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Probing the exchange rate's asymmetric reaction to oil price changes in the new BRICS Plus group

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Abstract

We aim to show how any variants of a unified currency among BRICS Plus countries are challengeable, by probing the disparate influence of the positive and negative alterations in the crude oil's international price on the real effective exchange rates. The paper applies the nonlinear autoregressive distributed lag approach to separate oil price upswings from downswings and assesses how such changes asymmetrically affect the real effective exchange rates of BRICS Plus members in the short and long runs using monthly time series variables from January 2000 until July 2023. Our findings reveal that in the short run, the asymmetric impacts of the positive and negative oil price changes on the real effective exchange rates appear in all BRICS Plus countries. In the long run, Brazil and Argentina confirmed the asymmetric impact of oil price changes on their real effective exchange rates, while the symmetric impact is confirmed in Russia, the United Arab Emirates, and Ethiopia. Our findings prove that a unified currency or a unified monetary union is a very challenging idea, as continuous appreciations or depreciations of the local currencies of BRICS Plus countries will have to be implemented to preserve their alignment with the composite currency unit. Moreover, the asymmetric responses will induce diverse policy recommendations concerning the oil pricing. Our study comes to fill a vital lacuna in the literature as it is the first study to probe the asymmetric association between the oil's international price and the real effective exchange rate in the BRICS Plus countries.

Keywords: exchange rate, oil price, ARDL, NARDL, BRICS Plus.
JEL classification: C22, C52, F31, F41, Q43.

1. Introduction

On August 24, 2023, the BRICS group of emerging economies comprising Brazil, Russia, India, China, and South Africa agreed to invite six new members, namely Saudi Arabia, United Arab Emirates (UAE), Iran, Argentina, Egypt, and

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Ethiopia, to join the agglomeration in what would be potentially entitled BRICS Plus (Business Standard, 2023).[1] The new members formally joined the group on January 1, 2024 — with the exception of Argentina which formally declined the invitation in December 29, 2023, following the election of a new president.[2] While the group cannot be considered as an organization as it neither has headquarters nor an abiding treaty, it does have an institution — the New Development Bank (NDB) — headquartered in Shanghai, China. The aim of NDB may be clear in financing infrastructure and providing emergency loans to the member states; nevertheless, the general political and economic aims of the group remain vague, and can solely be extracted from the opening speeches of the group's heads of states in the successive BRICS conferences.

One of the aims announced by the Brazilian president in the last BRICS conference that took place on August 22–24, 2023 in Johannesburg, South Africa, was the creation of a unified currency of BRICS members for trade and investment among them. While the proposed currency is meant to decrease dependence on the U.S. dollar to reduce the uncertainty associated with the dollar's fluctuations, many economists pointed out the difficulty of its implementation, given the diverse economic, political, and geographical structures of the member states (Savage, 2023). Furthermore, it was not clear whether the suggestion meant the creation of a composite currency unit where each member country preserves its local currency but agrees on an exchange rate dominated by the unified currency (a system similar to the abandoned European Currency Unit (ECU)), or to a unified currency where local currencies are totally abandoned and member countries surrender their monetary policy to a unified central bank (similar to the adoption of the euro in the eurozone countries). Given the declaration by the chief financial officer of the NDB that the members are not in a position to create a common currency soon (Sguazzin, 2023), we believe that a more probable step might be the creation of a unified monetary system. Yet even with such a system, member states would encounter multiple difficulties in preserving the conversion rates (within certain fixed margins) across their currencies, and between each local currency and the *unified* currency without *unified* macroeconomic policies. Otherwise, the conversion rates will be continuously modified to account for depreciation or appreciation in the real effective exchange rates. In this research, we show how one factor alone — the international crude oil price — will place an enormous challenge to a unified composite BRICS currency by influencing the real exchange rate (REER) differently in each BRICS Plus member state. Our emphasis will be on differentiating between the positive and the negative alterations in the oil price on REER. Even though empirical researches on asymmetries in the effect of oil price on exchange rate in BRICS countries abound, there is no evidence in the extant literature that assesses the impact on BRICS Plus countries or compares and contrasts such impact between the old and new members, which makes our study the first of its kind. This paper addresses this deficiency using the nonlinear autoregressive distributed lag (NARDL) approach on monthly time series that extend from 2000M1 till 2023M7. The NARDL approach

[1] While the name of the new group comprising the new members is not officially announced, we will use the proposed term — BRICS Plus — throughout this research for easier differentiation between the old group — BRICS — and the new group.

[2] Even though Argentina officially declined the invitation to join BRICS, we incorporate it in our study due to the possibility of its rejoining the agglomeration in the future in case a pro-BRICS government wins future elections.

produces estimates of the long-run and short-run impacts and tests for asymmetries in both time spans. Accounting for such asymmetries in the respective countries' REERs would also reveal whether or not a unified currency or a unified monetary union is feasible, which is the second objective of this paper. The paper is organized as follows. Section 2 reviews the present literature, while Section 3 explains the data sources and the methodological techniques employed. Section 4 reviews the results while the main findings and policy implications are stated in Section 5.

2. Theoretical background and literature review

Theoretically, oil price can influence the exchange rate via two trajectories: first, through the balance of payments, as any oil price rise will lead to the movement of capital from the oil-importing countries to the oil-exporting ones; second, through the terms of trade; since oil is considered a tradable input, a rise in the price of which will lead to a fall in the price of the non-tradable input — labor — in this two-country model, so that the goods of the tradable sector remain competitive. As the non-tradable sector uses more energy, commodities of the non-tradable sector would eventually increase leading to a rise in the exchange rate (Benassy-Quere et al., 2007). With respect to the group's aspiration of a unified currency or a unified monetary union, the existence of asymmetric changes in the exchange rate's responses to oil price change that differ across their countries can pose a significant challenge to its successful implementation, according to the theory of optimum currency areas (OCA). The OCA, originally formulated and developed by Mundell (1961), McKinnon (1963) and Kenen (1969), underscores the criteria upon which a unified currency can be sustainable. It has evolved over time to reflect a move away from criteria that focus on the state of the economy (like labor mobility, openness, and product diversification) and toward criteria that rely on desired policy trade-offs, such as real exchange rate variability, degree of policy integration, degree of wage and price flexibility, and similarity in inflation rates (Kunroo, 2015). In other words, aligning real exchange rate variability is a key factor underscoring the success of a unified currency.

Concerning the BRICS Plus members, the pass-through of the oil price change to the exchange rate is expected to vary due to two main factors. Firstly, some members are major oil-exporters (Russia, Saudi Arabia, UAE, Iran, Brazil) while others are major oil-importers (China, India); therefore, the impact of oil price changes on their balance of payments, and hence their REERs, will be different. Secondly, the adoption of different exchange regimes by the group members can ease or restrain the oil price change pass-through to REER. For example, Saudi Arabia and the UAE have been pegging their currencies to the U.S. dollar ever since 1986 and 1997 respectively, while Argentina did so from 1990 until 2002 when the system was finally abandoned and the country converted to a floating exchange rate regime. Brazil adopts a floating exchange rate regime[3] and so does India and South Africa (Oseifuah and Korkpoe, 2018). China, Russia, Iran, Ethiopia, and Egypt adopt some shades of a managed-float regime (Strohecker, 2019).

Although the first wave of researches tackling the oil price-exchange rate relation comprised a myriad of studies they all assumed linearity (see for example,

[3] Banco Central Do Brasil. https://www.bcb.gov.br/en/financialstability/fxpolicy

Chen and Chen, 2007; Ding and Vo, 2012; Reboredo, 2012; Kisswani, 2016). Notwithstanding, this assumption was earlier challenged by Hamilton (1983) and Mork (1989) who assumed that the influences of the oil price hikes and falls on the exchange rate are likely to vary in magnitude and direction, opening a plethora of studies on the non-linear or asymmetric relation between the two variables.

In fact, the extant literature comprises ample discussions on the asymmetric oil price-exchange rate nexus in developing and developed countries using multiple econometric techniques. Baek (2021), for example, confirms the relation with respect to OPEC oil-producing countries, but restricted the relation to those with flexible exchange rate regimes. It is widely known that many major oil-producing countries such as Kuwait, Saudi Arabia, and the UAE peg their currencies to the U.S. dollar; therefore, any effect of oil price alterations will appear only through its impact on the U.S. dollar. His results contradict those of Nouira et al. (2019) on some Middle Eastern countries using the official exchange rates. Their results confirmed that, with respect to Saudi Arabia, oil price rises (rather than falls) affect the exchange rate. Ahmed and Hernandez (2013) used the autoregressive distributed lag (ARDL), threshold autoregressive (TAR), and momentum threshold autoregressive (M-TAR) models and traced asymmetry in the UK, the eurozone countries, Brazil, and Nigeria. There was also evidence of asymmetry in India (Kumar, 2019; Bal and Rath, 2015), China (Bal and Rath, 2015), India and China but only in the long run (Khraief et al., 2021), some OECD countries (Kisswani and Elian, 2021), some African countries (Saidu et al., 2021; Baek and Kim, 2019), Indonesia (Alqaralleh, 2019; Saidi et al., 2020), Nigeria (Onodje et al., 2021) and Algeria (Chekouri et al., 2021). On the other hand, fewer studies supported a symmetric relation between the two variables, such as that in India and China (De Vita and Trachanas, 2016). Kozlovtceva et al. (2020) concluded that the dynamics of the CPI are likely to be impacted by exchange rate appreciation linked to rising commodity prices in a commodity-exporting economy. Although central banks typically attempt to ignore changes in relative prices, it can be very difficult to do so when those changes are persistent. As a result, the authors anticipate that central banks may relax their monetary policy and "lean against the wind" when commodity prices rise (Kozlovtceva et al., 2020).

Few studies were centered on BRICS countries, such as that by Salisu et al. (2021) who focused their study on the five founding BRICS members. The finding of their study highlighted that the oil price is an important predictor of the exchange rate in both oil-exporting BRICS members (Brazil and Russia) and oil-importing ones (China and South Africa).

Despite its extensiveness, the extant literature on the oil price–exchange rate nexus pinpoints some caveats. First, no study was ever done on BRICS Plus members. This is a fundamental gap in the literature as two of the world's major producers and exporters of oil — Saudi Arabia and the UAE — have recently joined the agglomeration. Consequently, it is vital to compare the impact of oil price changes on their exchange rates with that of other old members, especially with the intention of the group to create a common monetary union or even a common currency. Besides, no studies were ever done on the oil price-exchange relationship in some new BRICS Plus members such as Ethiopia. Second, very few studies were done using the real effective exchange rate, rather than the official exchange rate or the real exchange rate. As mentioned earlier, Saudi Arabia and the UAE peg their currencies to the U.S. dollar, therefore any impact of oil price changes on the official exchange rate as done in the previous studies will appear insignificant if there was no impact of the oil price change on the U.S. dollar. Our study overcomes this deficiency. Summing up, our study comes to fill a vital lacuna in the literature as it is the first study ever to investigate the asymmetric link between the international oil price and REER in the new BRICS Plus countries.

3. Data and methodology

3.1. Data

To probe the association between REER and the international price of oil in the BRICS Plus countries, we use monthly data starting 2000M1 until 2023M7. LREER is the monthly real effective exchange rate (CPI-based) in natural logs. The real effective exchange rate, obtained from Bruegel database,[4] measures the value of a country's exchange rate against a basket of other currencies. LOIL is the natural log of "crude oil average spot price per barrel of Brent, Dubai, and West Texas Intermediate, equally weighed" with data obtained from the IndexMundi[5] data portal. Fig. 1 shows the logged time series of REER in the eleven countries (with its scale on the left- hand side) besides the logged value of the international oil price (with its scale on the right-hand side).

3.2. Methodology

We begin by constructing our general long run equation as follows:

$$LREER_t = a_0 + a_1 LOIL_t + v_t, \tag{1}$$

where *LREER* and *LOIL* were defined earlier, while v is the error term that embodies the excluded factors which may influence the evolution of BRICS Plus's real effective exchange rates and is assumed to be *iid*. To grasp the short-run response of the international oil price change, we can redraft equation (1) in an Error Correction Model (ECM) format, and estimate the coefficients that are attached to the first differenced variables. To capture the long-run impact of the international oil price change, we can examine the coefficients that are attached to the lagged levels of oil price (equation 2):

$$\Delta LREER_t = \beta_0 + \sum_{k=1}^{n} \delta_k \Delta LREER_{t-k} + \sum_{k=1}^{n} \phi_k \Delta LOIL_{t-k} + \\ + \beta_1 LREER_{t-1} + \beta_2 LOIL_{t-1} + \beta_3 DUM_t + \varepsilon_t. \tag{2}$$

Equation (2) also includes a dummy variable $DUM_t = (DUM_{1t}, ..., DUM_{jt})$, which accounts for any major structural break in the time series. The dummy variable has a value equal to 1 if the observation belongs to the j^{th} period and 0 if it exists in any other period. Variables that are integrated of different I(0) and I(1) orders are co-

[4] https://www.bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database

[5] https://www.indexmundi.com/

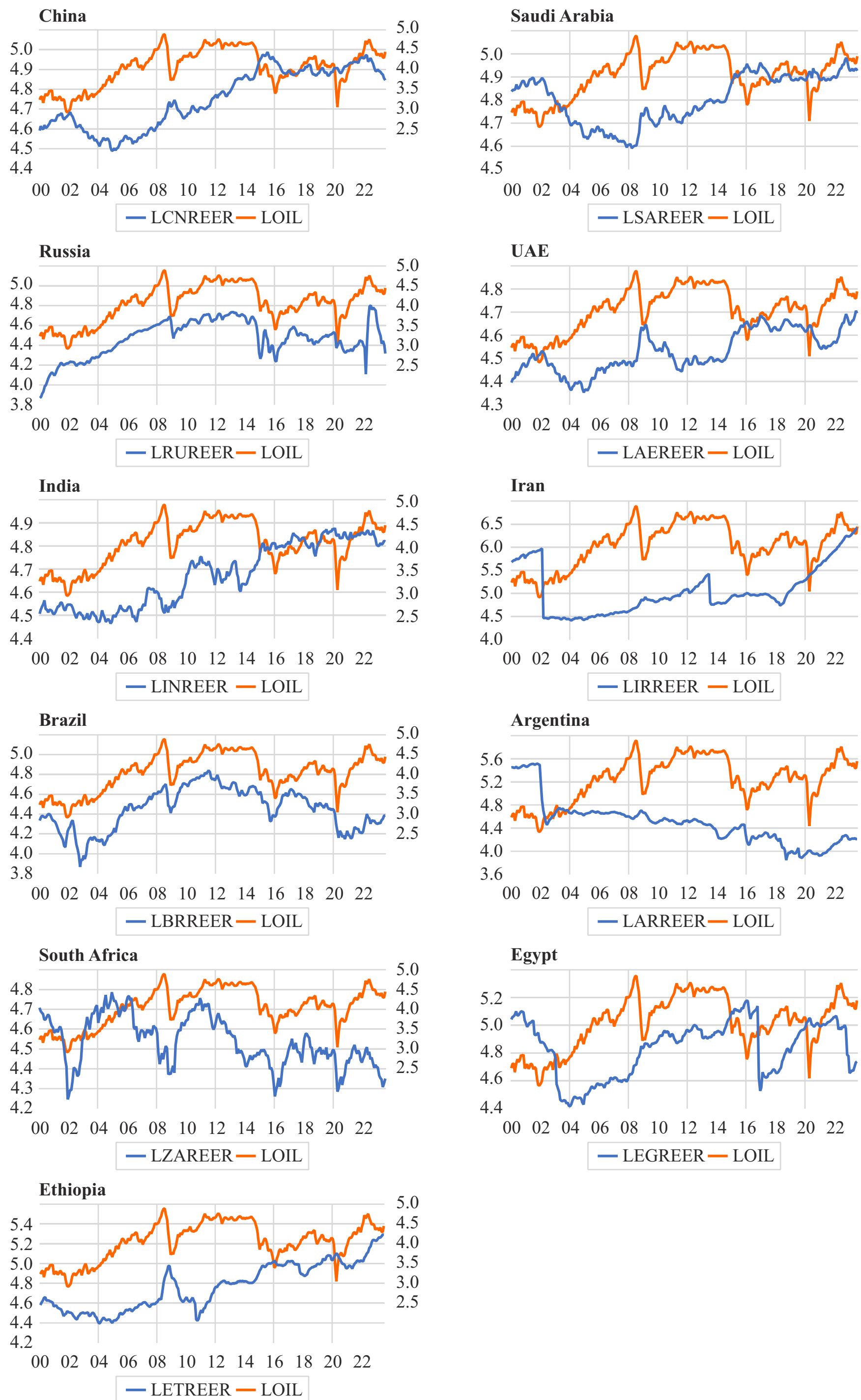

Fig. 1. Evolution of BRICS Plus real effective exchange rates (LREER), and the international oil price in natural logs, 2000M1–2023M7.

Note: REER is the monthly real effective exchange rate (CPI-based). LOIL is crude oil average spot price per barrel of Brent, Dubai and West Texas Intermediate, equally weighed. The acronyms of China, Russia, India, Brazil, South Africa, Saudi Arabia, UAE, Iran, Argentina, Egypt and Ethiopia are CN, RU, IN, BR, ZA, SA, AE, IR, AR, EG, and ET respectively, and are added to the REER acronym. All variables are transformed to their natural logs and have the letter "L" added to the country-real effective exchange rate acronym.
Source: IndexMundi data portal.

integrated if there exists a linear combination between the two variables and they share a common trend. To test for co-integration, a formal F-test is conducted with critical bounds (Pesaran et al., 2001). The lagged Error Correction Term (ECT_{t-1}) can substitute the linear combination of the lagged level variables (equation 3):

$$\Delta LREER_t = \beta_0 + \sum_{k=1}^{n} \delta_k \Delta LREER_{t-k} + \sum_{k=1}^{n} \phi_k \Delta LOIL_{t-k} + \\ + \beta_3 DUM_t + \omega_1 ECT_{t-1} + \varepsilon_t. \quad (3)$$

The linear ARDL model in equation (3) assumes that the reactions of REER to any changes from the oil prices are symmetric, an assumption which has recently been challenged as previously mentioned, as it neglects assessing the potential differences in the influences of positive and negative oil prices shocks on the real effective exchange rate (see, for example, Gbato et al., 2017; Alqaralleh, 2019). To account for such possible asymmetries in the reaction of LREER to positive and negative oil price alterations, we estimate separate NARDL models for each of the eleven countries under study. Following Shin et al. (2014), we can formulate the asymmetric long-run relationship as follows:

$$LREER_t = a_0 + \delta^+ LOIL_t^+ + \delta^- LOIL_t^- + \varepsilon_t, \quad (4)$$

where $LOIL_t^+$ and $LOIL_t^-$ are fractional sum processes of positive and negative changes in LOIL.

They are calculated as follows:

$$LOIL_t^+ = \sum_{1}^{t} \Delta LOIL_t^+ = \sum_{i}^{t} \max(\Delta LOIL_i, 0); \quad (5)$$

$$LOIL_t^- = \sum_{1}^{t} \Delta LOIL_t^- = \sum_{i}^{t} \min(\Delta LOIL_i, 0), \quad (6)$$

where $LOIL_t^+$ and $LOIL_t^-$ are positive and negative changes in the crude oil's international price. Any increases or decreases in the international price of oil are revealed by the long-run parameters δ^+ and δ^- respectively. Substituting LOIL in the linear ARDL model of equation (2) by the fractional sum processes of positive and negative changes in $LOIL$—$LOIL_t^+$ and $LOIL_t^-$—we obtain the following NARDL model:

$$\Delta LREER_t = \lambda_0 + \lambda_1 DUM_t + \sum_{k=1}^{n} \varsigma_k \Delta LREER_{t-k} + \sum_{k=1}^{n} \eta^+ \Delta LOIL_{t-k}^+ + \\ + \sum_{k=1}^{n} \eta^- \Delta LOIL_{t-k}^- + \rho_k LREER_{t-1} + \psi^+ LOIL_{t-1}^+ + \psi^- LOIL_{t-1}^- + \varepsilon_t. \quad (7)$$

Nonlinearities in short and long-run ARDL models can be expressed by the positive and negative components of the regressors (Shin et al., 2014). The nonlinear cointegration between the dependent variable and the regressors can be tested using the F-statistics with the null hypothesis assuming no cointegration ($\rho = \psi^+ = \psi^- = 0$) against the alternative hypothesis of cointegration. To test for the long-run asymmetric effect, we test for the long run symmetric effect of increases and decreases in the international price of oil. In other words, we test whether or not $\psi^+ = \psi^-$ where $\psi^+ = \psi^+/\rho$ and $\psi^- = \psi^-/\rho$. Rejecting the null hypothesis of long-run symmetry implies that the responses to the positive and negative changes in oil prices are *asymmetric* in the long run.

Following the same logic but concerning the short run, we test the null hypothesis of symmetry in the short-run impact of the rises and falls in the international oil price on LREERs, or

$$\sum_{k=1}^{n}\eta^{+} = \sum_{k=1}^{n}\eta^{-}. \tag{8}$$

Short run asymmetric impacts of oil price changes exist if the null hypothesis is rejected. In addition, if the fractional sum processes in the independent variable take different lags, then this will imply that there is asymmetry in short-run adjustments.

4. Empirical analysis

4.1. Descriptive statistics

We display the descriptive statistics in two separate Tables 1 and 2 to contrast the differences in the data between the old and new members of BRICS Plus.

Despite the log transformation, some new member's data such as the real exchange rate of Argentina (LARREER) displays leptokurtic (Kurtosis > 3.0)

Table 1
Descriptive statistics of the logged variables: original members.

Descriptive statistics	LOIL	LCNREER	LRUREER	LINREER	LBRREER	LZAREER
Mean	4.052510	4.753170	4.465634	4.672297	4.448978	4.538153
Median	4.115940	4.752728	4.490096	4.679350	4.471753	4.515136
Maximum	4.889070	4.988458	4.801723	4.878627	4.841506	4.786575
Minimum	2.918850	4.489423	3.868489	4.464298	3.867444	4.245204
St. deviation	0.481860	0.149090	0.187635	0.136899	0.211353	0.124577
Skewness	–0.418099	–0.118120	–0.600218	0.006646	–0.310334	–0.036862
Kurtosis	2.184893	1.540140	3.013527	1.424229	2.292698	2.156950

Note: The acronyms of China, Russia, India, Brazil, South Africa are CN, RU, IN, BR, ZA respectively, and are added to the to the REER acronym. All variables are transformed to their natural logs and have the letter "L" added to the country-real effective exchange rate acronym.
Source: Author's calculations.

Table 2
Descriptive statistics of the logged variables: new members.

Descriptive statistics	LSAREER	LAEREER	LIRREER	LARREER	LEGREER	LETREER
Mean	4.804234	4.532418	5.060969	4.491965	4.836070	4.768304
Median	4.819636	4.514041	4.939998	4.499699	4.895000	4.799420
Maximum	4.982921	4.706011	6.410701	5.517935	5.178182	5.290336
Minimum	4.590665	4.352598	4.417032	3.843744	4.416186	4.395683
St. deviation	0.106274	0.088661	0.519752	0.386786	0.201283	0.235576
Skewness	–0.335466	0.061658	0.834252	1.014337	–0.463297	0.165601
Kurtosis	1.796824	1.908460	2.693317	4.217321	2.004665	1.835994

Note: The acronyms of China, Russia, India, Brazil, South Africa are CN, RU, IN, BR, ZA respectively, and are added to the to the REER acronym. All variables are transformed to their natural logs and have the letter "L" added to the country-real effective exchange rate acronym.
Source: Author's calculations.

implying a distribution with long tails (outliers). This might have been due to Argentina's long history of anchoring its currency (the peso) with the U.S. dollar through the currency board system before finally abandoning the system in the second half of 2001, a policy that led to a sharp depreciation of the currency in the years that followed. It can also be discernable that the maximum logged values of REER of some new members, Iran, Argentina, Egypt, and Ethiopia were 6.42, 5.52, 5.18, and 5.29 respectively, all exceeding the 4.9 limit of the old members. Such values imply that the new members had episodes of overvalued real exchange rates indicative of a loss of competitiveness that accompanies an overvalued exchange rate pegged at higher-than-market equilibrium rates.

4.2. Unit root tests

We employ the Augmented Dickey–Fuller (ADF) and Philips–Perron (PP) tests (Table 3) to test for stationarity of the time series. The results of both tests imply

Table 3
Unit root tests.

Variable	Level		First difference	
	Intercept	Intercept and trend	Intercept	Intercept and trend
ADF test				
LOIL	–2.462856	–2.721701	–12.35088***	–12.32917***
LCNREER	–0.970463	–1.553994	–12.58886***	–12.57134***
LRUREER	–3.519073***	–3.210287*	–10.95561***	–11.12509***
LINREER	–1.133846	–3.220616*	–14.37328***	–14.34731***
LBRREER	–1.903802	–1.880015	–12.14835***	–12.13169***
LZAREER	–2.693648*	–3.192717*	–13.99863***	–13.97392***
LSAREER	–1.047117	–2.019695	–12.57739***	–12.62420***
LAEREER	–1.581914	–2.795137	–11.03543***	–11.01909***
LIRREER	–0.789374	–1.774326	–16.30669***	–16.52542***
LARREER	–2.537871	–3.377080*	–9.49531***	–9.54727***
LEGREER	–2.200718	–2.453121	–14.04601***	–14.02518***
LETREER	–0.377939	–3.243087	–10.91316***	–10.97113***
PP test				
LOIL	–2.258174	–2.409701	–11.87318***	–11.84337***
LCNREER	–1.077307	–1.435271	–12.68006***	–12.66291***
LRUREER	–3.214442**	–2.667241	–12.17074***	–12.34212***
LINREER	–1.106288	–2.854142	–14.24848***	–14.22041***
LBRREER	–1.823579	–1.774961	–12.10781***	–12.09028***
LZAREER	–2.593254*	–3.065264	–13.99863***	–13.97392***
LSAREER	–0.968895	–1.882914	–12.52098***	–12.56129***
LAEREER	–1.479114	–2.557905	–11.00088***	–10.98393***
LIRREER	–0.845959	–1.795142	–16.30665***	–16.52402***
LARREER	–2.389870	–2.846917	–9.25564***	–9.25926***
LEGREER	–2.031179	–2.247110	–14.03697***	–14.01581***
LETREER	–0.349225	–2.935164	–11.01775***	–11.03982***

Note: *, **, *** denotes rejection of the null hypothesis at the 1%, 5%, and 10% significance level. The number of lags is selected by the Schwarz info criterion with a maximum lag of 15. The bandwidth for the PP test is selected automatically by Newey–West Bandwidth, using the Barlett Kernel spectral estimation method. LOIL, LCNREER, LRUREER, LINREER, LBRREER, LZAREER, LSAREER, LAEREER, LIRREER, LARREER, LEGREER, LETREER are the logged values of the international price of oil, the real effective exchange rates of China, Russia, India, Brazil, South Africa, Saudi Arabia, the United Arab Emirates, Iran, Argentina, Egypt and Ethiopia respectively. Variables are in logarithmic form. The 1%, 5%, and 10% critical values for the ADF and PP tests are –3.453483, –2.871619, and –2.572213 for the test with an intercept only, and –3.991053–3.425898, and –3.136128 for an intercept and trend.
Source: Author's calculations.

Table 4
Unit root tests with structural breaks.

Variable	Level	Break date	First difference
LOIL	–5.058192*	2014M09	–13.53031***
LCNREER	–2.455190	2012M10	–13.19615***
LRUREER	–5.803951***	2014M07	–15.63587***
LINREER	–4.212050	2009M09	–14.92560***
LBRREER	–4.341303	2008M12	–13.00785***
LZAREER	–4.676673	2002M09	–15.14949***
LSAREER	–3.882124	2008M07	–13.49427***
LAEREER	–3.552239	2014M07	–11.27433***
LIRREER	–6.267758***	2002M02	–37.21548***
LARREER	–7.156907***	2001M12	–11.10770***
LEGREER	–3.253378	2016M10	–21.04159***
LETREER	–4.045500	2010M09	–12.75905***

Note: *, **, *** denotes rejection of the null hypothesis at the 1%, 5%, and 10% significance level. The trend specification was intercept and trend, and the breaking was assumed in the intercept and trend. The number of lags is selected by the Schwarz info criterion with a maximum lag of 15. Breakpoint selection was chosen according to the Dickey–Fuller min-*t* test. LOIL, LCNREER, LRUREER, LINREER, LBRREER, LZAREER, LSAREER, LAEREER, LIRREER, LARREER, LEGREER, LETREER are the logged values of the international price of oil, the real effective exchange rates of China, Russia, India, Brazil, South Africa, Saudi Arabia, the United Arab Emirates, Iran, Argentina, Egypt, and Ethiopia respectively. Variables are in logarithmic form. The 1%, 5%, and 10% critical values are –5.719, –5.175, and –4.893 for the test.
Source: Author's calculations.

that the variables are nonstationary at levels but stationary at first differences. The results guarantee that *none* of our variables are I(2), a condition required for ARDL (or NARDL) estimations.

We also test for unit roots with structural breaks (Table 4), to eschew any biasness in the results of the previous unit root tests that may result from the presence of structural breaks (Perron, 1989).

The breakpoint unit root tests demonstrated that the logged exchange rates of all except for three (Russia, Iran, and Argentina) members have unit roots at levels and that the time series turned stationary when first differenced. To overcome assigning multiple dummy variables accounting for every structural break in each country, we therefore allow for one dummy at the most probable structural break date when estimating the ARDL and NARDL models of each member country.

4.3. Nonlinearity tests

We employ Brook et al. (1996) BDS to test for the nonlinearity of the logged oil price and the logged exchange rates of the BRICS Plus countries. Results demonstrated in Table 5 reject the null hypothesis that our time series variables are identically and independently distributed. Accordingly, the use of the NARDL technique is verified.

4.4. Results

4.4.1. The ARDL models

In this section, we examine the impact of oil price changes on the exchange rate and determine whether the effects are symmetric or asymmetric. For that

Table 5
The results of the BDS test for nonlinearity.

BDS statistics series	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
LOIL	0.177203***	0.297551***	0.37659***	0.426526***	0.455949***
LCNREER	0.196633***	0.333594***	0.427687***	0.491720***	0.534404***
LRUREER	0.178136***	0.299737***	0.382166***	0.434160***	0.466747***
LINREER	0.194565***	0.328898***	0.420763***	0.483094***	0.524217***
LBRREER	0.181152***	0.304066***	0.385469***	0.437619***	0.469117***
LZAREER	0.163246***	0.271414***	0.340237***	0.382076***	0.404567***
LSAREER	0.187931***	0.316539***	0.403721***	0.462254***	0.500167***
LAEREER	0.179838***	0.301948***	0.384948***	0.440661***	0.476946***
LIRREER	0.194636***	0.328241***	0.419972***	0.482828***	0.526208***
LARREER	0.179838***	0.301948***	0.384948***	0.440661***	0.476946***
LEGREER	0.188874***	0.318748***	0.405739***	0.462104***	0.497168***
LETREER	0.189227***	0.317821***	0.405097***	0.464138***	0.503151***

Note: *** denotes the rejection of the null hypothesis that the residual is *iid* at the 1% significance level. LOIL, LCNREER, LRUREER, LINREER, LBRREER, LZAREER, LSAREER, LAEREER,, LIRREER, LARREER, LEGREER, LETREER are the logged values of the international price of oil, the real effective exchange rates of China, Russia, India, Brazil, South Africa, Saudi Arabia, the United Arab Emirates, Iran, Argentina, Egypt and Ethiopia respectively.
Source: Author's calculations.

purpose, the linear and nonlinear ARDL models are estimated by the OLS method. We allow for a maximum of 12 lags and use AIC to choose the optimal number of lags. Table 6 encapsulates the results from estimating the linear ARDL model. Short-run estimates are stated in Panel A, while the long-run estimates are illustrated in Panel B, whereas Panel C reports some diagnostic checks. With respect to the short-run effects of the oil price changes on the real effective exchange rate, Panel A shows that there is at least one statistically significant coefficient in five out of the eleven countries. The effect is negative in China, and the UAE, implying that a rise in the oil price decreases their REERs. On the other hand, the impact is positive in Brazil and South Africa, implying that a rise in the international price of oil increases their REERs and decreases their export competitiveness. In Saudi Arabia, the impact of an oil price rise is alternating, starting from a decrease in REER to an increase and finally to a decrease. The short-run impact either does not appear or is insignificant in the remaining six countries.

The negative and significant ECT term suggests that cointegration exists in all eleven countries. However, at the 5% significance level or lower, the *F*-bounds test in Panel C suggests weak cointegration in Brazil and Egypt, and no cointegration in the case of Saudi Arabia. Moreover, Panel B shows that in four countries oil prices have no or weak statistically significant long-run coefficient estimates. Finally, the diagnostic checks in Panel C show no evidence of residual serial correlation; however, there is evidence of heteroskedasticity in six countries and model misspecification and instability in Iran and Argentina.

To assess whether the possible lack of cointegration (as proposed by the *F*-bounds test) in some countries in addition to some model misspecifications was a result of neglected non-linearity in the models, we apply the NARDL model in equation (7). Table 7 summarizes the results. Panel A illustrates the short-run estimates, while Panel B demonstrates the long-run estimates; some diagnostic tests are provided in Panel C.

Table 6
Linear ARDL model coefficient estimates and diagnostic checks (model selection—AIC).

	CN	RU	IN	BR	ZA	SA	AE	IR	AR	EG	ET
A. Short-run estimates of ARDL models (dependent variable LREER)											
D(LOIL)	–0.014211**			0.071011***	0.079296***	–0.037785***	–0.032582***	–0.076651		–0.022898	–0.020331
D(LOIL(–1))					0.037698*	–0.001436					
D(LOIL(–2))					0.031181	0.014820**					
D(LOIL(–3))						–0.022856***					
OILDUM	Excluded	Excluded	0.019307***	–0.010906**	–0.013073***	0.003362	0.008151***	0.068381***	–0.031535***	0.016837*	0.022595
REERDUM	0.006145***	–0.010820***	0.020692***	0.009831**	0.031330***	0.002889**	–0.006469***	–0.155375***	–0.075648***	–0.018332*	–0.002614
D(LREER(–1))	0.297849***	0.263496***	0.196349***	0.279179***	0.117350**	0.219451***	0.366786***		0.485843***	0.164648***	0.342487***
D(LREER(–2))	–0.034582	–0.026012			–0.075362		–0.090866				
D(LREER(–3))	–0.028597	–0.125667**			0.084512						
D(LREER(–4))	0.195235***				0.029239						
D(LREER(–5))	–0.076517				0.022223						
D(LREER(–6))					–0.152235***						
CointEq(–1)*	–0.027743***	–0.149852***	–0.135181***	–0.045008***	–0.073765***	–0.026042***	–0.048881***	–0.073695***	–0.080156***	–0.038800***	–0.048599***
B. Long-run estimates of ARDL models (dependent variable LREER)											
LOIL	0.133831**	0.306978***	0.012765	0.229727**	–0.173161*	0.020891	0.097377***	0.887734***	–0.006033	0.289259*	0.340403***
C	4.130043***	3.233084***	4.481355***	3.468547***	4.900368***	4.614054***	4.214241***	3.076499***	5.508621***	3.613305***	3.273535***
C. Diagnostic tests											
CointEq(–1)*	–0.027743***	–0.149852***	–0.135181***	–0.045008***	–0.073765***	–0.026042***	–0.048881***	–0.073695***	–0.080156***	–0.038800***	–0.048599***
Adj. R^2	0.158639	0.202520	0.109319	0.150850	0.188245	0.212968	0.287604	0.104514	0.347236	0.063266	0.246917
Serial correlation LM test (Obs. R^2)	3.593615	0.265571	1.906653	1.396706	0.080956	0.348854	1.332497	0.637610	1.157641	0.502461	0.988724
Breusch–Pagan–Godfrey heteroskedasticity test (Obs. R^2)	14.237570	72.085760***	12.09365**	44.76919***	17.683730	14.59553	20.097300***	36.080800***	25.100670***	7.333591	5.153811
Ramsey RESET (t-statistic)	1.600606	1.906249*	0.541167	0.085364	0.191940	1.057903	0.254765	3.277881***	3.467799***	2.539540	1.803708*
CUSUM	Stable	Stable	Stable		Stable	Stable	Stable	Unstable	Unstable	Unstable	Stable
CUSUM SQ	Stable	Unstable	Stable		Stable	Stable	Stable	Unstable	Unstable	Unstable	Unstable
ARDL	(6, 1)	(4, 0)	(2, 0)		(7, 3)	(2, 4)	(3, 1)	(1, 1)	(2, 0)	(2, 1)	(2, 1)
F-bounds test	4.552280**	11.041120***	9.934158***		8.364385***	3.123356	8.162165***	8.834948***	12.794170***	3.994561*	10.251110***
Observations	277	279	281		276	279	280	282	281	281	281

Note: *, **, *** indicates 10%, 5%, and 1% significance level. CH, RU, IN, BR, ZA, SA, AE, IR, AR, EG, ET are the acronyms of China, Russia, India, Brazil, South Africa, Saudi Arabia, the United Arab Emirates, Iran, Argentina, Egypt and Ethiopia respectively. The F-bounds test checks the null hypothesis of no-cointegration against the alternative of cointegration. LM is Breusch–Godfrey serial correlation test with a χ^2 distribution with 12 degrees of freedom. Ramsey RESET test is Ramsey's test for functional misspecification. CUSUM test is the cumulative sum of recursive residuals used to estimate the stability of the coefficients. The REERDUM is a dummy variable to account for the break period in the REER time series in each country (see Table 4). Therefore it is different in each member country. To retain the parsimoniousness of the model the REER dummy or the oil dummy or both were excluded if found insignificant in the model.
Source: Author's calculations.

Table 7

Non-linear NARDL model coefficient estimates and diagnostic checks

	CN	RU	IN	BR	ZA	SA	AE	IR	AR	EG	ET
A. Short-run estimates of NARDL models (dependent variable LREER)											
D(LOIL_POS)		–0.043947			0.047888	–0.033966**	–0.015809	–0.277404**			
D(LOIL_POS(–1))		0.080873			0.034941	0.006114					
D(LOIL_POS(–2))					–0.091009**	0.033432**					
D(LOIL_POS(–3))						–0.033610***					
D(LOIL_NEG)	–0.024031**	0.148242***		0.092542***	0.123117***	–0.039275***	–0.039029***				–0.036532**
D(LOIL_NEG(–1))	0.012696	–0.064671			–0.153629**						
D(LOIL_NEG(–2))	0.006557	– 0.056959			0.111136*						
D(LOIL_NEG(–3))	–0.023100**				–0.136445**						
D(LOIL_NEG(–4))					0.104316*						
D(LOIL_NEG(–4))					–0.053887						
OILDUM	Excluded	Excluded	0.015181***	Excluded	Excluded	0.008751***	0.013216***	–0.084780***	Excluded	Excluded	0.027445***
REERDUM	0.007381***	Excluded	0.020097***	0.018231***	0.033136***	0.005749***	–0.005669***	–0.315543***	–0.086222***	–0.020542***	Excluded
D(LREER(–1))	0.302855***	0.267234***	0.204181***	0.283503***	0.142541**	0.199369***	0.348691***		0.479930***	0.176259***	0.321689***
D(LREER(–2))	–0.038754				–0.091951		–0.110891**				
D(LREER(–3))	–0.042109				0.099230*						
D(LREER(–4))	0.174863***				0.011971						
D(LREER(–5))	–0.112542*				0.016077						
D(LREER(–6))					–0.160144***						
CointEq(–1)*	–0.021159***	–0.156383***	–0.147737***	– 0.059189***	–0.080399***	–0.023967***	–0.041326***	–0.164479***	–0.104771***	–0.040335***	–0.043239***
B. Long-run estimates of NARDL models (dependent variable LREER)											
LOIL_POS	0.239621	0.337632***	–0.001238	0.287658***	–0.101732	0.114636	0.186761**	0.047392	0.122787**	0.077250	0.459584***
LOIL_NEG	0.275671	0.347746***	–0.012199	0.345691***	–0.067075	0.179346	0.220690**	–0.235798*	0.212014***	–0.015035	0.506710**
C	4.528875***	4.239597***	4.510822***	4.315111***	4.400465***	4.691968***	4.533233***	5.808478***	5.519495***	4.491462***	4.344622***
C. Diagnostic tests											
CointEq(–1)*	–0.022140***	–0.156383***	–0.147737***	–0.059189***	–0.080399***	–0.023967***	–0.041326***	–0.164479***	–0.104771***	–0.040335***	–0.043239***
Adj. R^2	0.167921	0.200674	0.115786	0.155355	0.201822	0.232878	0.296236	0.191814	0.383065	0.061255	0.256161
Serial correlation LM test (Obs. R^2)	0.878402	0.162447	1.995704	0.092589	0.147709	1.767936	2.068643	4.571368	4.546590	0.041566	0.622357
Breusch–Pagan–Godfrey heteroskedasticity test (Obs. R^2)	17.449740	85.686530***	11.931280*	47.514440***	27.12563*	30.152660***	27.293970***	70.711030***	18.155350***	8.814104	4.027823
Ramsey RESET (*t*-statistic)	1.429269	1.496391	1.167755	0.216072	0.079681	0.727857	0.269815	6.229605***	2.699149***	2.071561**	2.475228**
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Unstable	Unstable	Unstable	Stable
CUSUM SQ	Stable	Unstable	Stable	Stable	Stable	Stable	Stable	Unstable	Unstable	Unstable	Stable
ARDL	(6, 0, 4)	(2, 2, 3)	(2, 0, 0)	(2, 0, 1)	(7, 2, 5)	(2, 4, 1)	(3, 1, 1)	(1, 1, 0)	(2, 0, 0)	(2, 0, 0)	2, 0, 1)
F-bounds test	3.635973*	8.625779***	8.625779***	3.241466	6.362458***	3.631662*	7.209818***	13.590800***	14.060220***	2.686620*	8.870973***
Observations	277	279	281	281	276	278	280	291	281	281	281

Note: See note to Table 6.
Source: Author's calculations.

When asymmetries in the effect of oil prices on the real exchange rate are permitted, we find evidence of long-term relationships between oil prices and REER as indicated by the significant and negative ECT term. The *F*-statistic of the bounds test also supports long run cointegration at the 5- and 10-percent significance levels in all countries except for Brazil and Saudi Arabia. If we take at least one indicator to support the long-run cointegration of the oil price–REER relationship, we can conclude that cointegration exists in all BRICS Plus countries. However, a clear caveat appears in the diagnostic tests for the results of the models of three countries — Iran, Argentina, and Egypt. While the tests for all the other countries' models prove that the relationship is not spurious, the models of the three aforementioned countries clearly suffer from model misspecification and instability as evident from the Ramsey RESET test and the CUSUM and CUSUMSQ stability tests. Accordingly, the results of the three countries should be taken with caution. In the case of Ethiopia, the Ramsey RESET test shows evidence of misspecification, yet both CUSUM and CUSUMSQ tests depict a stable relation. The results were robust whether the estimation was done using a constant and trend as fixed regressors or keeping them restricted to the cointegrating equation. Moreover, all models do not suffer from serial correlation.

Focusing on the short results in Panel A we find short-run evidence that in China, UAE, and Ethiopia only decreases in oil prices (OIL^{-}) raise REER, signaling an asymmetric relation. The asymmetric relation also exists in Russia and Brazil, although in their cases the negative impact of a fall in oil prices leads to decreases in REERs. Both positive and negative alterations in oil prices had impacts on the REERs of South Africa, and Saudi Arabia in the short run; however, in the case of South Africa a positive change in oil prices decreases REER, whereas a negative change seems to have an oscillating effect on REER decreasing, increasing and again decreasing REER in the months that follow the change. The opposite takes place in Saudi Arabia where the positive change in oil price seems to have an oscillating effect on REER, decreasing it instantaneously, increasing it after two months, and finally decreasing it after the third month; while a negative shock in oil price leads to a rise in REER. The impact is also asymmetric in Iran with only positive changes leading to a fall in the REER. There are no short-run impacts in India, Argentina, and Egypt.

Focusing on the long-run asymmetric relation we find that there are no significant distinct positive or negative long-run impacts of oil prices on the exchange rate in China, India, South Africa, Saudi Arabia, Iran, and Egypt. However, positive and negative impacts exist in the cases of Russia, Brazil, UAE, Argentina and Ethiopia. In Iran, only the negative changes in oil prices seem important at the 10% significance level leading to rises in REER in the long run.

Table 8 synopsizes the findings from both the linear and nonlinear ARDL models in Tables 6 and 7. Compiling the results of the two models illustrates how the NARDL model is more informative, unveiling the partial impacts of oil changes on REER. While the results of the two models aligned with respect to India, Argentina, and Egypt in the short run, proving no or insignificant impacts of oil on REER, the results of the negative short-run relation between the two variables in China and the UAE applied only to *falls* in oil prices rather than rises. In Brazil, the positive relation between the two variables shown in the ARDL was proved to exist only with respect to the rises in oil prices with no impacts from

Table 8
Summary of the linear and non-linear models

Country	Linear ARDL model LREER = *f*(LOIL)			Non-linear ARDL model LREER = *f*(LOIL$^+$, LOIL$^-$)				
	Short-run effects of LOIL	Long-run effects of LOIL	Cointe-gration	Short-run effects of LOIL		Long-run effects of LOIL		Cointe-gration
				LOIL$^+$	LOIL$^-$	LOIL$^+$	LOIL$^-$	
China	–	+	Yes	N.E.	–	N.S.	N.S.	Yes
Russia	N.E.	+	Yes	N.S.	+	+	+	Yes
India	N.E.	N.S.	Yes	N.E.	N.E.	N.S.	N.S.	Yes
Brazil	+	+	Yes	N.E.	+	+	+	Yes
South Africa	+	N.S	Yes	–	+ –	N.S.	N.S.	Yes
Saudi Arabia	–	N.S.	Yes	– + –	–	N.S.	N.S.	Yes
UAE	–	+	Yes	N.S.	–	+	+	Yes
Iran	N.S.	+	Yes	–	N.E.	N.S.	N.S.	Yes
Argentina	N.E.	N.S.	Yes	N.E.	N.E.	+	+	Yes
Egypt	N.S.	N.S.	Yes	N.E.	N.E.	N.S.	N.S.	Yes
Ethiopia	N.S.	+	Yes	N.E.	–	+	+	Yes

Note: +(–) means a positive (negative) coefficient estimate associated with the independent variable(s). N.S. means statistically insignificant coefficient estimate at the 5% significance level. N.E. means the independent variable has no effect on the dependent variable. For the short-run effect, the +(–) sign stands for the cumulative short-run effect of the independent variable on the dependent variable. Cointegration is reported only if the null hypothesis of no-cointegration is rejected at the 5% significance level or lower by either the *F*-bounds statistic or ECT_{t-1} or both.
Source: Computed by the author.

falls in oil prices. In South Africa and Saudi Arabia, the respectively positive and negative relationship disclosed in the ARDL model appeared to be more complex, with the relationship alternating among the two variables in the months that followed the change in the oil prices. As each BRICS Plus country is impacted differently in the short run from any rises or falls in the oil price, the question arises as to how the countries — especially the oil-producing ones such as Russia, Saudi Arabia, UAE, and Iran — would decide on a single oil pricing policy that would benefit all BRICS members.

Comparing the long-run results of the ARDL and NARDL models in Table 8 revealed consistent results in India, South Africa, Saudi Arabia, and Egypt on the non-existence of an impact of oil on REER. It seems that in Russia, Brazil, UAE, and Ethiopia, there are no asymmetries in the long run as both the positive and negative price changes in oil have a positive relation with REER, raising it with the rise in oil price and lowering it with the fall in the oil price. The discrepancy between the two models can be grasped in China and Iran where the significant positive relation in the long run revealed by the ARDL models did not align with the insignificant partial sum impacts of oil produced by the NARDL models.

4.4.2. Wald tests

To confirm our results from the NARDL model, we conduct several Wald tests only for the countries that have both positive and negative significant coefficients in the short run or the long run. For the remaining countries which have either positive or negative, short or long-run impacts, we do not conduct the Wald tests as the asymmetric relation can be deduced without the test. For the countries where the test is not carried out because both the positive and negative partial impacts

Table 9
Wald tests for long run and short run asymmetric effects.

Country		Short run	Long run
China	*t*-statistic	Only negative	N.S.
	Result	Asymmetry	N.S.
Russia	*t*-statistic	Only negative	–1.562517
	Result	Asymmetry	Symmetry
India	*t*-statistic	N.E.	N.S.
	Result	N.E.	N.S.
Brazil	*t*-statistic	Only negative	–2.031666**
	Result	Asymmetry	Asymmetry
South Africa	*t*-statistic	Unequal lags	N.S.
	Result	Asymmetry	N.S.
Saudi Arabia	*t*-statistic	Unequal lags	N.S.
	Result	Asymmetry	N.S.
UAE	*t*-statistic	Only negative	–1.876537*
	Result	Asymmetry	Symmetry
Iran	*t*-statistic	Only positive	N.S.
	Result	Asymmetry	N.S.
Argentina	*t*-statistic	N.E.	–5.684905***
	Result	N.E.	Asymmetry
Egypt	*t*-statistic	N.E.	N.S.
	Result	N.E.	N.S.
Ethiopia	*t*-statistic	Only negative	–1.309782
	Result	Asymmetry	Symmetry

Note: *, **, *** indicates 10%, 5%, and 1% significance level.
Source: Computed by the author.

are non-existent or insignificant, the acronyms N.E. and N.S. are written instead. Table 9 represents a summary of our Wald tests. In the short run, the asymmetric impacts of oil price changes on REER appear in all BRICS Plus countries.[6] In the long run, Brazil and Argentina confirmed the asymmetric impact of oil price changes on REER while the symmetric impact of the positive and negative oil price changes is confirmed in Russia, UAE, and Ethiopia.

4.4.3. Dynamic multipliers

To depict how equilibrium is restored following a shock in oil prices, we use the dynamic multipliers approach developed by Shin et al. (2014). The dynamic multipliers of the eleven BRICS Plus countries are illustrated in Fig. 2 where the bold and dashed lines represent the responses of the BRICS members' real effective exchange rates to a 1% rise and fall in the international oil price. While the two thin dotted curves encompass a 95% confidence level of the asymmetry

[6] Because of the alternating nature of the impact of oil prices on REER in South Africa and Saudi Arabia, we did an additional exercise by testing the null hypothesis that the sum of all positive changes in oil price is equal to the sum of all negative oil prices changes on REER rather than the test in a particular period. For South Africa and Saudi Arabia, the *t*-statistic were –0.602514 and 0.361920 respectively, which means that the null hypothesis cannot be rejected at the 5% significance level for the two countries. In other words, the sum of all short-run impacts from the positive changes in the oil price is equal to the sum of all short-run impacts from the negative changes in the oil price in the two countries.

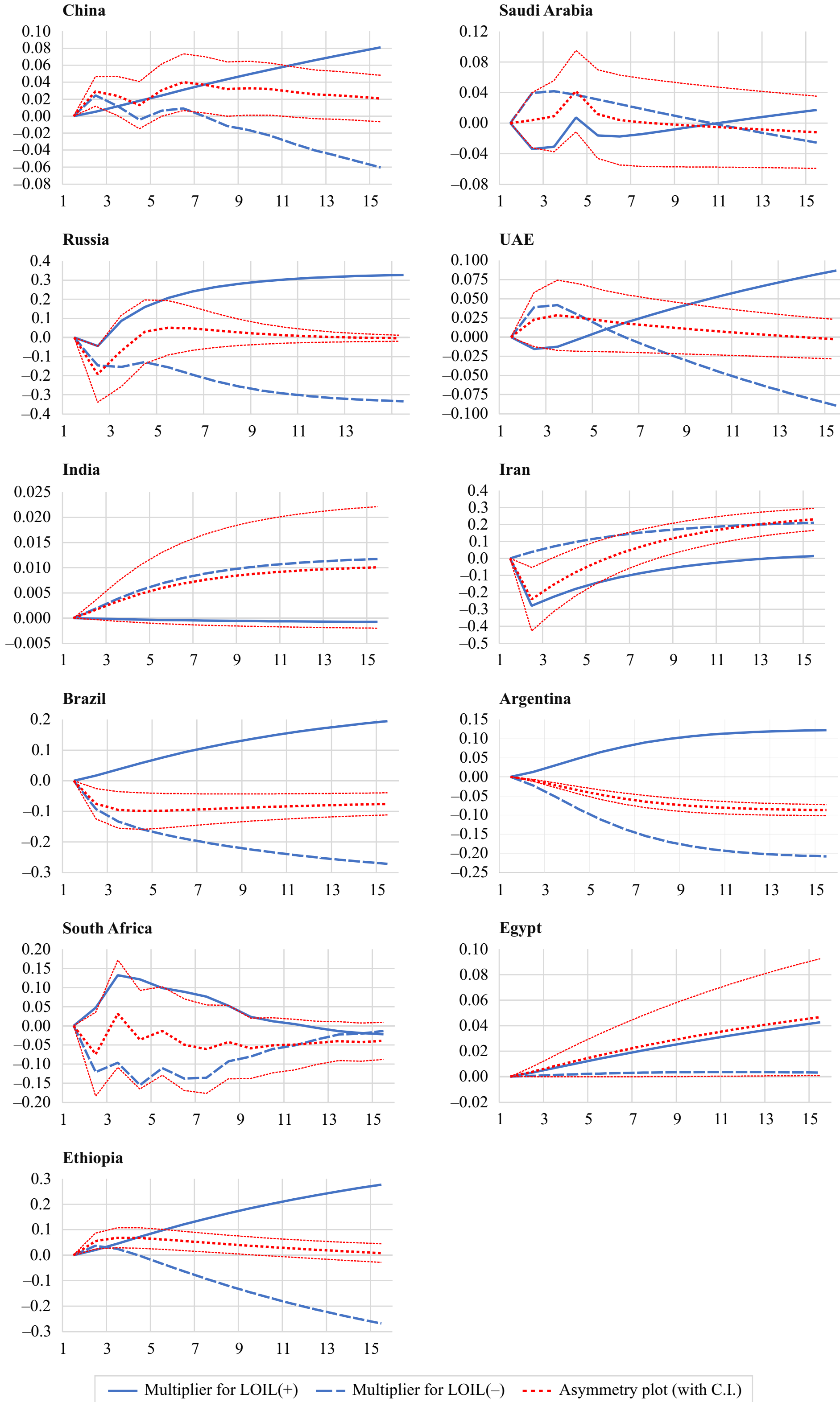

Fig. 2. Dynamic multipliers of the NARDL models.

Source: Author's calculations.

curve, the bold red dotted curve is the asymmetry curve which accounts for the linear combination of the dynamic multipliers related to the positive and negative alterations in the international price of oil. If the red dotted line is inclined more toward the black line compared to the black dotted line, this means that, in comparison to the negative shocks, the positive shocks are relatively more influential on REER.

With respect to China, it is clear that a negative shock in oil prices has a greater impact on REER than the positive impact in the short run. In Russia, only the negative impact decreases REER in the short run. In India, although the NARDL estimation technique proved the positive and negative impacts of oil shocks on REER insignificant, the dynamic multiplier analysis depicts negative changes to be more impactful compared to the positive ones. However, the insignificance of the impact is apparent from the magnitude of the change (maximum change 0.010), a phenomenon also taking place in Egypt. Brazil's REER is obviously more sensitive to negative changes in oil prices compared to positive ones, similar to the results from the NARDL analysis and the Wald test. South Africa's alternating impact of oil price changes on REER in the short run implied from the NARDL analysis is confirmed by the dynamic multiplier analysis, especially concerning the negative shock in oil prices; a phenomenon also confirmed in Saudi Arabia, but concerning the positive changes in oil prices on REER in the short run (same implications from the NARDL analysis). In the UAE, the negative change in oil price is more impactful in the first few months of the change leading to the rise in REER; nevertheless, a more symmetric relation is apparent in the long run. In Argentina as well as in Ethiopia a long-run symmetric influence is evident, consistent with the NARDL results.

5. Conclusion

On January 1, 2024, five countries, namely Saudi Arabia, United Arab Emirates, Iran, Egypt, and Ethiopia, formally joined the BRICS agglomeration (could be titled BRICS Plus), already comprising China, Russia, India, Brazil and South Africa. Argentina was also invited to join in 2023, yet rejected the invitation later that year. In this research, we show how any variants of a unified BRICS currency are challengeable by probing the influence of only one fundamental factor — the international price of crude oil — on the REERs of the BRICS Plus member states, while differentiating between the positive and the negative shocks in the oil price on REER. Even though empirical researches on asymmetries in the effect of oil price on exchange rate in BRICS countries abound, there is no evidence in the extant literature that assesses the impact in each BRICS Plus country individually, or compares and contrasts such impact between the old and new members. In the present article, therefore, we contribute to the literature by applying Shin et al. (2014) NARDL approach to separate oil price hikes from plunges and generate informative findings on how such alterations asymmetrically influence real exchange rates for BRICS Plus member countries.

Results of the paper demonstrate that the oil price alterations seem to have an asymmetric effect on REER for the BRICS Plus members. In the short run, the asymmetric impacts of oil price changes on REER appear in all BRICS Plus countries. REER in China, Russia, Brazil, the UAE, and Ethiopia (Iran) is generally more susceptible to oil price plunges (or hikes) than to hikes (or plunges) in the short run. In the case of South Africa and Saudi Arabia, the response of REER is more complex, with the rapid alternating fluctuations accompanying any change in oil price.

In the long run, Brazil and Argentina confirmed the asymmetric impact of oil price changes on REER, while the symmetric impact of the positive and negative oil price changes is confirmed in Russia, UAE, and Ethiopia. However, it is clear from the dynamic multiplier analysis that Russia adjusts faster than the UAE and Ethiopia.

Some important policy implications for researchers and policy-makers can be deduced from our study. Researchers analyzing the link between oil prices and REER in BRICS Plus countries should be aware of the asymmetric effect of oil prices, which, if neglected, could result in spurious results. Our findings also offer several relevant policy implications for policy-makers. First, since oil price dynamics affect the short-run movements of the selected BRICS Plus members, oil price fluctuations should be considered one of the integral short-run determinants of their exchange rates. In the case where a unified monetary union was created, continuous appreciations or depreciations of the local currencies will have to be implemented to preserve the alignment of the local currencies with the composite currency unit. Furthermore, unifying their macroeconomic policies would be problematic. For example, our study has proved that in Iran only the negative changes in the oil price increases its REER. Iran may thus be interested in hindering any oil price falls (or raising its oil price) to prevent raising its REER and increase its competitiveness. Such a policy may not align with Ethiopia, for example, where positive shocks in oil prices increase its REER and decrease its export competitiveness. Second, since it is proven that an upswing in the price of crude oil appreciates the exchange rates of Russia, Brazil, the UAE, Argentina, and Ethiopia in the long run, these members would have to employ expansionary monetary policies aimed at depreciating their local currencies, and ameliorating the trade deficit. Third, in countries with fixed exchange regimes, particularly Saudi Arabia, there are no long-run exchange rate reactions to changes in oil prices, hence Saudi Arabia may need to change the level of the peg to enhance its export earnings.

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