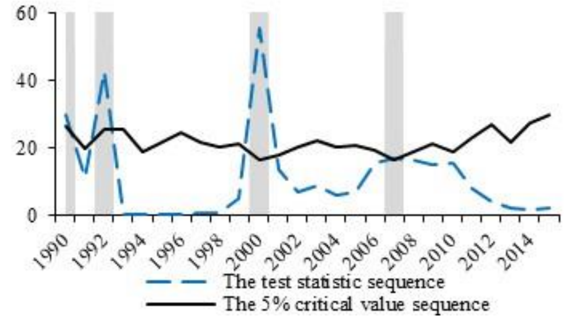
***a*).** $DC_t -/\rightarrow REM_t$



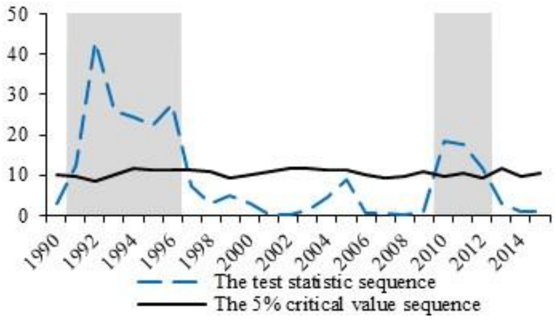


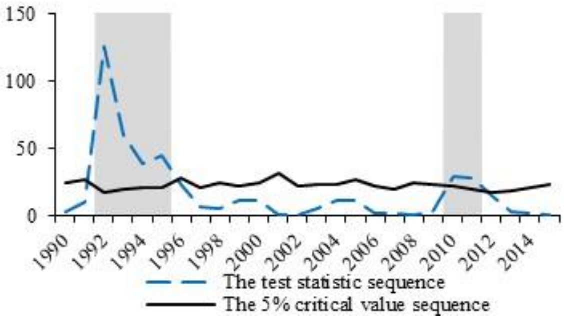
***b*).** $REM_t -/\rightarrow DC_t$



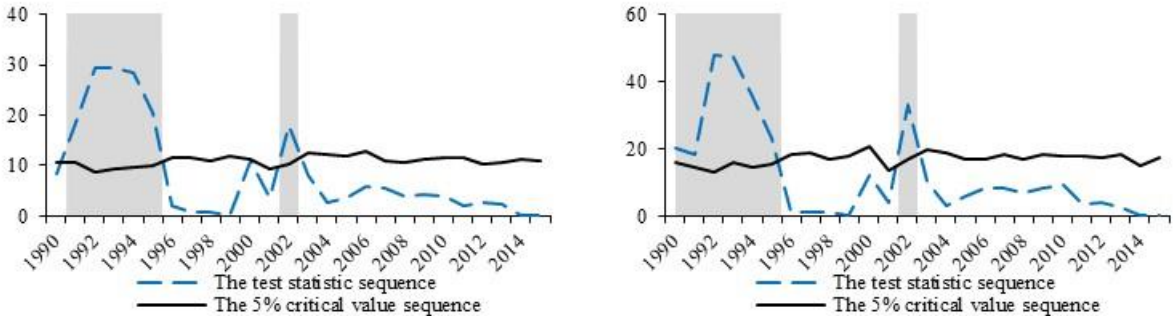


***c*).** $M2_t -/\rightarrow REM_t$





***d*).** $REM_t -/\rightarrow M2_t$

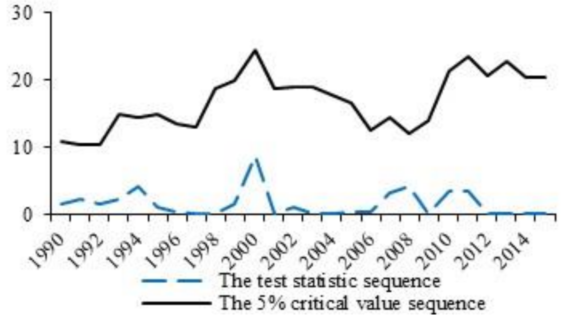


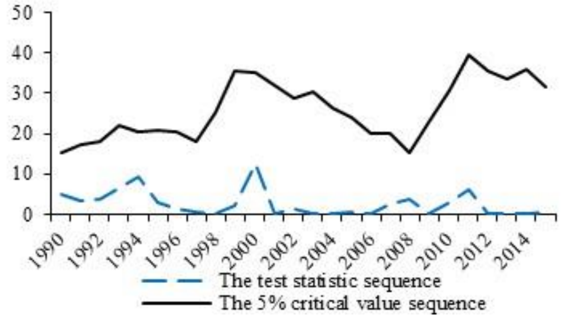
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

Figure 2: The Granger causality results for Egypt

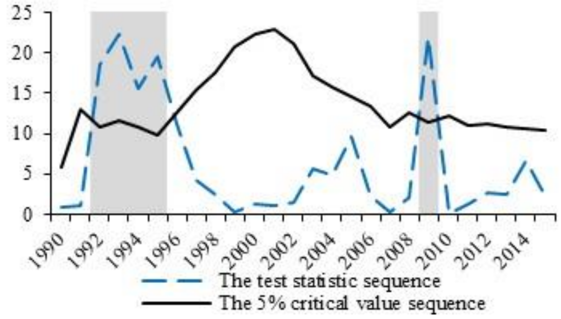
Panel A: Rolling - Homoscedasticity **Panel B:** Rolling -heteroscedasticity

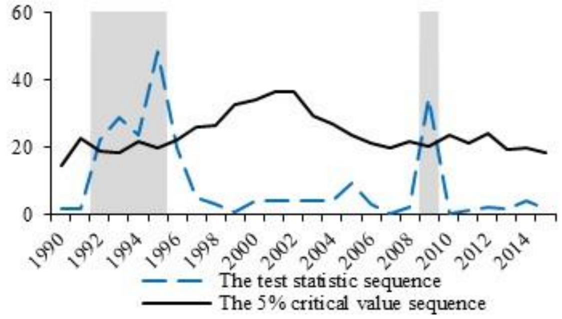
***a*).** $DC_t \ -/\rightarrow \ REM_t$



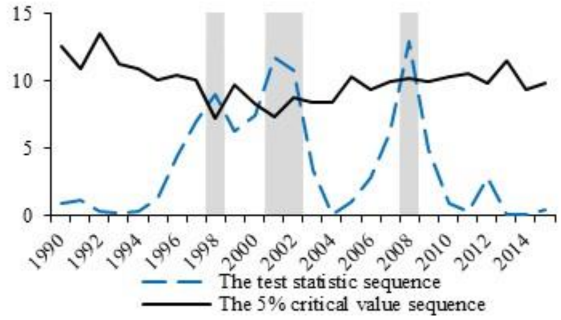


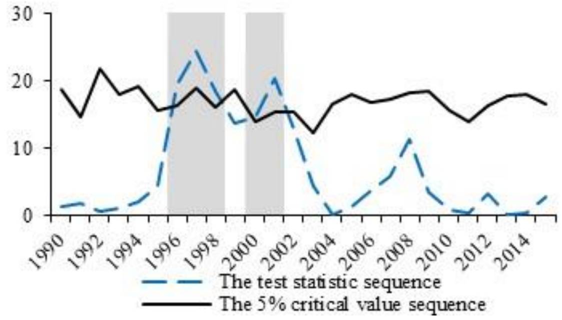
***b*).** $REM_t \ -/\rightarrow \ DC_t$



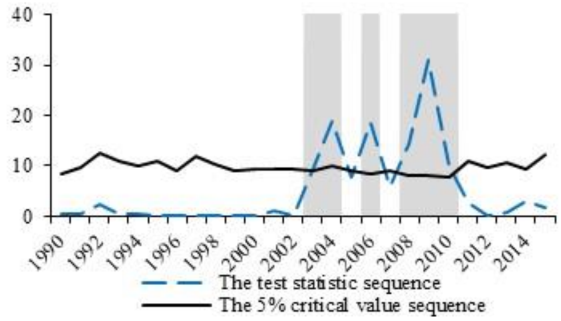


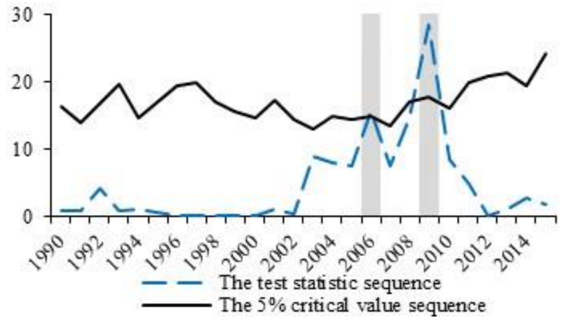
***c*).** $M2_t \ -/\rightarrow \ REM_t$





***d*).** $REM_t \ -/\rightarrow \ M2_t$





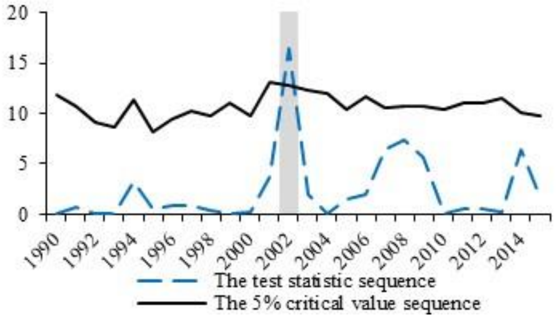
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

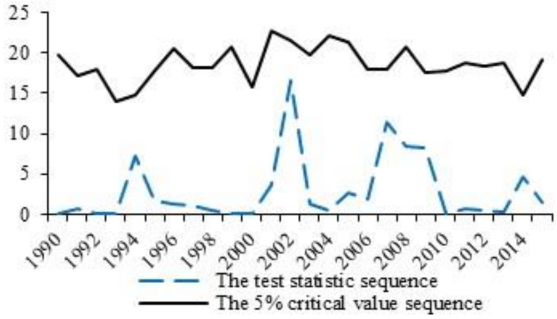
Figure 3: The Granger causality results for Israel

Panel A: Rolling - Homoscedasticity

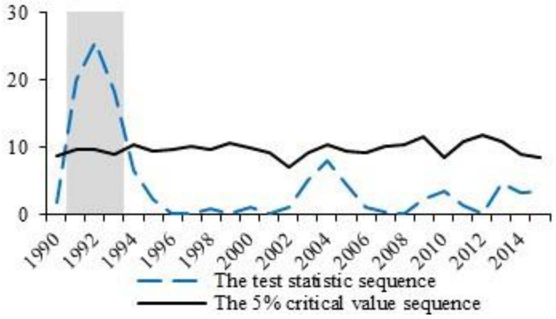
Panel B: Rolling -heteroscedasticity

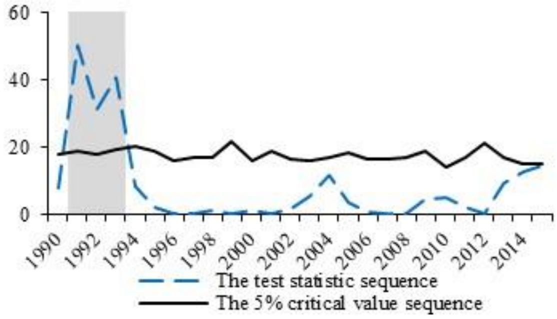
a). $DC_t -/\rightarrow REM_t$



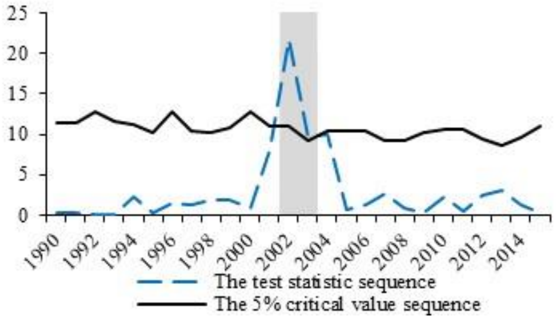


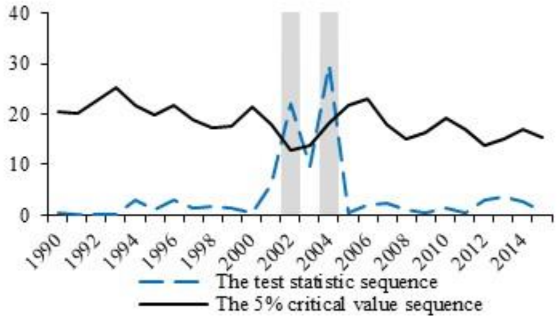
b). $REM_t -/\rightarrow DC_t$



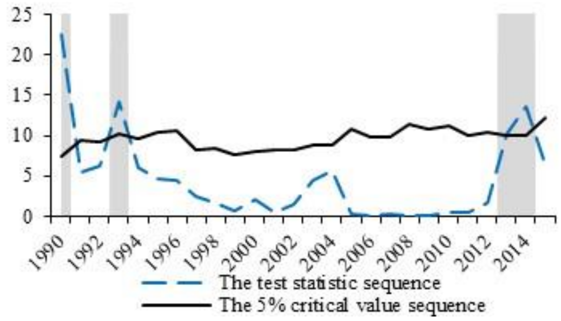


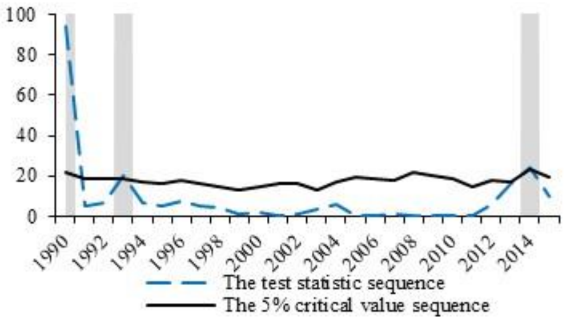
c). $M2_t -/\rightarrow REM_t$





d). $REM_t -/\rightarrow M2_t$



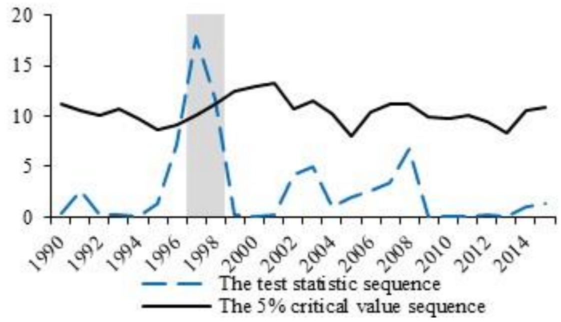


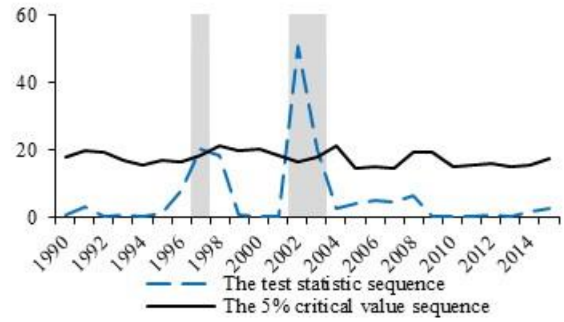
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

Figure 4: The Granger causality results for Jordan

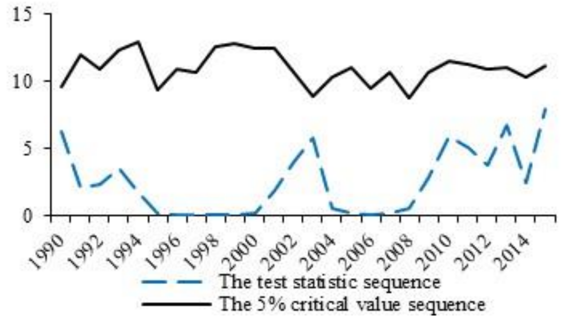
Panel A: Rolling - Homoscedasticity **Panel B:** Rolling -heteroscedasticity

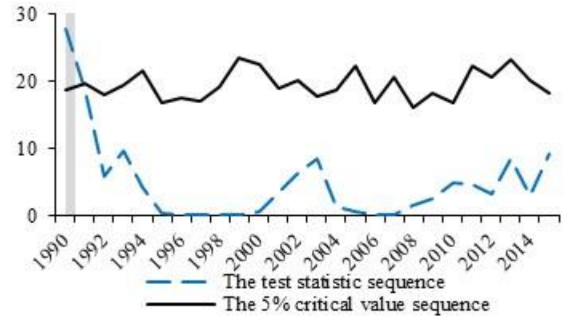
***a*).** $DC_t -/\rightarrow REM_t$



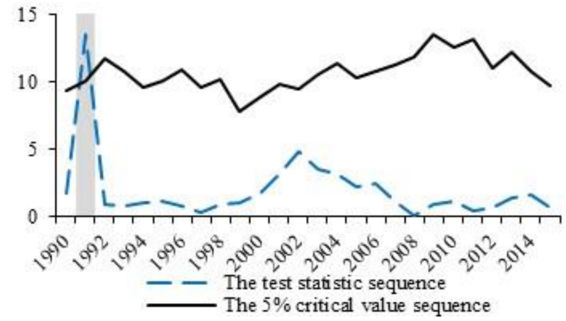


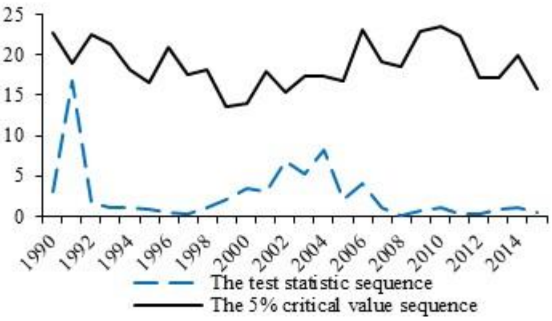
***b*).** $REM_t -/\rightarrow DC_t$



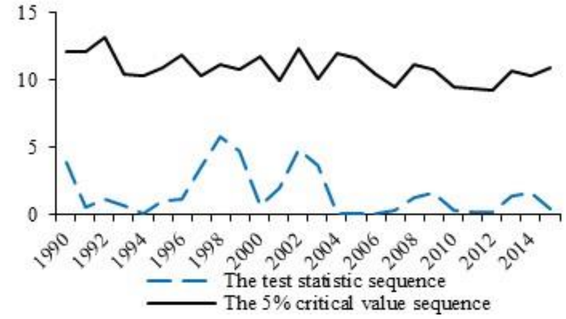


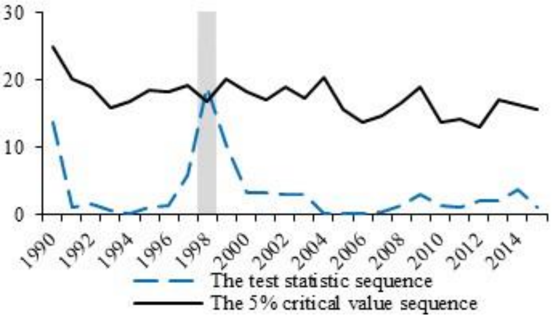
***c*).** $M2_t -/\rightarrow REM_t$





***d*).** $REM_t -/\rightarrow M2_t$





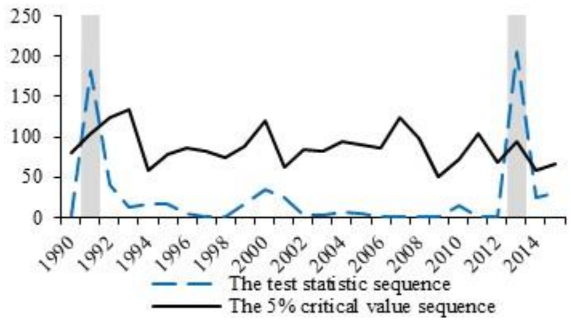
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

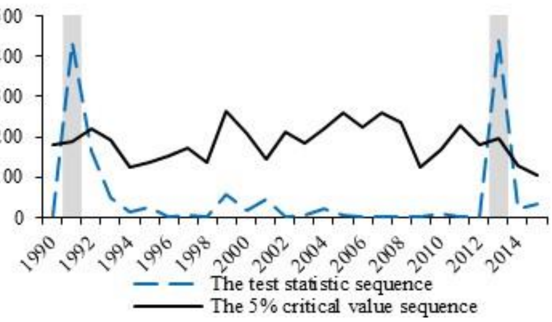
Figure 5: The Granger causality results for Malta

Panel A: Rolling - Homoscedasticity

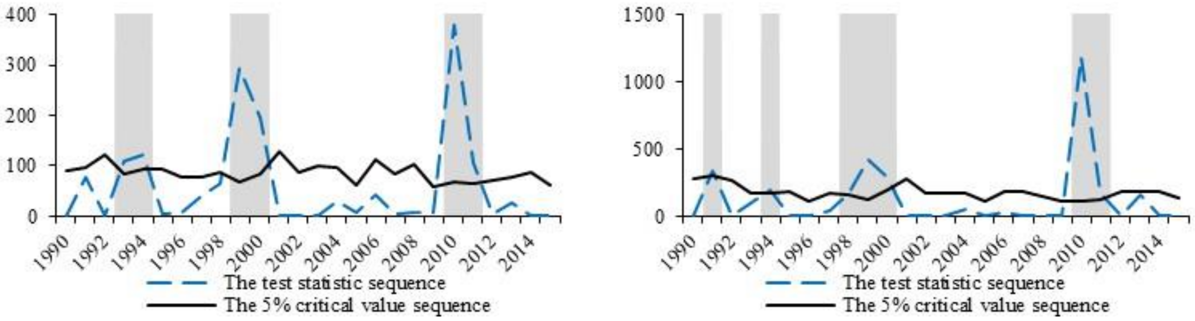
Panel B: Rolling -heteroscedasticity

***a*).** $DC_t -/\rightarrow REM_t$





***b*).** $REM_t -/\rightarrow DC_t$

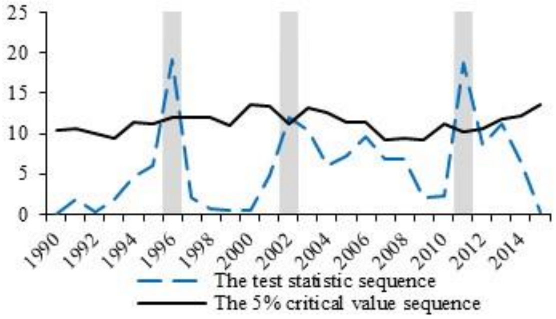


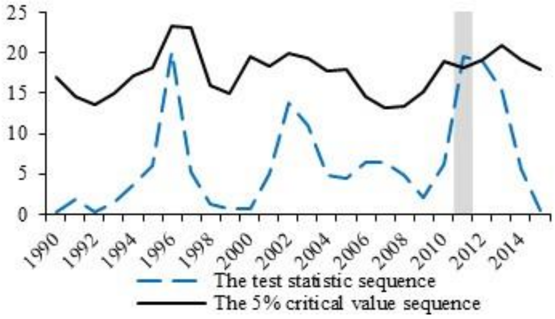
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

Figure 6: The Granger causality results for Morocco

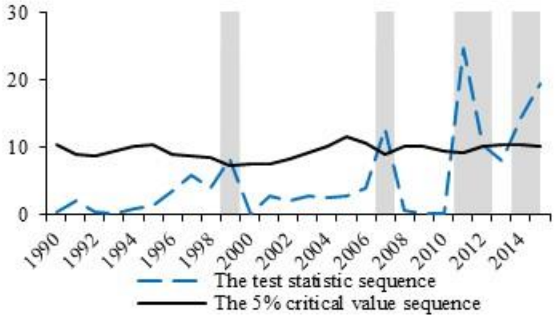
Panel A: Rolling - Homoscedasticity **Panel B:** Rolling -heteroscedasticity

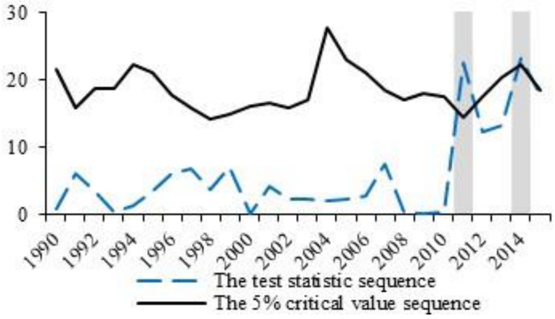
***a*).** $DC_t -/\rightarrow REM_t$



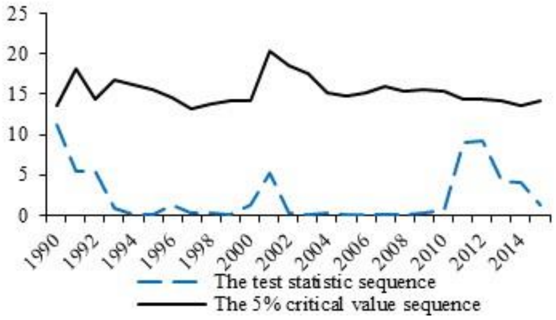


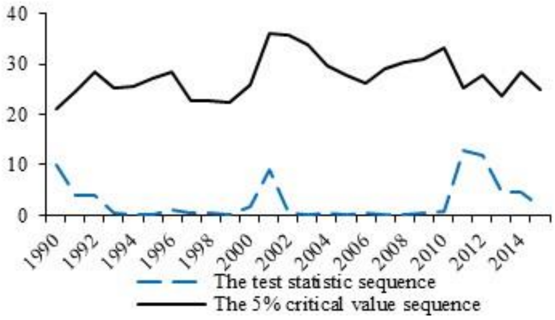
***b*).** $REM_t -/\rightarrow DC_t$



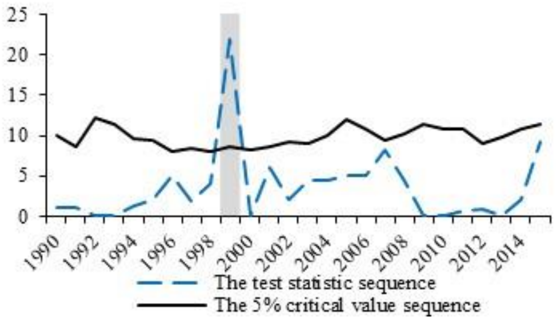


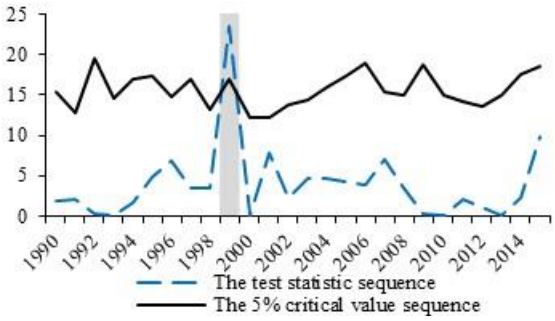
***c*).** $M2_t -/\rightarrow REM_t$





***d*).** $REM_t -/\rightarrow M2_t$



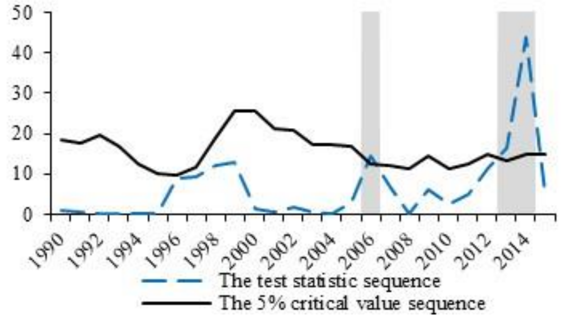


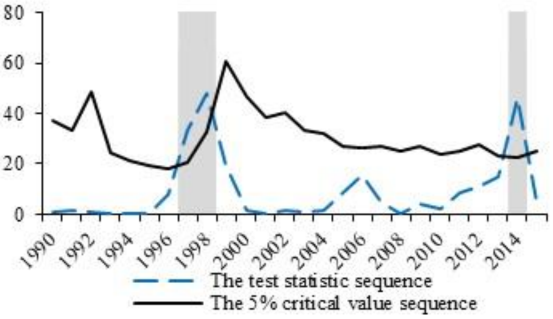
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

Figure 7: The Granger causality results for Oman

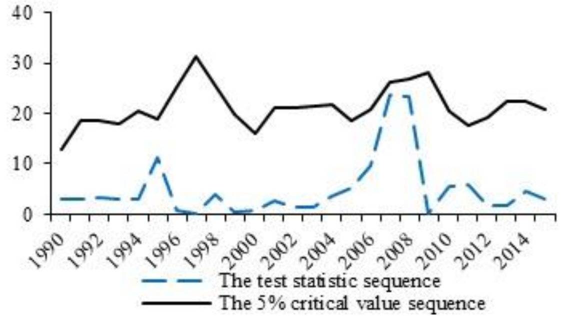
Panel A: Rolling - Homoscedasticity **Panel B:** Rolling -heteroscedasticity

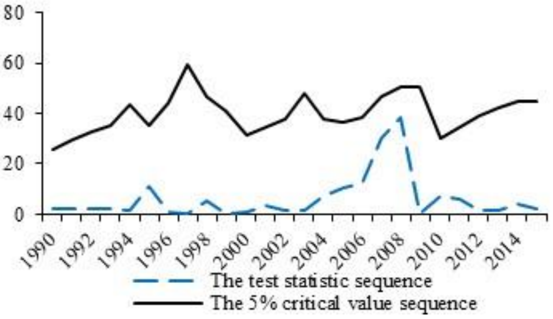
***a*).** $DC_t -/\rightarrow REM_t$



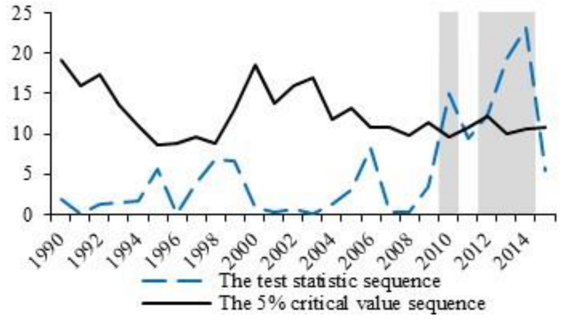


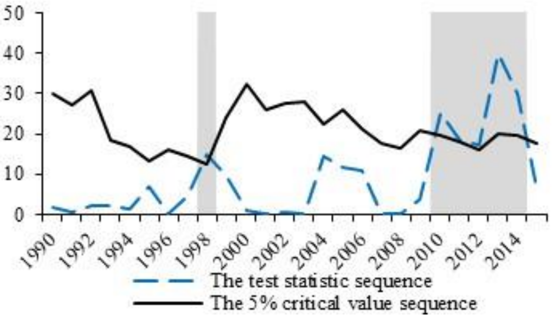
***b*).** $REM_t -/\rightarrow DC_t$



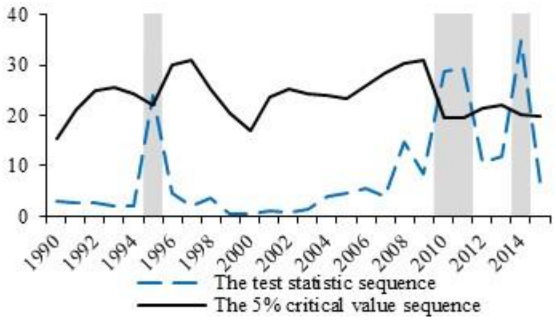


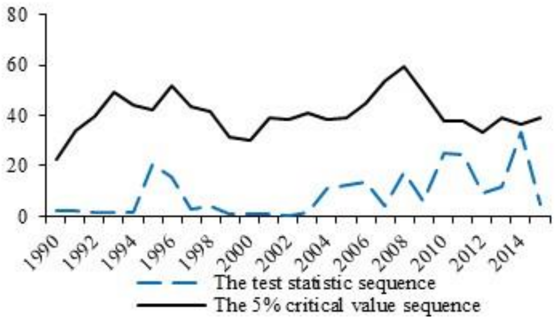
***c*).** $M2_t -/\rightarrow REM_t$





***d*).** $REM_t -/\rightarrow M2_t$



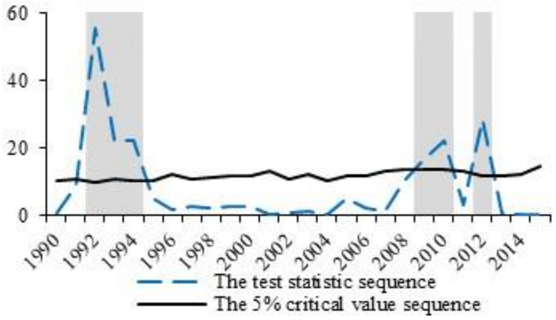


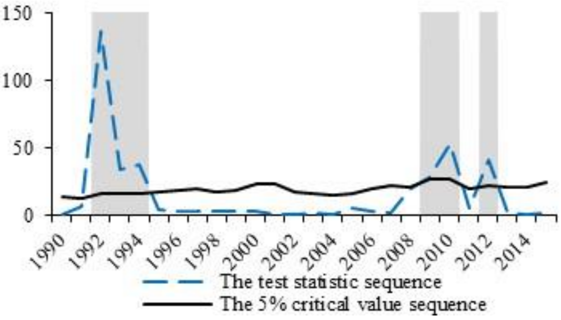
Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

Figure 8: The Granger causality results for Tunisia

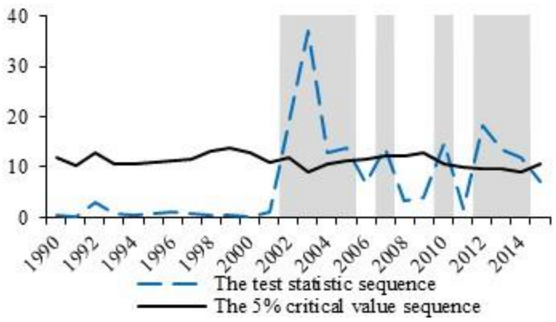
Panel A: Rolling - Homoscedasticity **Panel B:** Rolling -heteroscedasticity

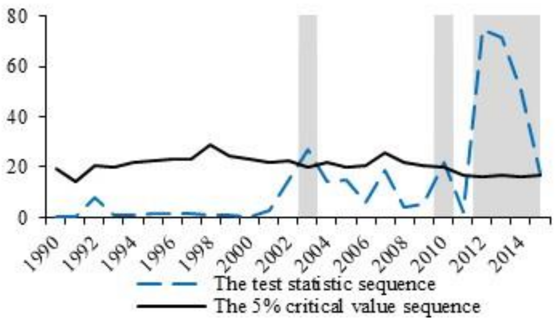
***a*).** $DC_t -/\rightarrow REM_t$



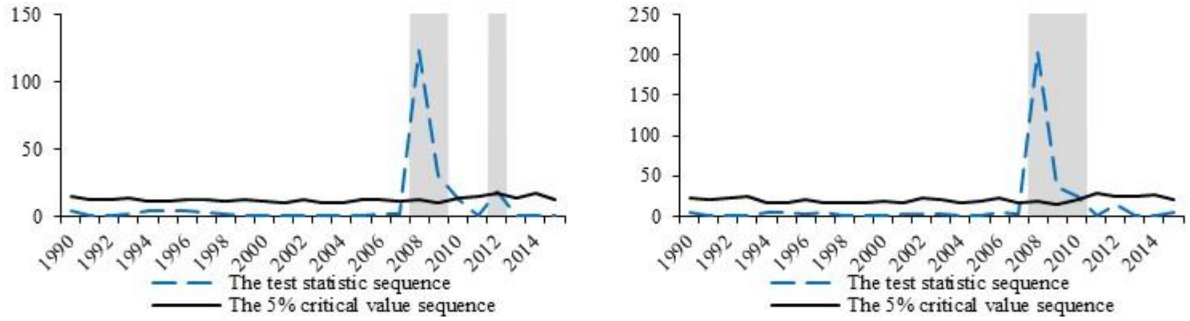


***b*).** $REM_t -/\rightarrow DC_t$

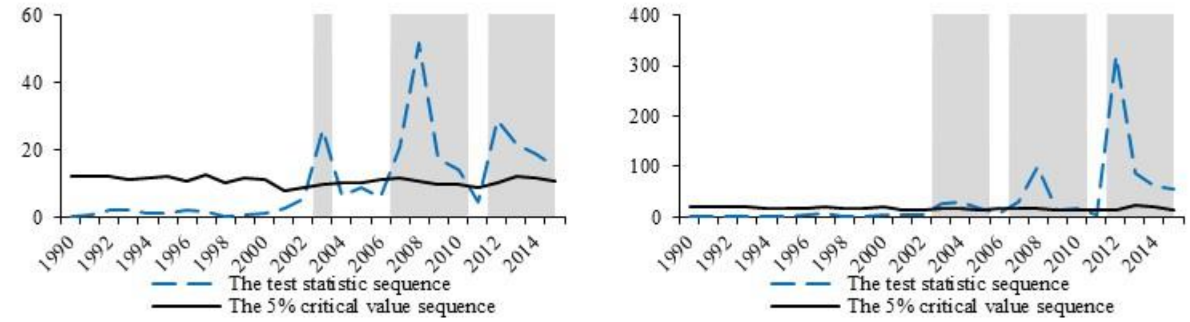




***c*).** $M2_t -/\rightarrow REM_t$



***d*). $REM_t -/\rightarrow M2_t$**



Notes: These figures represent the test statistic sequence (on y-axis) of the rolling window-based bootstrapped Wald tests and the corresponding 5% critical values. The time period is on x-axis. Panel A shows the homoscedastic version of Granger-causality $x_t -/\rightarrow y_t$spreads, whereas Panel B carries the heteroscedasticity-consistent version of the tests.

References

Acosta, P.A., Lartey, E.K.K., Mandelman, F.S., 2009. Remittances and the Dutch disease. *J. Int. Econ.* 79, 102–116.

Aggarwal, R., Demirgüç-Kunt, A., Pería, M.S.M., 2011. Do workers remittances promote financial development ? *J. Dev. Econ.* 96, 255–264.

Ahamada, I., Coulibaly, D., 2011. How does financial development influence the impact of remittances on growth volatility ? *Econ. Model*. 28, 2748–2760.

Ahamada, I., Coulibaly, D., 2012. Remittances and growth in sub-Saharan African countries. *Journal of International Development*, John Wiley & Sons, Ltd.

Ambrosius, C., Cuecuecha, A., 2016. Remittances and the Use of Formal and Informal Financial Services. *World Development*, 77, 80–98.

Amuedo-Dorantes, C., Pozo, S., 2004. Workers' remittances and the real exchange rate : a paradox of gifts. *World Dev*. 32, 1407–1417.

Amuedo-Dorantes, Catalina, Susan Pozo, and Carlos Vargas-Silva. 2007. Remittances and the Macroeconomy : The Case of Small Island Developing States. http://www-rohan.sdsu.edu/dept/econ/WPSeries/07_02.pdf January 31.

Arezki, R., Brückner, M., 2012. Rainfall, financial development, and remittances : evidence from Sub-Saharan Africa. *J. Int. Econ*. 8, 377–385.

Asatryan, Z., Bittschi, B., Doerrenberg, P., 2017. Remittances and public finances : Evidence from oil-price shocks. *Journal of Public Economics*, 155, 122-137.

Balcilar, M., Ozdemir, Z. A., & Arslanturk, Y. (2010). Economic growth and energy consumption causal nexus viewed through a bootstrap rolling window. *Energy Economics*, *32*(6), 1398-1410.

Balcilar, M. and Ozdemir, Z.A. (2013a). Asymmetric and time-varying causality between inflation and inflation uncertainty i n G -7 countries. Scottish Journal of Political Economy, 60 (1), 1-41.

Balcilar, M. and Ozdemir, Z. A. (2013b). The causal nexus between oil prices and equity market in the U.S.: A Regime Switching Model. Energy Economics, 39, 271-282.

Beck, T., Demirguc-Kunt, A., Levine, R. (2009). Financial Institutions and Markets across Countries and over Time. The World Bank, Policy Research Working Paper 4943.

Beine, M., Lodigiani, E., Vermeulen, R., 2012. Remittances and financial openness. *Regional Science and Urban Economics*, 42, 844-857.

Bettin, G., Zazzaro, A., 2011. Remittances and financial development : substitutes or complements in economic growth ? *Bull. Econ. Res*. http://dx.doi.org/10.1111/j.1467-8586.2011.00398.x.

Bettin, G., Lucchettia, R., Zazzaro, A., 2012. Financial development and remittances : microeconometric evidence. *Econ. Lett*. 115, 184–186.

Bettin, G., Presbitero, A., Spatafora, N., 2014. Remittances and Vulnerability in Developing Countries. (IMF Working Paper 14/13).

Billio, M., Getmansky, M., Lo, A. W. and Pelizzon, L., 2012. Econometric measures of connectedness and systemic risk in the finance and insurance sectors. *Journal of Financial Economics*, 104, 535–559.

Boubtane, E., Coulibaly, D., Rault, C., 2013. Immigration, unemployment and growth in host country : bootstrap panel Granger causality analysis on OECD countries. *Econ. Model*. 33, 261–269.

Barajas, A., Chami, R., Fullenkamp, C., 2009. Do workers' remittances promote economic growth ? (No. 09/153), *IMF Working Paper*. Washington, DC.

Bugamelli, M., Paternø, F., 2009. Output growth volatility and remittances. *Economica* 78, 480–500.

Calderon, C., Fajnzylber, P. and Lopez, J. H. 2008. Remittances and growth: the role of complementary policies. in Fajnzylber, P. and Lopez, J. H. (eds), *Remittances and Development: Lessons from Latin America.* Washington, DC: World Bank

Catrinescu, N., Leon-Ledesma, M., Piracha, M., Quillin, B., 2009. Remittances, Institutions, and Economic Growth. *World Development*, 37(1), 81–92.

Chami, R., Fullenkamp, C., Jahjah, S., 2003. Are immigrant remittance flows a source of capital for development ? *IMF Working Papers*, WP/03/89.

Chami, R., Fullemkamp, C., Jahjah, S., 2005. Are immigrant remittance flows a source of capital for development *? IMF Staff Paper*, 52(1), 55-81.

Chami, R., Barajas, A., Cosimano, T., Fullenkamp, C., Gapen, M., Montiel, P., 2008. Macro-economic consequences of remittances. *IMF Occasional Paper*, No. 259.

Chen, H., Cummins, J.D., Viswanathan, K.S. and Weiss, M.A., 2013. Systemic risk and the interconnectedness between banks and insurers: An econometric analysis. *Journal of Risk and Insurance*, 1 – 29.

Chowdhury, M.B., 2011. Remittances flow and financial development in Bangladesh. *Econ. Model.* 28, 2600–2608.

Couharde, C., Davis, J., Generoso, R., 2011. Do remittances reduce vulnerability to climate variability in West African countries ? Evidence from Panel Vector Autoregression.

UNCTAD Special Unit for Commodities Working Paper Series on Commodities and Development, (Discussion Paper 2).

Coulibaly, D., 2015. Remittances and financial development in Sub-Saharan African countries : A system approach. *Economic Modelling* 45, 249–258.

Diebold, F.X. and Yilmaz, K., 2013. Measuring the dynamics of global business cycle connectedness, Penn Institute for Economic Research, Department of Economics, and University of Pennsylvania Working Paper No. 13-070.

Edelbloude, J., Fontan Sers, C., Makhlouf, F., 2017. Do remittances respond to revolutions ? The Evidence from Tunisia. *Research in International Business and Finance*, 42, 91-101.

Frometin, V., 2017. The long-run and short-run impacts of remittances on financial development in developing countries. *The Quarterly Review of Economics and Finance* 66, 192-201.

Giuliano, P., Ruiz-Arranz, M., 2009. Remittances, financial development and growth. J. *Dev. Econ*. 90, 144–152.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37, 424-438.

Gupta, S., Pattillo, C.A., Wagh, S., 2009. Effect of remittances on poverty and financial development in Sub-Saharan Africa. *World Dev.* 37, 104–115.

Hacker R. S. and Hatemi-J A. (2006) Tests for causality between integrated variables using asymptotic and bootstrap distributions: theory and application. Applied Economics, 38(13), 1489-1500.

Hamma, I., 2016. Linking remittances with financial development and institutions: a study from selected MENA countries. *GREDEG Working Paper No.* 2016–38.

Jarque, C. M. and Bera, A. K. (1980). Efficient test for normality, homoscedasticity and serial independence of residuals. *Economic Letters*, **6**(3), pp. 255-259.

Lartey, E.K.K., 2013. Remittances, investment and growth in Sub-Saharan Africa. J. *Int. Trade Econ. Dev*. 22, 1038–1058.

Meyer, D., Shera, A., 2016. The impact of remittances on economic growth : An econometric model. *EconomiA*, 18, 147–155.

Mitrut, A., Wolff, F.C., 2014. Remittances after natural disasters : Evidence from the 2004 Indian tsunami. *Working Papers in Economics 604*. University of Gothenburg, Department of Economics.

Mohapatra, S., Joseph, G., Ratha, D., 2009. Remittances and natural disasters : ex-post response and contribution to ex-ante preparedness. *World Bank Policy Research Working Paper* No. 4972.

Mundaca, G., 2009. Remittances, financial market development and economic growth : the case of Latin America and the Caribbean. *Rev. Dev. Econ.* 13, 288–303.

Nyamongo, E., Misati, R., Kipyegon, L., 2012. Remittances, financial development and economic growth in Africa. *Journal of Economics and Business*, 64, 240-260.

Orozco, M., Fedewa, R., 2005. Leveraging efforts on remittances and financial intermediation. Report Commissioned by the Inter-American Development Bank.

Perron, P., 1989. The Great Crash, the oil price shock and the unit root hypothesis. Econometrica 57,1361-1401.

Perron P. (1997). « Further Evidence on Breaking Trend Functions in Macroeconomic Variables », *Journal of Econometrics*, vol. 80, pp. 355-385.

Pesaran, M. H., and Timmermann, A. (2005). Small sample properties of forecasts from autoregressive models under structural breaks. Journal of Econometrics, 129, 183–217.

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, *66*(1), 225-250.

Williams, K., 2016. Remittances and Financial Development : Evidence from Sub-Saharan Africa. *African Development Review*, 28(3), 357-367.

World Bank, 2016. Migration and Remittances, Recent Developments and Outlook. *Migration and Development Brief 26.*

Zapata, H. O., & Rambaldi, A. N. (1997). Monte Carlo evidence on cointegration and causation. *Oxford Bulletin of Economics and Statistics*, 59(2), 285-298.