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Sustainability of current account balances in MENA countries: threshold cointegration approach

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Abstract
This document aims to determine the empirical link between current account balances and a set of economic variables proposed by the theoretical and empirical literature. To do this, we first use a generalized method of moments (GMM) dynamic panel regression technique to identify the key fundamentals of current account balances in certain economies in the Middle East and North Africa (MENA) region. Next, we estimate the link between exports and imports in order to test the sustainability of current account balances. To do this, the authors estimate a threshold cointegration model on a sample of 12 countries from the MENA region over the period 1970–2018. Nevertheless, the results show that the countries of the MENA region must put in place policies aimed at reducing their current account deficits in order to regain their external stability.

Keywords Current account · Threshold autoregressive · Budget constraint

JEL Classification F32 · C22 · H61

1 Introduction

Sustainability of current account balance is one of the controversial and major issues in macroeconomics over the past two decades. The large global current account imbalances due to the progress integration of the world economy raised

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the fundamental question of their sustainability. The basic idea is appealing as it amounts to analyzing whether a country is able to meet its long-run intertemporal budget constraint without incurring episodes of painful and fast adjustment (Christopoulus and León-Ledesma 2010; Brissimis et al. 2013; Chen 2015; Tang 2019). However, a bulk of the literature has concentrated on the developed economies in the analysis of current account sustainability and developing countries have attracted less attention with the exception of Asian countries (Gnimassoun and Coulibaly 2014).

While the increase in global imbalances during the 2000s has led to increased interest in the literature on current account sustainability and adjustment, little attention has been paid to the link between current account imbalances and the exchange rate regime. The pattern of current account imbalances in the MENA countries in recent years shows a worsening of current account deficits in some countries (e.g., Tunisia, Jordan, Egypt, and Morocco), which translates into growing surpluses in other countries (Saudi Arabia, Kuwait, and Qatar). The existence of chronic imbalances in current accounts and the macroeconomic risks associated with a disorderly absorption of these imbalances make the analysis of the sustainability of these positions very relevant to political debate and macro-prudential surveillance. Moreover, to our knowledge, no study has discussed the case of MENA countries. The focus on oil-producing countries is partly justified by the fact that their external imbalances also pose a challenge to the stability of the world economy. However, the case of MENA countries—North African countries in particular—is also of high interest, as external imbalances pose a challenge to their own development.

With this context, stylized facts of the current account determinants require more attention in sustainability analysis and the identification of these determinants in order to propose policy measures that reduce imbalances of current account. On the one hand, most countries rely heavily on imports of various types of goods for consumption. On the other hand, their export sector is still not competitive in international market. Subsequently, the growing gap between rapidly expanding imports and declining export sectors makes current balances unsustainable over time. The intertemporal approach, invented by Sachs (1981) and thoroughly extended by Obstfeld and Rogoff (1994), has been considered an important theoretical development to explain whether the imbalance in the current account of an economy is sustainable in the long term or not. The overwhelming amount of the literature has been devoted to current account sustainability around the world, following in mixed results depending on the countries, the sample, and the methodological approach.

However, sustainability of current balance has an ambiguous effect on economic from both theoretical and empirical points of view, and existing studies provide evidence of linear or nonlinear of that balance. Based on Walsh and Trehan (1991), a myriad of studies have devoted many efforts to this issue and the empirical literature has developed in two directions. First, these studies either use the linear unit root and cointegration tests or a linear panel unit root or panel cointegration to test the sustainability of current account balance in the long run[1] (Gabsi 2006; Gnimassoun and Coulibaly 2014; Manoranjan et al. 2017; Fadlallah and chakhat 2018). Second, many researchers stress that the dynamic adjustments of the current account imbalance pursue a nonlinear process[2] (Chen 2015; Tarlok 2016; Diaktte and Drama 2017).

With regard to methodological problems, the data concerning current account imbalances deserve some comments. In the existing literature, current imbalances are generally considered simply as current account deficits and surpluses. However, it is well known that relatively large deficits are natural in an intertemporal framework, usually when a country begins its development process, enhancing domestic investment by importing capital (Obstfeld and Rogoff 1994; Chinn and Ito 2007; Bussière et al. 2010). Our article contributes to the literature in several ways.

First, we are tackling for the first time a topical and far-reaching problem in terms of economic policy for the MENA countries, namely the potential influence of the exchange rate regime on current imbalances. To identify the main determinants of current accounts while addressing the uncertainty of the model, we use the technique we used the generalized method of moments (GMM) of Arellano and Bond (1991). In addition, the GMM system developed by Arellano and Bover (1995) and Blundell and Bond (1998) increases the GMM estimator of the difference by making the additional assumption that the first differences of the instrument variables are not correlated with fixed effects. Therefore, efficiency can be considerably improved by the possibility of introducing more instruments. We use appropriate approaches allowing us to take into account the dynamics of the current account such as the GMM difference and the GMM system approaches. This allows us to derive more reliable current account equilibrium values than those based on the usual Hodrick–Prescott filtered series and to go further than studies that simply consider current account deficits and surpluses as external imbalances. Secondly, it is obviously relevant to study the sustainability of the current account balance in the MENA countries, since few empirical studies examining this question have been carried out on this set of countries. In addition, most studies have examined only the linear aspect of the current account balance, but have neglected the transmission channels that have an impact on its linearity process. This document aims to fill this gap by examining the sustainability of the current account balance in MENA countries. To this end, we estimate a threshold cointegration model developed by Enders and Siklos (2001) for a sample of 12 countries over the period 1970–2018.

The remainder of this paper is organized as follows. Section 2 reviews the potential current account determinants. In Sect. 3, we present the sustainability of current

[1] We use the unit root test to examine the sustainability of the current account balance. If the current account deficit of a country increases for an unforeseeable long time, the probability of a country defaulting on external debt is high.

[2] Chortareas et al. (2003) indicate that there are at least three channels that perform the current balance series a nonlinear process. The first source of nonlinearity is the twin-deficit channel. A second channel that leads to nonlinearity is the level of a country's indebtedness, which reflects the willingness of foreign lenders to hold domestic assets. The third channel results from the transaction cost.

account and their methodology and result. Finally, Sect. 4 describes the conclusions that we draw from this research.

2 Potential current account determinants for MENA countries

The determinants presented in this section are derived from the predictions of theoretical models and also from previous empirical studies, in particular those related to medium-term determinants of current account (Calderon et al. 2002; Lane and Milesi-Ferretti 2012). Whereas Debelle and Faruqee (1996) focus both on industrialized countries and use cross-sectional and panel approaches, Calderon et al (2002) consider only developing countries in a panel framework. In addition to the traditional fundamentals presented in these articles, we also suggest other potential determinants, which are factors related to the countries under study.

2.1 Standard determinants of the current account

2.1.1 Economic growth

Economic growth is often identified as a potential determinant of current account. Countries with high productivity growth may attract international capital flows because they are expected to produce higher rates of return. Per capita real GDP growth is used as a proxy for productivity growth.

2.1.2 General government consumption expenditure

The link between current account and fiscal balance is shown to be positive, giving rise to the well-known "twin deficits hypothesis." Most empirical studies have established a positive relationship between fiscal balances and current account balances (Bussiere et al. 2010). Moreover, the impact of budget deficits on current account balances may depend on how fiscal expenditures are allocated. Blanchard's (1985) finite horizon model and the overlapping generation models (Obstfeld and Rogoff 1994) show that a deterioration in fiscal balance tends to have the same negative effect on the current account to the extent that it involves a redistribution of income from future to present generations. This relationship does not hold in the particular case of Ricardian equivalence in which private savings fully offset changes in public saving.

2.1.3 Degree of exchange rate flexibility and exchange rate policy

Given that the degree of exchange rate flexibility can influence an economy's ability to respond to external shocks, it could be argued that a flexible exchange rate regime is more likely to limit current account imbalances. According to Milesi-Ferretti and Razin (1996), the degree of flexibility of the exchange rate in response to external shocks can affect the ability of an economy to sustain current account deficits.

2.1.4 Oil intensity/dependency

The effect of oil price fluctuations on current account depends on several factors. Most important is whether a country is a net exporter or a net importer of oil. The size of the impact would then vary with how intensively a nation uses oil in its economy (for an importer), or with the relative importance of oil production in its economy (for an exporter). The variables applied to indicate a country's oil intensity or dependency are volumes of oil consumption per capita and volumes of oil production as a share of GDP, each multiplied by oil prices to obtain values.

2.2 The benchmark current account model for MENA countries

The set of empirical studies on the current account cannot be fully analyzed through a single theoretical model (Chinn and Prasad 2003). Empirical studies are generally conducted to examine the predictions of different theoretical models, and most of them make an arbitrary choice of model specification given the lack of clear theoretical guidelines.

As heterogeneity is the main characteristic of the countries under consideration, other specifications might be preferred to a simple OLS specification in our analysis. In fact, this requires the use of robust econometric methods to deal with potential endogeneity problems and measurement errors. This is generally not the case in previous empirical studies based on OLS or fixed effects (FE) estimators (see among others Chinn and Prasad 2003; Gruber and Kamin 2007; Lane and Milesi-Ferretti 2012).

For example, IMF (2013) notes the presence of a strong autocorrelation in the current account data. If this phenomenon (dynamic effect) can be captured by introducing the lagged current account in the regression, it becomes clearly inappropriate to estimate it by OLS since the latter is correlated with the time-invariant country effects. It is therefore important to use a more robust method to take into account the dynamic effect of the current account, as well as problems of multiple endogeneity and error measurements. Thus, in order to obtain consistent and efficient estimates of the model, we employed the generalized method of moments GMM of Arellano and Bond (1991). Also, system GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998) augments difference GMM estimator by making an additional assumption that the first differences of instrument variables are uncorrelated with the fixed effects. Accordingly, the efficiency can be considerably improved by the possibility of introducing more instruments. Given the likely endogeneity of the regressors in the context of our panel data regression, where the current account is explained by its own lagged value and the fundamentals identified above, we use both GMM estimators.

In order to identify the determinants of current account balances, we regress current account balances on a set of macroeconomic variables. Following previous theoretical and empirical studies by Debelle and Faruqee (1996), Calderon et al. (2002), Chinn and Prasad (2003), Bussière et al. (2010) and Zanghieri (2004), we estimate a model which can be expressed in the following form:

$$\mathrm{CA}_{it} - \mathrm{CA}_{it-1} = \beta\left(\mathrm{CA}_{it-1} - \mathrm{CA}_{it-2}\right) + \gamma\left(X_{it} - X_{it-1}\right) + \left(\varepsilon_{it} - \varepsilon_{it-1}\right)$$

where CA is the current account balance (negative values indicate a deficit), and x_{it} is a vector of macroeconomic variable. The sample covers 12 countries for the period 1998–2018. The estimation results are presented in Table 1.

Empirical analysis shows that the lagged current account has a positive and statistically significant effect on the current account. The size of this partial regression coefficient (0.232; 0.543) reveals the relatively strong persistence of transitory shocks, implying that the half-life persistency of these shocks on the current account is up to 3 years (similar to developing countries as found by Calderon et al. (2002)). The results reflect a relatively slow current account adjustment process, which could be influenced by foreign creditors as well as by decisions of the private sector. However, the empirical result for the MENA countries is inconsistent with theoretical expectations that domestic economic growth accelerates demand for foreign goods and services and consequently deteriorates the current account.

Countries with important oil-producing sectors tend to have a higher current account. The positive coefficient likely reflects the effects of rising oil prices over the sample period and that oil-exporting countries have tended to save a large part of their income windfall to smooth consumption intertemporally. The observed tendency for oil producers to use revenue gains to increase savings rather than consumption may reflect that oil price increases prior to 2002 were mostly temporary in nature. For the oil price increase since 2002, Ruiz and Vilarubia (2007) find that major oil exporters have recycled roughly half of income gains into higher imports and half into higher savings. The portion directed toward imports exceeds that in previous episodes of similar oil price increase and may reflect perceptions of its more permanent nature. We find a positive and statistically significant relationship between the oil price and the current account balance, which is somewhat consistent with the H–L–M[3] effect. However, when comparing oil-exporting countries to oil-importing countries, the former, according to the expectations, indicate an even higher partial regression coefficient when the same oil price hike emerges, i.e., up to a 4% points improvement in the current account. Since many MENA countries are oil-exporting countries, a result of positive transitory terms of trade shocks leads primarily to an increase in savings in the region.

A potentially fundamental of the current account is public sector consumption. Government consumption expenditure appears to be negative and statistically significant in relation to the current account. A one-percentage point rise in government expenditure leads to about 0.189–0.498% point deterioration in the current account. Such results imply moderate liquidity constraints and the inelasticity of domestic

[3] The Harberger–Laursen–Metzler effect forecasts that positive transient shocks (i.e., oil price shocks) produce an improvement in current income greater than that in permanent income. As a result, an increase in savings follows and an improvement in current positions appears (see Mendoza, 1995).

Table 1 Current account estimations results

Variables	Model A		Model B		Whole sample	
	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM
L.CA	0.333** (0.051)	0.232** (0.034)	0.543** (0.011)	0.503** (0.031)	0.499** (0.151)	0.521** (0.004)
GOV	− 0.211** (0.043)	− 0.189** (0.039)	− 0.491** (0.023)	− 0.313** (0.033)	− 0.281** (0.283)	− 0.287** (0.009)
GROWTH	0.223 (0.119)	0.151 (0.061)	0.183 (0.121)	0.114 (0.133)	0.273 (0.219)	0.181** (0.061)
OILB	0.021** (0.002)	0.082** (0.042)	0.377*** (0.000)	0.488** (0.003)	0.121*** (0.002)	0.112** (0.042)
FIXED	0.123** (0.009)	0.121** (0.002)	0.538** (0.006)	0.344** (0.019)	0.413*** (0.089)	0.321** (0.019)
OER	0.214** (0.063)	0.328** (0.032)	0.221** (0.022)	0.421** (0.052)	0.214** (0.063)	0.328** (0.082)
Constant		− 0.023 (0.215)		− 0.112 (0.315)		− 0.124 (0.115)
AR(2) *P* value	0.625	0.833	0.823	0.788	0.877	0.921
Hansen *P* value		0.772		0.992		0.733
Countries	4	4	8	8	12	12
Time	1998–2018	1998–2018	1998–2018	1998–2018	1998–2018	1998–2018

All time dummies are included but not reported to save space; in both the difference GMM and the system GMM, L.CA is treated as pre-determined and all other variables are treated as endogenous. The ** and *** indicate statistical significance at the 5% and 1% levels, respectively (private) consumption and are similar to the results of Chinn and Prasad (2003) and Zanghieri (2004). Finally, the negative link between government expenditure and the current account provides some evidence in favor of the supposed twin deficits hypothesis in the MENA region.

The average exchange rate dummy is about two-thirds, which implies that the samples with a fixed exchange rate will be approximately higher. The coefficient of the variable FIXED in model B is more powerful and significant than of model A, this is explained by the argument of the theory of monetary hegemony. However, most states opted for a fixed exchange rate regime because oil was quoted in dollars (in 1974–1975 following the collapse of the Breton Woods system, all OPEC[4] members had decided to institute the dollar as currency anchor). Thus, the countries had to convert their currencies into dollars to make purchases of oil, and the receipts of oil revenues accumulated by the exporting countries were then reinvested in the form of treasury bonds in the American banks, thus leading to the rise of petrodollars.

However, this theory is no longer suitable for the current context as the world is moving toward a multipolar world. The USA still maintains the status of military hegemony, which is why the oil-exporting countries are continuing to peg their currencies to the dollar. Indeed, countries that are naturally specialized in the petroleum industry possess so many petroleum resources that it would be absurd to engage in the production of other merchantable goods. As a result, prices become vulnerable to price volatility associated with excessive budget spending, which would explain why the oil-producing countries adopt a fixed exchange rate regime in order to restore stability in the domestic market. On the other hand, the States which are not major exporters and little specialized in the petroleum industry will be the least affected by the price volatility since the diversification of these economies is relatively high.

3 Current account sustainability: a threshold cointegration approach

Starting from the determinants of the current account identified by GMM, we can now estimate the sustainability of the current account in the Arab context while focusing on MENA countries. To achieve this, we use a threshold cointegration model for 12 MENA countries from during the period 1970–2018. Our aim is to take advantage of specific lessons from MENA countries using empirical models.

3.1 Model and methodology

The intertemporal model of the current account balance contributes to the optimal current account path founded on the behavior of a representative agent who is infinitely lived and smooth consumption over time by lending or borrowing abroad. The theoretical framework being considered in this study is drawn from discussions by

[4] Organization of the Petroleum Exporting Countries.

Walsh and Trehan (1991), and let us consider an economy with the following two period budget constraints:

$$C_0 = Y_0 + B_0 - I_0 - (1 + r_0)B_{t-1} \tag{1}$$

where C_0, Y_0, I_0, and r_0 represent current consumption, income, investment, and global interest rate, respectively. B_0 is the current loan, and $(1 + r_0)B_{t-1}$ is the size of the original debt.

The resolution of B_0 for Eq. (1) produces expression (2) where the trades balance $(X - \mathrm{MM})_t = Y_t - C_t - I_t$ and $\overline{\omega}$ is the discount factor:

$$B_0 = \sum_{t=1}^{\infty} \overline{\omega}_t (X - \mathrm{MM})_t + \lim_{n \to \infty} \overline{\omega}_n B_n \tag{2}$$

To obtain a testable equation, Husted (1992) develops the following hypothesis where:

$$W_t = \mathrm{MM}_t + \left(r_t - r\right) B_{t-1} \tag{3}$$

$$X_t + B_t = W_t + (1 - r)B_{t-1} \tag{4}$$

and $\mathrm{MM_t}$ is the import expenditure. From Eq. (4), to solve $\mathrm{MM}_t + r_t B_{t-1}$ yields:

$$\mathrm{MM}_t + r_t B_{t-1} = X_t + \sum_{j=0}^{\infty} \gamma^{j-1} \left[\Delta X_{t+j} - \Delta W_{t+j}\right] + \lim_{n \to \infty} \gamma^{t+j} B_{t+j} \tag{5}$$

Husted (1992) further indicates that import and export expenditures represent non-stationary processes that can be written as follows:

$$W_t = \emptyset_1 + W_{t-1} + \mu_{1t} \tag{6}$$

$$X_t = \emptyset_2 + X_{t-1} + \mu_{2t} \tag{7}$$

Substituting Eqs. (6) and (7) in Eq. (5) and rearranging give:

$$X_t = \left[\frac{(1 + r)}{r}\right] \left(\emptyset_1 - \emptyset_2\right) + (\mathrm{MM}_t + r_t B_{t-1}) - \lim_{n \to \infty} \gamma^{t+j} B_{t+j} + \sum_{j=0}^{\infty} \gamma^{j-1} \left(\mu_{1t} - \mu_{2t}\right) \tag{8}$$

By letting,$\beta = \left[\frac{(1+\mathrm{r})}{\mathrm{r}}\right] \left(\emptyset_1 - \emptyset_2\right)$ and $\mu_t = \sum_{\mathrm{j}=0}^{\infty} \gamma^{\mathrm{j}-1} \left(\mu_{1\mathrm{t}} - \mu_{2\mathrm{t}}\right)$, Eq. (8) can be written as:

$$X_t = \beta + (\mathrm{MM}_t + r_t B_{t-1}) - \lim_{n \to \infty} \gamma^{t+j} B_{t+j} + \mu_t \tag{9}$$

Finally, Eq. (9) can be formulated as follows: $M_t = \mathrm{MM_t} + r_t B_{t-1}$ and assuming that $\lim_{\mathrm{n} \to \infty} \gamma^{\mathrm{t+j}} \mathrm{B_{t+j}} = 0$:

$$X_t = \beta + \delta M_t + \mu_t \tag{10}$$

According to Husted (1992), the current balance is sustainable if X_t exports and M_t imports are cointegrated. It has been argued, however, that for the current balance to be highly sustainable, the sufficient condition should be that $\delta = 1$ and in case $0 < \delta < 1$, they are only weakly sustainable (Tiwari 2012 and Diakite and Drama 2017).

3.2 Estimation method

Threshold cointegration model initiated by Enders and Granger (1998) and Enders and Siklos (2001) is displayed above, the method which is exploited in this study to test for cointegration between imports and exports in our Middle East and North Africa. Using TAR and M-TAR models, Enders and Sikols (2001) suggest the following steps for testing threshold cointegration.

In the first step, we need to estimate the following long-term equilibrium relationship:

$$x_t = \alpha_1 + \alpha_2 m_t + \mu_t \tag{11}$$

In the second step, the following equation is estimated using ordinary least squares (OLS):

$$\Delta\mu_t = I_t \rho_1 \mu_{t-1} + \left(1 - I_t\right) \rho_2 \mu_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\mu_{t-i} + \tau_t \tag{12}$$

where μ_t is the series of residues of Eq. (11) and I_t is the Heaviside indicator function such that:

$$I_t = \begin{cases} 1 \text{ if } \mu_{t-1} \geq \lambda^* \\ 0 \text{ if } \mu_{t-1} < \lambda^* \end{cases} \tag{13}$$

$$I_t = \begin{cases} 1 \text{ if } \Delta\mu_{t-1} \geq \lambda^* \\ 0 \text{ if } \Delta\mu_{t-1} < \lambda^* \end{cases} \tag{14}$$

where λ^* is the threshold value to be estimated.

In fact, Eqs. (12) and (13) together form the autoregressive threshold model (TAR) and Eq. (12) and (14) form the momentum threshold autoregressive model (M-TAR). The threshold value is selected using the method of Chan (1993), where the optimal value is such that the residual sum of squares is minimal. From Eq. (12), to estimate threshold cointegration, Enders and Granger (1998) and Enders and Siklos (2001) suggest testing the following hypothesis of threshold non-cointegration:H_0: $\rho_1 = \rho_2 = 0$. The statistic test used is known as Φ statistic, and the critical values come from Enders and Siklos (2001).

3.3 Empirical results and discussions

As a preliminary analysis, we apply a battery of unit root tests to study the stationary of the series. However, the augmented Dickey–Fuller (ADF) test (Dickey and Fuller 1981) does not reject the null hypothesis of a unit root in level, but rejects the null hypothesis in the first set of imports and exports to several countries.

Therefore, we also employ it in this study; the Phillips–Perron (PP) test (Phillips and Perron 1989) validates the evidence and does not reject the null hypothesis of a unit root level, but strongly rejects the null hypothesis in the first differentiated series in most cases countries. The Kwiatkowski, Phillips, Schmidt, and Shin test (KPSS) (Kwiatkowski et al. 1992) rejects the opposite null hypothesis of a unit root in the level series for only some countries. The KPSS test does not reject the null hypothesis, even in the first round of differentiated imports and exports for most countries.

Finally, the asymptotically powerful ADF-GLS test (Elliott 1999, Elliott et al. 1996) is based on generalized least squares (GLS) and is performed to quantify the robustness of the results. Indeed, the optimal ADF-GLS test in points does not reject the hypothesis null of a unit root in the unstructured series of levels for most countries. This test rejects the null hypothesis of the de-trended series of the first difference in several countries. The results of applying these tests are reported in Table 9.

Moreover, in the presence of structural breaks in their temporal trends, the series can be unidentified as a stationary process. The exchange rate regime and the liberalization of the capital account are very important for the sustainability of current account balances. Indeed, regime switching can lead to structural breaks in the temporal trends of exports, imports, tourism receipts, and tourism spending (Chen 2015).

The one-regime unit root tests become mis-specified and are not very informative of non-stationarity in the presence of structural breaks and discontinuities in the time series. The estimates from the Perron (1989) test, nevertheless, would be biased in favor of the rejection of the null hypothesis, as the break points are not treated as data dependent and unknown under the alternative hypothesis (Zivot and Andrews 1992).

To approve this proposal, a structural break test of Zivot and Andrews (1992) is required, and the results of this test are given in Table 2.

However, the analysis is performed in the presence of a structural break in the time series. Unit root structural break tests involve estimating the model for different break dates adopting a recursive approach and performing a grid search to locate the most significant breakpoint, endogenously from the data. The results indicate that both the exports and imports for all the MENA economies are non-stationary at their levels in the presence of a structural break and stationary at first difference. These tests indicate the I (1) properties of the model series. In the next step, we continue the estimation by incorporating the asymmetric adjustment in the cointegration process, in the framework of TAR and momentum TAR models proposed by Enders and Siklos (2001).

Together, Tables 3 and 4 also indicate that the null hypothesis of no threshold cointegration is rejected only for Bahrain, Iran, Iraq, Qatar, Saudi Arabia, Kuwait, and UAE at 5% level for both TAR and M-TAR models. This would imply that

Table 2 Zivot and Andrews unit root test results

Country	X_t	M_t	X_t	M_t
	Level form		First differences	
Algeria	– 4.278 [2010]	– 4.896 [1985]	– 11.672 [2005]	– 6.134 [1999]
Bahrain	– 3.295 [1983]	– 4.438 [2010]	– 6.788 [1985]	– 8.037 [2011]
Egypt	– 3.764 [1992]	– 3.330 [2004]	– 8.356 [2016]	– 7.553 [2016]
Iran	– 2.450 [1983]	– 4.070 [1983]	– 5.226 [2017]	– 4.659 [2017]
Iraq	– 1.744 [2017]	– 3.829 [1990]	– 5.526 [2016]	– 5.907 [1991]
Jordan	– 3.974 [1987]	– 2.827 [2008]	– 8.267 [2000]	– 7.490 [1991]
Kuwait	– 3.190 [1991]	– 3.740 [1991]	– 8.267 [1991]	– 9.584 [2000]
Morocco	– 3.808 [2000]	– 7.807 [2009]	– 2.579 [2003]	– 5.879 [1996]
Qatar	– 2.698 [2004]	– 3.363 [2004]	– 6.193 [1998]	– 5.886 [2006]
Saudi Arabia	– 2.106 [1983]	– 4.561 [1993]	– 5.155 [1984]	– 6.599 [1985]
Tunisia	– 3.729 [2016]	– 4.233 [1991]	– 10.368 [2016]	– 10.124 [2016]
UAE	– 2.105 [1985]	– 3.987 [2002]	– 8.074 [2006]	– 5.874 [2008]

Assumption was the existence of trend and intercept. The figures in square brackets are the break points [years]. The maximum delay is set to K_max = Int $\{12[T/100]^{[1/4]}\} = 9$ [Schwert 1989], and the length of the AR delay is determined using the (i) information criterion of Akaike (AIC) in the Zivot-Andrews

Table 3 Threshold cointegration with consistent TAR model results

Country	ρ_1	ρ_2	λ^*	Φ	AIC	LB(4)	LB(8)	Lag
Algeria	0.147	0.168	10.599	8.241	– 1.828	5.826	10.632	2
Bahrain	0.695	0.709	10.002	138.627**	– 3.256	3.628	7.423	1
Egypt	1.159	1.183	9.704	3.156	– 6.829	9.197	9.798	1
Iran	0.253	0.285	10.929	71.151**	– 2.960	6.634	10.715	2
Iraq	0.505	0.576	10.488	138.391**	– 1.818	3.820	6.740	2
Jordan	1.222	1.236	9.763	7.315	– 2.280	6.437	8.715	1
Kuwait	0.056	0.094	10.623	67.363**	– 3.803	5.730	5.663	1
Morocco	0.932	0.946	10.104	4.674	– 2.609	9.126	12.482	1
Qatar	0.540	0.568	10.240	56.262**	– 5.496	3.858	5.251	1
Saudi Arabia	0.109	0.124	11.300	25.565**	– 1.721	6.055	11.481	2
Tunisia	0.910	0.923	9.638	6.146	– 7.582	1.994	5.223	1
UAE	0.755	0.767	11.441	14.959 **	– 5.858	5.423	6.503	2

λ is the estimated threshold value. The exponent ** denotes the rejection of the null hypothesis at 5%. Φ is the threshold cointegration test statistic. The lag length used was selected using LR, and AIC stands for Akaike information criterion. The values presented for Ljung–Box (LB) test are the *P* values

Table 4 Threshold cointegration with consistent momentum TAR model results

Country	ρ_1	ρ_2	λ^*	Φ	AIC	LB(4)	LB(8)	Lag
Algeria	0.132	0.172	10.610	8.252	– 1.798	5.799	9.432	2
Bahrain	0.654	0.723	10.103	99.892**	– 3.174	3.718	7.411	1
Egypt	1.142	1.194	9.758	2.426	– 6.411	9.002	9.772	1
Iran	0.234	0.287	10.989	66.189**	– 2.958	6.714	9.175	2
Iraq	0.496	0.589	10.497	123.487**	– 1.801	3.720	6.642	2
Jordan	1.201	1.238	9.812	7.263	– 2.277	6.336	8.565	1
Kuwait	0.031	0.099	10.783	56.296**	– 3.799	5.620	5.643	1
Morocco	0.921	0.951	10.214	4.596	– 2.609	9.116	9.221	1
Qatar	0.579	0.596	10.320	49.878**	– 5.491	3.788	5.591	1
Saudi Arabia	0.096	0.131	11.420	22.363**	– 1.701	6.045	9.956	2
Tunisia	0.875	0.933	9.723	5.123	– 7.579	2.135	5.101	1
UAE	0.732	0.777	11.521	14.366 **	– 5.852	5.411	6.383	2

λ is the estimated threshold value. The exponent ** denotes the rejection of the null hypothesis at 5%. Φ is the threshold cointegration test statistic. The lag length used was selected using LR, and AIC stands for Akaike information criterion. The values presented for Ljung–Box (LB) test are the *P* values

current balances in those countries are sustainable. These results showed that the threshold cointegration occurs only for the oil-producing countries those contributions to the total production of the MENA in the highest. Since the speed of adjustment is faster in the lower regime, these countries as a whole have the mechanism at their disposal to quickly return to equilibrium after they leave, or in other words, economies remain shorter in the downturn regime. For Tunisia, Jordan, Egypt, and Morocco belonging to the oil-importing countries, no evidence in favor of the threshold cointegration with asymmetric adjustment has been found.

Given the threshold cointegration is found, the next step proceeds with the Granger causality test using the advanced threshold error correction model by Enders and Granger (1998) and Enders and Siklos (2001). The results of the threshold cointegration tests present some interesting relationships for oil-producing countries in the selected economies. The study implements the following asymmetric ECM:

$$\Delta Y_{jt} = \alpha + \sum_{i=1}^{q1} \beta_{ji}\Delta \mathrm{CA}_{t-i} + \sum_{i=1}^{q2} \beta_{ji}\Delta \mathrm{OIL}_{t-i} + \gamma_{j1}Z_{t-1}^{\mathrm{plus}} + \gamma_{j2}Z_{t-1}^{\mathrm{minus}} + \mu_t \quad (15)$$

where $\Delta Y_{jt} = (\Delta \mathrm{CA}_t;\Delta \mathrm{OIL}_t)$, $j=1, 2$, while the Z_{t-1}^{plus} and Z_{t-1}^{minus} are error correction terms which serve as the speed of adjustments. It is also desirable to check whether these two sources of causation are jointly significant. Moreover, the joint significance of the γ coefficients and all the coefficients of a given explanatory variable is tested in order to indicate which variables bear the burden of short-run adjustment to restore the long-run equilibrium given a shock to the system.

Table 5 presents the results from the asymmetric error correction models. In case of Saudi Arabia, Iran, and the UAE, similarly to the findings in Tables 3 and 4, the current account deviations below the threshold adjust faster toward the long-run relationship than the deviation above the threshold (since $|\gamma_1| < |\gamma_2|$). In other words, deviations below the threshold from the long-run equilibrium resulting from increases in oil prices are corrected more quickly than deviations above the threshold. However, for Qatar, the speed adjustment is faster in the regime with deviations in oil prices above the threshold. This rather symmetric adjustment of current account may indicate that Qatar in general is not negatively influenced by higher oil prices. Although it is one of the oil-producing countries, at the same time, it is the leading liquefied natural gas exporting economy and currently becoming one of the three largest gas reserves in the world. This allows Qatar to level off the negative impact of increasing oil prices.

Panel A of Table 5 displays the results from the asymmetric error correction model for changes in current account (ΔCA) for oil-producing countries. It can be observed from the results displayed in Panel A that the regression coefficient on Z_{t-1}^{plus} is statistically significant at the 5% level in the case of Saudi Arabia and Iran. These results imply that changes in current account respond strongly to positive shocks to changes in oil prices. Panel B of Table 5 reveals the results from the asymmetric error correction model for changes in the oil price (ΔOIL). The result indicates that the regression coefficient Z_{t-1}^{minus} is statistically significant at the 5% level for all countries.

However, we must find out if they are strongly sustainable. In order to justify whether the sufficient condition is fulfilled for a strong current account sustainability, (if $\alpha_2=1$ in Eq. (11)), we have estimated Eq. (11) by OLS and used the Wald restriction coefficient test. The results are reported in Table 5, and they indicate that the estimated coefficient α_2 is statistically significant at the 5% level but statistically different from 1 for the seven countries in Table 6.

Table 5 Estimates of nonlinear error correction models

	Constant	Z_{t-1}^{plus}	Z_{t-1}^{minus}	ΔCA_{t-1}	ΔCA_{t-2}	ΔOIL_{t-1}	ΔOIL_{t-2}
Panel A: Equation for ΔCA							
Bahrain	− 7.961 (− 1.001)	− 0.246 (− 1.132)	− 0.062* (− 2.143)	0.271 (− 1.801)	− 0.101 (− 0.852)	6.225 (− 1.458)	4.720 (− 1.642)
Iran	8.191 (0.971)	− 0.181** (− 3.801)	− 0.022** (− 3.406)	0.072 (0.160)	0.245** (2.251)	6.781** (− 3.149)	4.868** (− 2.725)
Iraq	− 8.572 (− 0.140)	− 0.191* (− 2.275)	− 0.211* (− 3.187)	− 0.162 (− 1.423)	− 0.159 (− 1.428)	2.021** (− 2.497)	7.078** (− 2.441)
Kuwait	5.962 (0.089)	0.066 (− 0.559)	0.222 (− 1.336)	− 0.089 (− 0.023)	− 0.103 (− 0.103)	2.421** (− 3.108)	1.786 (− 0.559)
Qatar	4.612 (0.051)	0.021 (− 0.442)	− 0.192* (− 2.223)	− 0.042 (− 0.032)	− 0.071 (− 0.062)	1.782** (− 3.032)	5.769* (− 2.092)
Saudi Arabia	5.812 (0.001)	− 0.321** (− 3.442)	− 0.172* (− 2.423)	0.346** (− 2.022)	− 0.121 (− 0.032)	3.782** (− 4.032)	5.769** (− 3.092)
UAE	12.321 (0.099)	− 0.263* (− 2.442)	− 0.182* (− 2.423)	0.178** (− 2.862)	0.345** (− 2.262)	1.992** (− 2.666)	5.769** (− 5.092)
Panel B: Equation for ΔOIL							
Bahrain	− 9.861 (− 0.021)	0.321 (− 1.442)	− 0.242* (− 3.159)	0.302 (− 1.621)	0.131 (− 0.751)	4.529 (− 0.895)	4.932 (− 0.592)
Iran	6.291 (0.871)	− 0.498** (− 2.331)	− 0.322* (− 3.067)	0.073 (0.360)	0.245** (2.251)	2.781 (0.149)	3.868 (0.725)
Iraq	7.573 (− 0.040)	0.233* (− 2.335)	0.122* (− 3.111)	0.792** (− 2.420)	0.156 (− 0.528)	2.021 (0.477)	4.078 (− 0.771)
Kuwait	7.002 (0.029)	0.155 (− 0.449)	− 0.122* (− 1.336)	0.089 (− 0.023)	0.123 (− 0.103)	1.421 (− 0.138)	9.786 (− 0.559)
Qatar	5.712 (0.062)	0.111 (− 0.222)	− 0.182* (− 2.723)	0.342 (− 0.332)	0.061 (− 0.162)	1.782 (− 0.032)	5.785 (− 1.052)
Saudi Arabia	8.012 (0.141)	− 0.412** (− 3.132)	− 0.177* (− 2.223)	0.062 (− 0.032)	0.331 (− 0.062)	1.782 (− 0.032)	5.112 (− 1.092)
UAE	9.441 (0.059)	− 0.269* (− 2.752)	− 0.222* (− 3.223)	0.178** (− 3.872)	0.446** (− 4.262)	1.792** (− 4.666)	5.769* (− 2.092)

** and * represent rejection of the hypotheses at the 5% and 10% levels of significance. CA represents current account and OIL—oil price. The figures in parentheses are the *t* ratios. The Akaike information criterion is used to determine the optimal lag lengths

Table 6 Estimation of the Wald restriction coefficient test

	Bahrain	Iran	Iraq	Kuwait	Qatar	Saudi Arabia	UAE
F $(H_0 : \alpha_2 = 1)$	6.870***	21.119**	5.886**	0.158****	6.078**	1.091****	0.795***
P value	0.000	0.024	0.019	0.000	0.041	0.000	0.003

The long-run equilibrium equation is $x_t = \alpha 1 + \alpha 2\ m_t + u_t$, where x_t and m_t are exports and imports, respectively. F ($H0$: $\alpha 2 = 1$) is the statistic of the Wald coefficient restriction test. The *** and ** represent significance at 1, and 5% levels, respectively

This suggests that even though imports and exports have proven to be cointegrated for Bahrain, Iran, Iraq, Qatar, Saudi Arabia, Kuwait, and UAE, it seems that the current account is only strong sustainable for Saudi Arabia and weakly sustainable for Kuwait, Qatar, and UAE. However, the strong sustainability of Saudi Arabia's current account can be explained by the strong recovery in favor of a considerable increase in oil production and investment in non-oil activities, in a particular construction.

After testing the sustainability of current account balances in MENA countries, using the threshold cointegration method, we complete the analysis below using Pedroni (1999) panel cointegration test to examine the viability of current account in the MENA countries. The above inference can be improved if we combine the individual statistics through the definition of panel data statistics. Thus, the literature on non-stationary panel data statistics argues that a better characterization of the stochastic properties of the time series can be obtained if we increase the amount of information when performing the statistical inference.

The results in Table 7 indicate that, at the 5% level of significance, exports and imports are non-stationary processes, integrated of order one, I (1). However, although the use of panel data has a number of advantages over pure time series data, caution is needed when interpreting panel data results, especially when heterogeneity dimension among the cross-sections is not taken into account (Dumitrescu and Hurlin 2012).

As shown in Table 8, panel statistics suggest that the null hypothesis of non-cointegration can be rejected independently of the deterministic components included. There is, then, a cointegration relationship between the exports and imports of the countries studied, which implies that current balances are sustainable in the MENA region.

Since exports and imports are cointegrated, the panel dynamic OLS (DOLS) is used to estimate the long-term equation. The results of the estimation are presented in Table 8, and the restriction test χ^2 rejects the null hypothesis that the cointegration coefficient is equal to 1. This suggests that current balances are weakly sustainable in MENA countries as a panel. However, ensuring sustainable current balances presents a big challenge facing many developing countries in general and African countries, specifically, since many of them rely frequently on imports of various types of goods for consumption rather than for investment.

Table 7 Panel unit root test results

Fisher-ADF					
Variables	Level form		First difference		
	Z statistical	*P* value	*Z* statistical	*P* value	OBV
Export	− 8.855	0.225	− 4.775	0.001***	588
Import	− 3.226	0.682	− 4.473	0.000***	588
Im, Pesaran and Shin					
Variables	Level form		First difference		
	W statistical	*P* value	*W* statistical	*P* value	OBV
Export	− 1.175	0.119	− 2.403	0.008***	588
Import	− 0.656	0.255	− 3.846	0.000***	588
LM unit root tests with structural break					
	Level form		First difference		OBV
Export	− 1.393**		− 3.452***		588
Import	− 1.482**		− 3.888***		588

IPS (Im et al. 2003) and Fisher-ADF (Fisher 1932) are unit roots tests in heterogeneous panels with cross-sectional dependence. A lag of one was used for both IPS and Fisher-ADF tests. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively, of the null hypothesis of panel unit root. Panel LM unit root test with structural breaks by Lee and Strazicich (2003; 2004) and Im et al. (2005). And the 1%, 5%, and 10% critical values for the panel LM test without and with a break are − 2.326, − 1.645, and − 1.282, respectively.

4 Conclusion

In this article, we focus on MENA countries and examine the determinants that can influence the magnitude of its current account imbalances. To this end, we identify medium-term external imbalances on the basis of the following key fundamentals: General government consumption expenditure, oil balance, Official exchange rate, exchange rate regime, and GDP growth rate. However, considering the current account model with these engines and introducing the dynamic effect, the estimation results of appropriate approaches such as the GMM difference and the GMM system show that only the oil balance and the exchange rate regimes are relevant. Particularly, the fixed exchange rate regime is most effective in preventing absolute external imbalances. In addition, external imbalances also seem to be exacerbated by the deviations of the budget balance and the oil balance from their medium-term value. The empirical results, which are somewhat consistent with the previous theoretical and empirical literature, show that a more open economy, higher oil prices, and domestic economic growth generate an improvement in the current account balance, reflecting the original characteristics of the countries studied. Indeed, the boost to domestic economic growth is associated with an increase in domestic savings greater than investment in the MENA

Table 8 Pedroni (1999) panel cointegration test results

Alternative hypothesis: common (intra-dimensional) AR coefficients						
Approach	I		II		III	
	Statistical	*P* value	Statistical	*P* value	Statistical	*P* value
Panel V-stat	1.259	0.103	0.931	0.175	4.512	0.000
Panel rho-stat	− 3.511	0.000	− 0.597	0.275	− 0.284	0.388
Panel PP-stat	− 3.506	0.000	− 1.039	0.149	1.051	0.853
Panel ADF-stat	− 2.772	0.000	0.584	0.720	− 0.459	0.322
Alternative hypothesis: common AR coefficients (between dimension)						
	W statistical	*P* value	*W* statistical	*P* value	*W* statistical	*P* value
Group rho-stat	− 0.535	0.2962	− 0.398	0.345	1.051	0.853
Group PP-stat	− 3.418	0.0003	− 1.073	0.141	− 0.459	0.322
Group ADF-stat	− 2.693	0.0035	− 0.563	0.286	1.051	0.853

Dynamic least squares					
Variable	Coefficient	Std-Dev	*P* value	R^2	$F\ (H_0: \alpha=1)$
Import	0.993	0.030	0.000	0.969	10.860

"I" indicates a model with no deterministic intercept and no trend, "II," a model with an interception, but no trend, and "III," a model with deterministic interception and trend.

region. Furthermore, the analysis somewhat supports the allegation of a current account persistence as well as the existence of the double deficit hypothesis in the MENA countries, since public spending clearly deteriorates domestic savings and, by extension, therefore, the current balance.

In addition, this paper studies the sustainability of the current account in the Middle East and North Africa (MENA) countries. We pick up Husted's (1992) idea and examine whether or not the current account balance is sustainable by using the threshold cointegration test developed by Enders and Sikols (2001), allowing for asymmetric adjustment toward the long-run equilibrium. Our results show that the structural break nonlinearity is crucial to the current account balance of our sample. The results reject the null hypothesis of no cointegration thresholds in Bahrain, Iraq, Iran, Saudi Arabia, Kuwait, Qatar, and UAE, at a level of 5% for the TAR and M-TAR model. Then, current balances are only strongly sustainable for Saudi Arabia, but weakly sustainable for Kuwait and UAE.

Since the use of panel data has a number of merits over time-series data, the panel cointegration test developed by Pedroni (1999) was also adopted to test the sustainability of current balance. The findings are mixed from one country to another. In fact, panel threshold cointegration test estimates have shown that exports and imports are cointegrated and that the cointegrating coefficient is statistically more than 1, which means that current balances are weakly sustainable in the MENA region.

In view of the results obtained from our model, it should be mentioned that the current balances of especially the North African countries seem to be unsustainable, which implies that governments did not respect intertemporal budgetary constraints (Marial 2009). In view of the above, they should implement coherent economic policies aiming to reduce their current account deficits at a sustainable level to achieve their external stabilities. For the other countries in the specific region where sustainability has proved weak, they should put in place economic policies to strengthen the sustainability of current accounts.

The very different results for oil-exporting and oil-importing countries are notable. The persistence of the current account balance is more or less the same in the two subsamples, but the drivers differ significantly. The current account of oil exporters is mainly driven by internal factors such as the output gap, oil production, and the exchange rate regime. The current account of oil importers is driven by external factors reflecting by changes in the competitiveness of internal costs, which are partly determined by external developments.

As another implication, our results suggest caution in fiscal management in the studied countries to the extent that deviations in fiscal balance from its medium-term value increase external imbalances. As current account imbalances are also explained by deviations in oil balance from its medium-term value, prudent management of oil revenues is also recommended in the oil-exporting countries.

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Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Appendix

The data used in this article come from different sources. Below, we provide a list of abbreviations for the variables used in the analysis, along with a description of the variables and the source(s) from which the primary data used to construct these variables was drawn.

See Appendix Tables 9 and 10.

Table 9 Data sources and definition of the variables

Primary data	Sources	Notation	Comments
Current account balance	WEO Database, IMF	CA	% of GDP
General government consumption expenditure	IMF	GOV	General government final consumption expenditure (% of GDP)
GDP growth rate	WDI Database	Growth	Real GDP growth
Oil balance	WTRG Economics	OIL-P	Annual average of crude oil prices (in USD per barrel, inflation adjusted)
Exchange rate regime	Areaer, IMF	FIXED	The dummy variable FIXED takes the value one if the country has a strict fixed exchange rate regime and zero otherwise
Official exchange rate	WDI	OER	Official exchange rate (LCU per US$, period average)
Export	WDI	X	Exports of goods and services in log, at constant prices
Import	WDI	M	Import of goods and services in log, at constant prices
MENA countries included in the sample	Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Tunisia, UAE		
MENA oil-exporting countries included in the sample	Model B: Algeria, Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, UAE		
MENA oil-importing countries included in the sample	Model A: Egypt, Jordan, Morocco, Tunisia		

WDI – World Development Indicators (World Bank); IFS – Areaer- International Financial Statistics (IMF); WTRG Economics

Table 10 Unit root tests without structural breaks results

Country	Conventional tests						GLS-based point optimal tests	
	ADF		PP		KPSS		DF-GLS	
	X_t	M_t	X_t	M_t	X_t	M_t	X_t	M_t
				Level form				
Algeria	− 0.746	− 2.046	− 1.175	− 1.494	0.378	0.359	− 2.558	− 2.824
Bahrain	− 2.500	− 1.912	− 2.378	− 2.039	0.249	0.324	− 2.514	− 1.970
Egypt	− 2.630	− 1.346	− 2.362	− 1.371	0.331	0.390	− 2.622	− 2.592
Iran	− 1.763	− 2.741	− 1.621	− 2.646	0.389	0.282	− 3.112	− 1.890
Iraq	− 3.606	− 2.165	− 0.215	− 2.092	0.284	0.275	− 1.982	− 2.302
Jordan	− 2.878	− 2.931	− 2.326	− 2.537	0.443	0.334	− 2.440	− 2.368
Kuwait	− 2.760	− 3.009	− 2.841	− 2.902	0.410	0.236	− 2.902	− 1.933
Morocco	− 3.109	− 3.136	− 3.057	− 2.439	0.244	0.222	− 2.509	− 2.928
Qatar	− 1.847	− 1.475	− 1.491	− 1.170	0.368	0.388	− 3.711	− 2.330
Saudi Arabia	− 2.766	− 2.472	− 1.499	− 2.138	0.294	0.357	− 2.902	− 1.977
Tunisia	− 3.719	− 1.844	− 3.716	− 2.318	0.261	0.335	− 2.068	− 2.576
UAE	− 1.868	− 1.934	− 1.951	− 1.995	0.261	0.200	− 1.936	− 2.025
First difference								
Algeria	− 6.197***	− 4.578***	− 10.412***	− 4.841***	0.093***	0.068***	− 3.420***	− 4.531***
Bahrain	− 5.041***	− 5.109***	− 6.339***	− 7.243***	0.052***	0.064***	− 5.160***	− 5.230***
Egypt	− 5.712***	− 4.326***	− 5.705***	− 6.658***	0.062***	0.067***	− 3.171***	− 4.441**
Iran	− 3.618***	− 3.197***	− 4.699***	− 5.502***	0.055***	0.091***	− 3.313***	− 3.484***
Iraq	− 6.565***	− 4.418***	− 6.619***	− 4.307***	0.050***	0.071***	− 5.566***	− 3.390***
Jordan	− 4.135***	− 4.445***	− 7.265***	− 6.333***	0.055***	0.120**	− 4.123***	− 4.547***
Kuwait	− 6.791***	− 5.414***	− 7.657***	− 8.942***	0.035***	0.090***	− 5.373***	− 6.808***
Morocco	− 6.209***	− 4.218***	− 7.852***	− 5.812***	0.047***	0.050***	− 4.096***	− 4.022***
Qatar	− 4.126***	− 5.354***	− 5.733***	− 5.332***	0.084***	0.105***	− 3.935***	− 2.734**

Table 10 (continued)

Country	Conventional tests						GLS-based point optimal tests	
	ADF		PP		KPSS		DF-GLS	
	X_t	M_t	X_t	M_t	X_t	M_t	X_t	M_t
Saudi Arabia	− 6.353**	− 3.474***	− 5.397***	− 6.023***	0.081**	0.115**	− 4.858***	− 3.579***
Tunisia	− 3.418***	− 3.443***	− 7.190***	− 6.630***	0.009***	0.133**	− 6.931***	− 3.583**
UAE	− 3.3874***	− 3.810***	− 6.502***	− 5.086***	0.070***	0.083***	− 3.313***	− 3.801***

All tests are performed, including a constant and a trend in the model; *** and ** indicate statistical significance at the 5% and 10% levels, respectively

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