

Yildirim, Hakan; Akdag, Saffet; Alola, Andrew Adewale

Article

Is there a price bubble in the exchange rates of the developing countries? The case of BRICS and Turkey

Journal of Economics, Finance and Administrative Science

Provided in Cooperation with:

Universidad ESAN, Lima

Suggested Citation: Yildirim, Hakan; Akdag, Saffet; Alola, Andrew Adewale (2022) : Is there a price bubble in the exchange rates of the developing countries? The case of BRICS and Turkey, Journal of Economics, Finance and Administrative Science, ISSN 2218-0648, Emerald Publishing Limited, Bingley, Vol. 27, Iss. 54, pp. 247-261, <https://doi.org/10.1108/JEFAS-04-2021-0025>

This Version is available at:

<https://hdl.handle.net/10419/289638>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Is there a price bubble in the exchange rates of the developing countries? The case of BRICS and Turkey

Exchange rate dynamics of BRICS and Turkey

247

Hakan Yildirim

Department of International Logistic and Transportation, Istanbul Gelisim University, Istanbul, Turkey

Saffet Akdag

Department of Banking and Finance, Tarsus University, Tarsus, Turkey, and

Andrew Adewale Alola

Department of Economics and Finance, Istanbul Gelisim University, Istanbul, Turkey

Received 6 April 2021
Revised 4 August 2021
16 October 2021
3 January 2022
Accepted 1 February 2022

Abstract

Purpose – The last decades have experienced increasingly integrated global political and economic dynamics ranging especially from the influence of exchange rates and trade amid other sources of uncertainties. The purpose of this study is to examine the exchange rate dynamics of Brazil, Russia, India, China, and South Africa (BRICS) and the Republic of Turkey.

Design/methodology/approach – Given this perceived global dynamics, the current study examined the BRICS countries and the Republic of Turkey's exchange rate dynamics by using the United States (US) monthly dollar exchange rate data between January 2002 and August 2019. The price bubble which is expressed as exceeding the real value of assets' prices which is observably caused by speculative movements is investigated by using the Supremum Augmented Dickey-Fuller (SADF) and the Generalized Supremum Augmented Dickey-Fuller (GSADF) approaches.

Findings – Accordingly, the GSADF test results opined that there are price bubbles in the dollar exchange rate of other countries except for the United States Dollar (USD)/Indian Rupee (INR) exchange rate. As the related countries are classified as developing countries in terms of their structure, they are also expectedly the subject of speculative exchange rate movements. Speculative movements in exchange rates may cause serious problems in national economies.

Originality/value – Thus, the current study provides a policy framework to the BRICS countries and the Republic of Turkey.

Keywords Price bubble, Currency conversion rates, SADF, GSADF, BRICS, Turkey

Paper type Research paper

Nomenclature

ADF	Augmented Dickey-Fuller	BRL	Brazilian Real
ARDL	Auto-regressive	BTC	Bitcoin (Decentralized digital currency)
	Distributed Lag		
BEKK	Baba, Engle, Kraft and Kroner (1990) model		

JEL Classification — C22, D51, G12, G17

© Hakan Yildirim, Saffet Akdag and Andrew Adewale Alola. Published in *Journal of Economics, Finance and Administrative Science*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>.



Journal of Economics, Finance and Administrative Science
Vol. 27 No. 54, 2022
pp. 247-261
Emerald Publishing Limited
e-ISSN: 2218-0648
p-ISSN: 2077-1886
DOI 10.1108/JEFAS-04-2021-0025

CNY	Renminbi (Official currency of the People's Republic of China)	INR	Indian Rupee
CUSUM	Cumulative Sum	JPY	Japanese Yen
BRICS	Brazil, Russia, India, China, and South Africa	MXN	Mexican Peso
DEM	Deutsche Mark	RTADF	Right Tail Augmented Dickey-Fuller
ETH	Ethereum	RUB	Russian Rubble/Rouble
GARCH	Generalized Autoregressive Conditional Heteroskedasticity	SADF	Supremum Augmented Dickey-Fuller
GBP	Great Britain Pound	TRY	Turkish Liras
GSADF	Generalized Supremum Augmented Dickey-Fuller	US	United States of America
		USD	United States Dollars
		XRP	Digital asset/currency created by Ripple
		ZAR	South African Rand

1. Introduction

Just like the production of essential goods and services are subject to human needs, the prices of essential commodities are largely associated with the dynamics of their supply and demand. In essence, the availability and/or prices of the essential goods and services are associated with the dynamics related to economic uncertainties, natural events or disasters and market-related factors (Balcilar *et al.*, 2016; Alola *et al.*, 2019; Akadiri *et al.*, 2020; Onifade *et al.*, 2020; Akdag *et al.*, 2021). Moreover, the monetary policies applied to one of the currency pairs or the macroeconomic consequences that may affect the currency, thus shaping the price trend of the currency pair. Most of the time, speculative balloons can lead to high pricing of commodities, securities and other financial items, thus causing the relevant financial value to exceed the basic value. In essence, this causes markets and investors to react faster than rising prices among other reasons. As a result of the extinction of the bubbles in question, it then prompts a rise in price situation against the markets and investors.

To date, world history has witnessed a handful of financial crises and the price bubbles that caused these crises (Kindleberger and Aliber, 2005). Chronologically, the most important price bubbles in the history of finance include the: Tulip Mania (1,636), Mississippi Bubble (1720), Great Depression (1929), Internet Bubble (2001), the Global Financial Crisis (GFC) of 2008–2010 and the Real Estate Bubble and Mortgage Crisis. For instance, the Tulip Mania is one of the most important examples of the price bubble as it is the first manipulative movement in history. In the European region, Tulip Mania especially influenced the Netherlands in 1,623, when the price of Tulip bulbs rose to 1,000 guineas, average annual wage was 150 guinea. Additionally, in February 1,637, resulting of the tulip bulb in Amsterdam, the price of a bourgeois house could be recorded to be about 5,200 guineas (Mazgir, 2007).

As a follow-up to the Tulip Mania, everyone was affected by the tulip bulbs, which led to a sharp rise in prices at the beginning of a great mania. Thus, because of the extinction of the bubble in prices, it reportedly caused a crisis that will continue to be remembered throughout Europe. In history, another important financial crisis caused by the price bubble is the 2008 GFC (Alola, 2020; Alola and Uzuner, 2020; Balcilar *et al.*, 2020). Price bubbles, which became a very important issue in the aftermath of the 2008 global crisis, have become a popular research topic in the financial and academic circles. Especially the bubbles in housing prices and the extinction of these bubbles were seen as the main cause of the crisis. In the financial literature, firstly, the price bubbles in housing prices were emphasized, followed by the existence of the price bubble for the securities' markets, cryptocurrencies, commodities and many different financial assets.

In the study by Phillips and Yu (2011), it opined that the bubbles are expressed as an increasing situation, moving away from the rapid and real values formed in asset prices. In the literature, many different financial and investment instruments related to the price bubbles are being investigated. While the study of price bubbles has been conducted for several economies across the globe including Evans (1986) for the United States of America (US) and the United Kingdom (UK), Wu (1995) for the US, UK, Germany and Japan, Case and Shiller (2003) for the US, Fernández-Kranz and Hon (2006) for Spain, Cheung *et al.* (2015) for digital or cryptocurrency, Kristoufek (2015) for digital or cryptocurrency, Landgraf (2016) in asset prices, Shi (2017) for asset markets, Fabozzi and Xiao (2019) for the US real estate market and Narta *et al.* (2018) in the Singaporean and Indonesian stock markets; the case of Turkey has been considered in the works of Altay (2008), Bozoklu and Zeren (2013), Afşar and Dogan (2018), and Uzuner *et al.* (2017). In regard to the Brazil, Russia, India, China, and South Africa (BRICS) countries, the banking sector indicators such as the size of the financial intermediaries, domestic credit to the private sector and credit to deposit ratio are vital to the economic stability of the bloc countries (Guru and Yadav, 2019).

While the efforts to test the existence of price bubbles in financial assets increased rapidly (Deviren *et al.*, 2014), different models are being employed to test the asset. For variance tests such as LeRoy and Porter (1981) and Shiller (1981), the first of the models aiming to detect price balloons, were used. Thereafter, other approaches such as Diba and Grossman (1988) and Hamilton and Whiteman (1985) have been explored. In the 2000s, Chow and cumulative sum (CUSUM) tests applied in Homm and Breitung's (2012) study became popular. Tests such as SADF and GASDF, which were first shown in the Phillips *et al.* (2011) study and developed by Phillips *et al.* (2015), are frequently mentioned in the price bubble test recently.

In this study, Supremum Augmented Dickey-Fuller (SADF) and Generalized Supremum Augmented Dickey-Fuller (GSADF) tests were applied to test the presence of price bubbles in BRICS member countries alongside Turkey while using the United States Dollar the indexed exchange rates. The group of countries: South Africa, India, Brazil, Russia and China, accounts for 40% of the world's population and accounts for 60% of the world's mineral reserves. The justification for examining the case of the BRICS economies is not limited to the fact that the BRICS's share of global output is forecasted at one-third by 2030 (or 45% of the world's gross domestic product (GDP) by about 2030 in price purchase parity term), the bloc occupies about 30% of the global territory, the BRICS accounts for about 17% of world trade and yielding about 4 trillion USD worth of foreign reserves (South African Government, 2021). This study considered the BRICS countries because they are commonly regarded as the world's leading developing economies. As originally noted by O'Neill (2001), the leading four (Brazil, India, Russia and China) are reportedly at a similar stage of advanced economic development. Thus, the current study considers Turkey alongside the BRICS economies because the significant improvement in the Turkish economy in recent years and that the Turkish Lira has remained one of the most vulnerable and volatile currencies among the leading developing states (E-7). Although, as one of the largest European Union (EU) neighbours, the Turkish currency reportedly lost almost half of its value in the last quarter of 2021, thereby causing, more devastating economic disruption.

Considering the importance of the BRICS economies as highlighted above, it is important to mention that the current study attempts to expand the financial literature for the BRICS countries from the following perspectives. As a first approach, the hypotheses for the existence of the price bubbles in the exchange rates of the BRICS and Turkish economies are tested. In a follow-up approach, the respective dates for the existing bubbles are also revealed, thus highlighting the severity of the occurrence of price bubbles and the associated events. By doing so, relevant policy recommendations for the examined economies are implied from the outlined results.

The remainder of this study is organized as follows: The next section presents the review of related literature that is presented in Section 2. Section 3 provides the data and

methodological approach of the study. Subsequently, [Section 4](#) focuses on the interpretation of empirical results. Finally, [Section 5](#) renders the concluding remarks.

2. Literature review

In reviewing contextual studies, we outline both the theoretical and empirical related studies.

2.1 Theoretical insight

Following the use of the word “efficient market”, subsequent development of the phrase by the proponent has resulted in more theoretical discussion, thus the context of the Efficient Market Hypothesis in the literature ([Fama, 1970](#)). Given that an efficient market is associated with information that is often incorporated in market prices, the asset values are conditioned on the associated information. Thus, there is rationality in market prices while the unexpected changes associated with a change in price are unpredictable because of the relatively new information. Then, the unpredictability vis-a-vis irrationality account for the “random walk” theory is associated with asset prices, thus causing the characterization of the efficient market as weak form, semi-strong form and strong form ([Clarke et al., 2001](#)). According to the early studies of [Shiller \(1980\)](#), and [Kindleberger and Aliber \(2005\)](#), the deviation of market price from market fundamentals which is responsible for the market irrationality is a leading factor for large historical bubbles. Subsequently, price bubbles in assets such as stocks, house prices and exchange rates have been widely covered in several studies ([Blanchard and Watson, 1982](#); [Wu, 1995](#); [El Montasser et al., 2016](#)).

2.2 Review of empirical studies

In this section, a literature review is conducted in two different directions. The first part of the literature focuses on price balloons that may be associated with exchange rates, while the second part focuses on the studies that test price balloons that may occur in cryptocurrencies. Meanwhile, prior to the observance of bubbles, several underlying factors are associated with the market prices of assets such as the stocks, the real estate industry and other financial valuations ([Huy et al., 2020a, 2020b, 2021](#)).

In the [Evans \(1986\)](#) study, the existence of price bubbles for the Great Britain Pound (GBP)/USD exchange rate in the period 1981–1984 was tested. As a result of the findings, there is significant evidence of the price bubble for the GBP/USD exchange rate. Thus, the result claimed that the bubbles formed during the period 1981–1984 are associated with irrational expectations. Additionally, in the study of [Wu \(1995\)](#), price bubbles in exchange rates were tested by employing the Kalman filter method. However, they failed to establish a price bubble for GBP, USD and Deutsche Mark (DEM)/Japanese Yen (JPY). Meanwhile, [Case and Shiller \(2003\)](#) stated that bubbles in asset prices are caused by the rise of prices arising from the expectation of future price increases; while [Jirasakuldech et al. \(2006\)](#) also found the existence of a price bubble in exchange rates. As a result of the application of the co-integration analysis, [Jirasakuldech et al. \(2006\)](#) found evidence of a price bubble in US Dollar indexed exchange rates such as British Pound, Canadian Krone, Japanese Yen and South African Rand.

Furthermore, [Mayer \(2011\)](#) stated that if asset prices are volatile during the conjuncture period, they expectedly increase more than in the uptrend period and fall faster than expected in the downturn period, thus indicating the presence of a bubble in asset prices. In another study, [Bettendorf and Chen \(2013\)](#) tested the existence of a price bubble in the exchange rate. By employing the unit root tests approach, [Bettendorf and Chen \(2013\)](#) established the existence of speculative bubbles in the Sterling-Dollar exchange rate. Moreover, the existence of price bubbles was tested in the exchange rate price movements by [El Montasser et al.](#)

(2016). The study employed the right-tailed unit root SADF and GSADF tests. Consequently, the result indicates that the price bubble for the Renminbi (CNY)/USD exchange rate was in the form of an explosion in 2005. Similarly, the study by [Hu and Oxley \(2017\)](#) examined the existence of price bubbles in exchange rates by applying the GSADF test. The study concluded that there is a price bubble in the USD/Mexican Peso (MXN) exchange rate over the period 1994–1995.

From the perspective of cryptocurrency, statistical evidence has also revealed that there are deviations from the basic value of prices for cryptocurrency such as the Bitcoin (BTC), thus suggesting the existence of bubbles in cryptocurrencies ([Dowd, 2014](#); [Cheah and Fry, 2015](#)). For instance, [Cheah and Fry \(2015\)](#) employed econometric tools to establish that the fundamental value of BTC is zero and its prices contain a considerable speculative component, thus suggesting that BTC markets are susceptible to bubbles. Similarly, [Cheung *et al.* \(2015\)](#), tested the existence of a price bubble for cryptocurrency by using the GSADF test approach and found that there are three large price bubbles for cryptocurrency. While [Ceylan *et al.* \(2018\)](#) affirmed the existence of price bubbles in most cryptocurrencies by using the GSADF test, [Mete *et al.* \(2019\)](#) used the SADF and GSADF tests and found that BTC, Ethereum (ETH) and ripple (XRP) all showed evidence of a speculative bubble.

Moreover, for the specific case of the BRICS countries, [Mroua and Trabelsi \(2020\)](#) examined the causal dynamics among the common financial indicators (the exchange rate and stock market indices). By utilizing the panel approaches of the generalized method of moments and the autoregressive distributed lag (ARDL) methods, the study revealed that exchange rate changes exert a significant effect on the previous and existing volatility of the BRICS stock indices. Additionally, with the ARDL approach, [Mroua and Trabelsi \(2020\)](#) found that movement in exchange rate exerts a significant short- and long-term effect on the stocks market indices for BRICS. For other similar developing countries, the dynamics associated with the financial markets have been investigated in the literature ([Hung, 2019](#); [Alola, 2020, 2021](#)). For instance, [Hung \(2019\)](#) employed the vector autoregression with a bivariate GARCH–BEKK model approach to reveal that the Chinese market’s volatility significantly affects other markets of concern. Importantly, the result offered that the stock markets were obviously inter-linked to the economic and/or financial crisis.

Besides the evidence of speculative bubbles associated with the examined currencies, the exchange rate has remained an essential indicator of the emerging economies such as Turkey and China. For instance, the studies of [Kotil \(2019\)](#) and [Umar and Sun \(2015\)](#), respectively, examined the significance of the exchange rate to the aspects of the Turkish and Chinese economies. Specifically, [Umar and Sun \(2015\)](#) applied the vector autoregressive approach which revealed that the index of the stock market is a significant determinant of the exchange rate movement in China where the exchange rate and stock market moves in the same direction. On the other hand, while examining the case of Turkey, [Kotil \(2019\)](#) investigated the causal nexus between export, import and exchange rate. Although the exchange rate has remained an all-time important indicator in the Turkish economy, the study revealed that export and import does not have Granger cause exchange rate at least at a statistically significant level.

3. Method

3.1 Data

In this study, the BRICS countries and Turkey’s dollar rate of monthly data between January 2002 and August 2019 date were used for the investigation (see [Table A1](#)). Since the largest data range for all countries occurred between relevant dates, the analysis was performed on the data between relevant dates. The website link investing.com is the source of the utilized dataset.

3.2 Procedure

In the analysis, SADF developed in the study of Phillips *et al.* (2011) and GSADF tests developed in the study of Phillips *et al.* (2015) were used. In the study of Diba and Grossman (1988), right-tailed unit root tests were proposed to identify potential rational bubbles in the stock market. As stated in the study of Gürkaynak (2008), it is inferred that standard unit root and co-integration tests are ex-post and the GSADF test is *ex ante* according to estimation procedure, thus the standard unit root tests may be insufficient to determine price bubbles.

In a study by Phillips *et al.* (2011), a SADF-based test was proposed to test the evidence of bubbles including the start and end dates for the speculative price increase. Additionally, Homm and Breitung (2012) conducted an effective simulation study demonstrating that the SADF test can be used to detect price bubbles. However, Phillips *et al.* (2015) reported that the SADF test has a limited ability to detect the presence of multiple bubbles and the GSADF test, which is more successful in detecting multiple bubbles, was proposed.

In this case, and considering the perspectives from the literature, both SADF and GSADF tests were used to analyse the subject, since they could provide a wider perspective. The analysis was carried out following the procedure proposed by Caspi (2016) by using the Right Tail Augmented Dickey-Fuller (RTADF) extension in EViews statistical program. The following regression model (1) is used for unit root calculations in SADF and GSADF test statistics (El Montasser *et al.*, 2016).

$$y_t = m + \lambda y_{t-1} + \sum_{i=1}^p \alpha_i \Delta y_{t-i} + \varepsilon_t, \varepsilon_t \sim iidN(0, \sigma^2), t = 1, \dots, T \tag{1}$$

Standard ADF test y_{t-1} coefficient (λ) is divided into the standard error *se* λ by the following equation (2) is calculated by dividing.

$$ADF_{r1,r2} = \frac{\lambda_{r1,r2}}{se(\lambda_{r1,r2})} \tag{2}$$

In order to calculate the GSADF test, the RTADF tests for multiple sub-samples will be deployed with the regression equation defined in equation (1). Both the endpoint ($r2$) and the starting point ($r1$) of the sub-samples change dynamically and the sub-samples result from differentiation from the zero point. When the sample range is evaluated between 0 and 1, the starting point of the sub-samples is between 0 and $r_2 - r_0$. The endpoint is expected to take values ranging from r_0 to 1 while the r_0 is the minimum estimation window length.

SADF and GSADF test calculations can be expressed as follows (Phillips *et al.*, 2015):

$$SADF_{r2}(r_0) = \sup_{r1 \in [0, r2 - r_0]} ADF_{r1}^{r2} \tag{3}$$

$$GSADF(r_0) = \sup_{r2 \in [r_0, 1]} SADF_{r2}(r_0) \tag{4}$$

The null hypothesis that the price bubble exists in the SADF and GSADF unit root tests is $H_0: \lambda = 1$ versus the alternative hypothesis $H_1: \lambda > 1$ which indicates that the price bubble does not exist in the unit root tests. In iterative regressions, the model expressed in equation (1) is repeatedly estimated using subsets of sample data, which is increased by one observation each, pass (Phillips *et al.*, 2015).

4. Results

As a preliminary estimate, the statistical properties of the dataset are estimated. Therefore, the descriptive statistics related to the variables used in the analysis were calculated and the relevant statistics are given in Table 1.

When the descriptive statistics in Table 1 are evaluated, it is seen that the highest volatility in the relevant exchange rates is realized in USD/RUB (exchange rate from United

States dollar to Russian rubble) and the lowest volatility in USD/BRL (exchange rate from United States dollar to Brazilian real) exchange rates. The results of SADF and GSADF tests are now performed to determine the existence of balloons in the relevant exchange rates given in Table 2.

According to the SADF test results in Table 2, USD/RUB, USD/INR, USD/CNY, USD/ZAR and USD/Turkish Liras (TRY) exchange rates and GASDF test results indicate USD/BRL, USD/RUB, USD/CNY, USD/TRY, there are evidence of price bubbles due to speculative movements in South African Rand (ZAR) and USD/TRY exchange rates. However, the SADF and GSADF test results are different for USD/BRL and USD/INR.

Phillips *et al.* (2015) stated that the SADF test may be inadequate if there is more than one balloon and GSADF tests may be more successful in this case. The dates of the price bubbles formed in the relevant exchange rates regarding the GSADF test results are given in Table 3.

When the results in Table 3 are evaluated, the USD/CNY rate is 115 months with the longest price bubbles and followed by the USD/ZAR rate with 23 months. The reason for the longer period of the bubble in the case of the USD/CNY rate could be largely ascribed to the heightened level of economic, financial and global penetration of the US and Chinese markets. For want of economic strength and dominance, the Chinese markets are currently extending influence and dominance in both the Asian and African regions but facing stiff competition in the well-established European and North American markets. Thus, the Chinese Yuan is expectedly vulnerable to the movements in the world's major currencies such as the USD and the Euro. However, the best economic intuition for the long period of bubbles for the USD/ZAR rate is not unrelated to the recent level of economic instability experienced

Variables	Average	Max	Min	S. Deviation
USD/BRL	2.6046	4.2500	1.5500	0.7394
USD/RUB	39.0552	75.4644	23.4360	15.2934
USD/INR	53.4315	73.9600	39.1950	9.9268
USD/CNY	7.0588	8.2785	6.0540	0.7725
USD/ZAR	9.5315	15.8910	5.6651	2.9128
USD/TRY	2.226	6.5380	1.1616	1.2352

Source(s): Own elaboration

Table 1.
Descriptive statistics

Variables	Test statistics	
	SADF	GSADF
USD/BRL	0.4731	3.7225*
USD/RUB	7.9499*	10.2216*
USD/INR	1.3960**	1.5841
USD/CNY	7.8002*	8.0818*
USD/ZAR	1.2321***	2.9308**
USD/TRY	5.4871*	5.5928*

Critical values			Critical values		
%1	%5	%10	%1	%5	%10
1.9732	1.2556	1.0189	3.3729	1.9689	1.8572

Note(s): * 1%, ** 5% and *** 10% are significant. Critical values were obtained from Monte-Carlo simulations with 1,000 replicates. Initial window size 0.10 (21) is taken

Source(s): Own elaboration

Table 2.
SADF and GSADF test
results

Currencies	Date	Deadlines	Total time
USD/BRL	March 2005–Sep 2005	7 Months	29 Months
	Nov 2005–Feb 2006	4 Months	
	Oct 2014–March 2016	18 Months	
USD/RUB	Oct 2003–March 2004	6 Months	75 Months
	Sep 2004–Feb 2005	6 Months	
	Dec 2006–May 2008	18 Months	
	Sep 2008–Jan 2009	5 Months	
	Jul 2014–Sep 2016	27 Months	
	June 2018–June 2018	1 Months	
	Sep 2018–Oct 2018	2 Months	
USD/CNY	May 2005–Jan 2014	105 Months	115 Months
	June 2014–June 2014	1 Months	
	August 2014–August 2014	1 Months	
	Oct 2015–Dec 2015	3 Months	
	March 2016–April 2017	14 Months	
	Jan 2018–Jan 2018	1 Months	
	July 2014–July 2014	1 Months	
USD/ZAR	Oct 2014–June 2016	21 Months	23 Months
	Dec 2008–Dec 2008	1 Months	
USD/TRY	Jul 2011–Jul 2011	1 Months	68 Months
	Oct 2011–Oct 2011	1 Months	
	Oct 2013–Dec 2013	3 Months	
	July 2014–August 2019	62 Months	

Table 3.
Bubble dates

Source(s): Own elaboration

in South Africa arising from the country’s past and present political events. Moreover, when the results are evaluated in general, it is observed that balloons exist for some exchange rates for the examined countries, especially in 2014, 2015 and 2016. In general, these observations are further supported by the inferences from the trends illustrated in [Figures A1 and A2](#).

5. Discussion

5.1 Theoretical implications

In theory and practice, this study is of significant relevance to the literature on the efficient market hypothesis. In theory, the study further reveals the vulnerability of the valuation of assets, stock market, foreign exchange trading and international trading of goods and services to the deviation of currency rates from market fundamentals. Moreover, the socio-economic relevance of the concerned countries suggests that the implied policies from this study are potentially suitable in other economies across the globe.

In the case of future studies, conducting analyses separately for developed and developing countries will contribute to the literature in terms of a more generalized policy recommendation. Considering the importance of energy to the world economy, similar studies could be carried out in the future, especially for the world’s major energy-producing and consuming economies such as the Organization of the Petroleum Exporting Countries.

5.2 Policy implications

The current study posits a significant policy framework for the BRICS countries and the Republic of Turkey, considering the position of the BRICS and Turkey, the results of the study hint at the economic vulnerability of those countries that are heavily dependent or reliant on the exchange of foreign goods and services or foreign trade in terms of energy, raw material and technology. In this context, it may be recommended as a policy to devise trade

acts that are designed as pre-emptive measures against deliberate exchange rate manipulation or artificial speculative movements. The world's major and developing economies such as the US, UK, Germany, Japan, the BRICS and Turkey among others could also assume an effective role in the foreign exchange market by applying hedging methods with the use of derivative products such as hedging against exchange rate risk by closer monitoring of the exchange rate movements.

6. Conclusions

Price increases due to speculative movements in the prices of investment instruments traded in financial markets are one of the important factors destabilizing the related markets. The price bubble, which is expressed as exceeding the real value of assets' prices, is also caused by speculative movements. In this context, the existence of balloons in asset prices has continued to be the subject of research among scholars and policymakers. Thus, in this study, the focus is aimed to test the existence of price bubbles in exchange rates for the BRICS economies and Turkey.

Among other things, the BRICS economy is expected to account for about one-third of the world's GDP by 2030 (or 45% of the world's GDP by about 2030 in price purchase parity). For this purpose, the BRICS countries in addition to Turkey and the USD exchange rate monthly data between January 2002 and August 2019 have been tested with SADF GSADF unit root tests. According to the GSADF test results, it is concluded that there are price bubbles in the dollar exchange rate of other countries except for the USD/INR exchange rate. As the related countries are classified as developing countries in terms of their structure and economic capacity, they may be expected to be subject to speculative exchange rate movements. Speculative movements in exchange rates may cause serious problems to national economies even as studies have revealed damaging economic downturn resulting from the spill over effects. Although the economies of China, India and Russia are relatively stable so their respective currencies, less can be said for the TRY. Therefore, the findings in this study could well guide policymakers, especially in Turkey and South Africa for a more fine-tuned exchange rate regime.

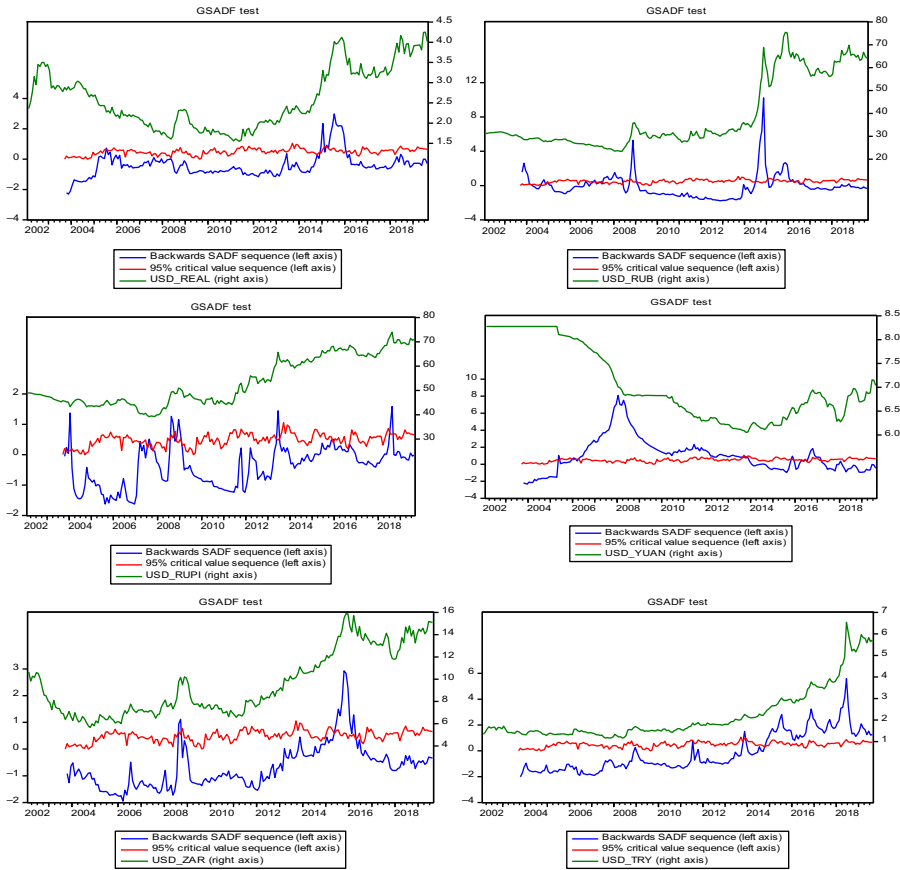
References

- Afsar, A. and Dogan, E. (2018), "Analyzing asset of bubbles in the housing market with right-tailed unit root tests: the case of Turkey", *Journal of Business Economics and Finance*, Vol. 7 No. 2, pp. 139-147, doi: [10.17261/Pressacademia.2018.836](https://doi.org/10.17261/Pressacademia.2018.836).
- Akadiri, S.S., Alola, A.A. and Uzuner, G. (2020), "Economic policy uncertainty and tourism: evidence from the heterogeneous panel", *Current Issues in Tourism*, Vol. 23 No. 20, pp. 2507-2514, doi: [10.1080/13683500.2019.1687662](https://doi.org/10.1080/13683500.2019.1687662).
- Akdag, S., Yildirim, H. and Alola, A.A. (2021), "The USA–China trade policy uncertainty and inference for the major global south indexes", *Journal of Economic and Administrative Sciences*, doi: [10.1108/JEAS-05-2020-0077](https://doi.org/10.1108/JEAS-05-2020-0077).
- Alola, A.A. (2020), "Evidence of speculative bubbles and regime switch in real estate market and crude oil price: insight from Saudi Arabia", *International Journal of Finance and Economics*, doi: [10.1002/ijfe.1971](https://doi.org/10.1002/ijfe.1971).
- Alola, A.A. (2021), "The dynamics of crude oil price and the real estate market in Saudi Arabia: a Markov-switching approach", *Journal of Public Affairs*, Vol. 21 No. 2, e2178, doi: [10.1002/pa.2178](https://doi.org/10.1002/pa.2178).
- Alola, A.A. and Uzuner, G. (2020), "The housing market and agricultural land dynamics: appraising with Economic Policy Uncertainty Index", *International Journal of Finance and Economics*, Vol. 25 No. 2, pp. 274-285, doi: [10.1002/ijfe.1751](https://doi.org/10.1002/ijfe.1751).

- Alola, U.V., Cop, S. and Adewale Alola, A. (2019), "The spillover effects of tourism receipts, political risk, real exchange rate, and trade indicators in Turkey", *International Journal of Tourism Research*, Vol. 21 No. 6, pp. 813-823, doi: [10.1002/jtr.2307](https://doi.org/10.1002/jtr.2307).
- Altay, E. (2008), "Rational bubbles in Istanbul stock exchange: linear and nonlinear unit root tests", *Economics in Emerging Markets*, Edt, Lado Beridze, Nova Science Publishers, New York, pp. 169-202.
- Balcilar, M., Gupta, R. and Pierdzioch, C. (2016), "Does uncertainty move the gold price? New evidence from a nonparametric causality-in-quantiles test", *Resources Policy*, Vol. 49, pp. 74-80, doi: [10.1016/j.resourpol.2016.04.004](https://doi.org/10.1016/j.resourpol.2016.04.004).
- Balcilar, M., Ozdemir, Z.A., Ozdemir, H. and Wohar, M.E. (2020), "Spillover effects in oil-related CDS markets during and after the sub-prime crisis", *The North American Journal of Economics and Finance*, Vol. 54, 101249, doi: [10.1016/j.najef.2020.101249](https://doi.org/10.1016/j.najef.2020.101249).
- Bettendorf, T. and Chen, W. (2013), "Are there bubbles in the Sterling-dollar exchange rate? New evidence from sequential ADF tests", *Economics Letters*, Vol. 120 No. 2, pp. 350-353, doi: [10.1016/j.econlet.2013.04.039](https://doi.org/10.1016/j.econlet.2013.04.039).
- Blanchard, O.J. and Watson, M.W. (1982), "Bubbles, rational expectations and financial markets", NBER working paper, (w0945).
- Bozoklu, Ş. and Zeren, F. (2013), "Türkiye hisse senedi piyasasında rasyonel köpükler: sakli eş bütünleşme yaklaşımı", *Finansal Araştırmalar ve Çalışmalar Dergisi*, Vol. 5 No. 9, pp. 17-31.
- Case, K.E. and Shiller, R.J. (2003), "Is there a bubble in the housing market?", *Brookings Papers on Economic Activity*, Vol. 2003 No. 2, pp. 299-362, doi: [10.1353/eca.2004.0004](https://doi.org/10.1353/eca.2004.0004).
- Caspi, I. (2016), "Testing for a housing bubble at the national and regional level: the case of Israel", *Empirical Economics*, Vol. 51 No. 2, pp. 483-516, doi: [10.1007/s00181-015-1007-y](https://doi.org/10.1007/s00181-015-1007-y).
- Ceylan, F., Ekinci, R., Tüzün, O. and Kahyaoglu, H. (2018), "Kripto para piyasasında balonların tespiti: bitcoin ve ethereum örneği", *Business and Management Studies: An International Journal*, Vol. 6 No. 3, pp. 263-274.
- Cheah, E.T. and Fry, J. (2015), "Speculative bubbles in Bitcoin markets? An empirical investigation into the fundamental value of Bitcoin", *Economics Letters*, Vol. 130, pp. 32-36, doi: [10.1016/j.econlet.2015.02.029](https://doi.org/10.1016/j.econlet.2015.02.029).
- Cheung, A., Roca, E. and Su, J.J. (2015), "Crypto-currency bubbles: an application of the Phillips-Shi-Yu (2013) methodology on Mt. Gox bitcoin prices", *Applied Economics*, Vol. 47 No. 23, pp. 2348-2358, doi: [10.1080/00036846.2015.1005827](https://doi.org/10.1080/00036846.2015.1005827).
- Clarke, J., Jandik, T. and Mandelker, G. (2001), "The efficient markets hypothesis", *Expert Financial Planning: Advice from Industry Leaders*, Vol. 7 Nos 3/4, pp. 126-141.
- Deviren, B., Kocakaplan, Y., Keskin, M., Balcilar, M., Özdemir, Z.A. and Ersoy, E. (2014), "Analysis of bubbles and crashes in the TRY/USD, TRY/EUR, TRY/JPY and TRY/CHF exchange rate within the scope of econophysics", *Physica A: Statistical Mechanics and Its Applications*, Vol. 410, pp. 414-420, doi: [10.1016/j.physa.2014.05.029](https://doi.org/10.1016/j.physa.2014.05.029).
- Diba, B.T. and Grossman, H.I. (1988), "Explosive rational bubbles in stock prices?", *The American Economic Review*, Vol. 8 No. 3, pp. 520-530, available at: <https://www.jstor.org/stable/1809149>.
- Dowd, K. (2014), "New private monies: a bit-part player?", Institute of Economic Affairs Monographs, Hobart Paper, 174, available at: <https://ssrn.com/abstract=2535299>.
- El Montasser, G., Fry, J. and Apergis, N. (2016), "Explosive bubbles in the US-China exchange rate? Evidence from right-tailed unit root tests", *China Economic Journal*, Vol. 9 No. 1, pp. 34-46, doi: [10.1080/17538963.2015.1125591](https://doi.org/10.1080/17538963.2015.1125591).
- Evans, G.W. (1986), "A test for speculative bubbles in the sterling-dollar exchange rate: 1981-84", *The American Economic Review*, pp. 621-636, available at: <https://www.jstor.org/stable/1806063>.
- Fabozzi, F.J. and Xiao, K. (2019), "The timeline estimation of bubbles: the case of real estate", *Real Estate Economics*, Vol. 47 No. 2, pp. 564-594, doi: [10.1111/1540-6229.12246](https://doi.org/10.1111/1540-6229.12246).

- Fama, E.F. (1970), "Efficient capital markets a review of theory and empirical work", *The Journal of Finance*, Vol. 25, pp. 383-417.
- Fernández-Kranz, D. and Hon, M.T. (2006), "A cross-section analysis of the income elasticity of housing demand in Spain: is there a real estate bubble?", *The Journal of Real Estate Finance and Economics*, Vol. 32 No. 4, pp. 449-470, doi: [10.1007/s11146-006-6962-9](https://doi.org/10.1007/s11146-006-6962-9).
- Gürkaynak, R.S. (2008), "Econometric tests of asset price bubbles: taking stock", *Journal of Economic Surveys*, Vol. 22 No. 1, pp. 166-186.
- Guru, B.K. and Yadav, I.S. (2019), "Financial development and economic growth: panel evidence from BRICS", *Journal of Economics, Finance and Administrative Science*, doi: [10.1108/JEFAS-12-2017-0125](https://doi.org/10.1108/JEFAS-12-2017-0125).
- Hamilton, J.D. and Whiteman, C.H. (1985), "The observable implications of self-fulfilling expectations", *Journal of Monetary Economics*, Vol. 16 No. 3, pp. 353-373.
- Homm, U. and Breitung, J. (2012), "Testing for speculative bubbles in stock markets: a comparison of alternative methods", *Journal of Financial Econometrics*, Vol. 10 No. 1, pp.198-231, doi: [10.1093/jjfinec/nbr009](https://doi.org/10.1093/jjfinec/nbr009).
- Hu, Y. and Oxley, L. (2017), "Are there bubbles in exchange rates? Some new evidence from G10 and emerging market economies", *Economic Modelling*, Vol. 64, pp. 419-442, doi: [10.1016/j.econmod.2017.02.022](https://doi.org/10.1016/j.econmod.2017.02.022).
- Hung, N.T. (2019), "Return and volatility spillover across equity markets between China and Southeast Asian countries", *Journal of Economics, Finance and Administrative Science*, doi: [10.1108/JEFAS-10-2018-0106](https://doi.org/10.1108/JEFAS-10-2018-0106).
- Huy, D.T.N., Dat, P.M. and Anh, P.T. (2020a), "Building an econometric model of selected factors' impact on stock price: a case study", *Journal of Security and Sustainability Issues*, Vol. 9 No. 3, pp. 1-16.
- Huy, D.T.N., Loan, B.T.T. and Pham, T.A. (2020b), "Impact of selected factors on stock price: a case study of Vietcombank in Vietnam", *Entrepreneurship and Sustainability Issues*, Vol. 7 No. 4, p. 2715.
- Huy, D.T.N., Nhan, V.K., Bich, N.T.N., Hong, N.T.P., Chung, N.T. and Huy, P.Q. (2021), "Impacts of internal and external macroeconomic factors on firm stock price in an expansion econometric model—a case in Vietnam real estate industry", in *Data Science for Financial Econometrics*, Springer, Cham, pp. 189-205.
- Jirasakuldech, B., Emekter, R. and Went, P. (2006), "Rational speculative bubbles and duration dependence in exchange rates: an analysis of five currencies", *Applied Financial Economics*, Vol. 16 No. 3, pp. 233-243, doi: [10.1080/09603100500378997](https://doi.org/10.1080/09603100500378997).
- Kindleberger, C.P. and Aliber, R.Z. (2005), *Manias, Panics and Crashes: A History of Financial Crises*, John Wiley & Sons, New Jersey.
- Kotil, E. (2019), "Exports, imports, and the exchange rate: a causality analysis for Turkey (2004-2017)", in *Contemporary Issues in Behavioral Finance*, Emerald Publishing Limited, Bingley, Vol. 101, pp. 163-170.
- Kristoufek, L. (2015), "What are the main drivers of the Bitcoin price? Evidence from wavelet coherence analysis.", *PLoS One*, Vol. 10 No. 4, p. e0123923, doi: [10.1371/journal.pone.0123923](https://doi.org/10.1371/journal.pone.0123923).
- Landgraf, N. (2016), "Testing for multiple bubbles in asset prices", *MaRBL*, Vol. 1, doi: [10.26481/marble.2016.v1.257](https://doi.org/10.26481/marble.2016.v1.257).
- LeRoy, S.F. and Porter, R.D. (1981), "The present-value relation: tests based on implied variance bounds", *Econometrica: Journal of the Econometric Society*, pp. 555-574, doi: [10.2307/1911512](https://doi.org/10.2307/1911512).
- Mayer, C. (2011), "Housing bubbles: a survey", *Annual Review of Economics*, Vol. 3 No. 1, pp. 559-577, doi: [10.1146/annurev.economics.012809.103822](https://doi.org/10.1146/annurev.economics.012809.103822).
- Mazgir, I. (2007), "Speculation in capital markets: the recurrent of history", *Financial Political and Economic Commentary*, No. 10, p. 9. Berghahn Books. ISBN 0857455818.

- Mete, S., Ayben, K. and Ersoy, H. (2019), "Price bubble review in cryptocurrencies", *Journal of BRSA Banking and Financial Markets*, Vol. 13 No. 1, pp. 105-120.
- Mroua, M. and Trabelsi, L. (2020), "Causality and dynamic relationships between exchange rate and stock market indices in BRICS countries: panel/GMM and ARDL analyses", *Journal of Economics, Finance and Administrative Science*, doi: [10.1108/JEFAS-04-2019-0054](https://doi.org/10.1108/JEFAS-04-2019-0054).
- Narta, G.V., Cheema, M.A. and Szulczyk, K.R. (2018), "Searching for rational bubble footprints in the Singaporean and Indonesian stock markets", *Journal of Economics and Finance*, Vol. 41 No. 3, pp. 529-552, doi: [10.1007/s12197-016-9369-3](https://doi.org/10.1007/s12197-016-9369-3).
- O'Neill, J. (2001), *Building Better Global Economic BRICs*.
- Onifade, S.T., Çevik, S., Erdoğan, S., Asongu, S. and Bekun, F.V. (2020), "An empirical retrospect of the impacts of government expenditures on economic growth: new evidence from the Nigerian economy", *Journal of Economic Structures*, Vol. 9 No. 1, pp. 1-13, doi: [10.1186/s40008-020-0186-7](https://doi.org/10.1186/s40008-020-0186-7).
- Phillips, P.C. and Yu, J. (2011), "Dating the timeline of financial bubbles during the subprime crisis", *Quantitative Economics*, Vol. 2 No. 3, pp. 455-491, doi: [10.3982/QE82](https://doi.org/10.3982/QE82).
- Phillips, P.C., Wu, Y. and Yu, J. (2011), "Explosive behavior in the 1990s Nasdaq: when did exuberance escalate asset values?", *International Economic Review*, Vol. 52 No. 1, pp. 201-226, doi: [10.1111/j.1468-2354.2010.00625.x](https://doi.org/10.1111/j.1468-2354.2010.00625.x).
- Phillips, P.C., Shi, S. and Yu, J. (2015), "Testing for multiple bubbles: historical episodes of exuberance and collapse in the S&P 500", *International Economic Review*, Vol. 56 No. 4, pp. 1043-1078, doi: [10.1111/iere.12132](https://doi.org/10.1111/iere.12132).
- Shi, S. (2017), "Speculative bubbles or market fundamentals? An investigation of US regional housing markets", *Economic Modelling*, Vol. 66, pp. 101-111, doi: [10.1016/j.econmod.2017.06.002](https://doi.org/10.1016/j.econmod.2017.06.002).
- Shiller, R.J. (1980), "Do stock prices move too much to be justified by subsequent changes in dividends?". Working Paper 0456, National Bureau of Economic Research, doi: [10.3386/w0456](https://doi.org/10.3386/w0456).
- Shiller, R.J. (1981), "Alternative tests of rational expectations models: the case of the term structure", *Journal of Econometrics*, Vol. 16 No. 1, pp. 71-87.
- South African Government (2021). available at: <https://www.gov.za/events/fifth-brics-summit-general-background>.
- Umar, M. and Sun, G. (2015), "Country risk, stock prices, and the exchange rate of the renminbi", *Journal of Financial Economic Policy*, Vol. 7 No. 4, pp. 366-376, doi: [10.1108/JFEP-11-2014-0073](https://doi.org/10.1108/JFEP-11-2014-0073).
- Uzuner, G., Bekun, F.V. and Saint Akadiri, S. (2017), "Public expenditures and economic growth: was Wagner right? Evidence from Turkey", *Academic Journal of Economic Studies*, Vol. 3 No. 2, pp. 36-40.
- Wu, Y. (1995), "Are there rational bubbles in foreign exchange markets? Evidence from an alternative test", *Journal of International Money and Finance*, Vol. 14 No. 1, pp. 27-46, doi: [10.1016/0261-5606\(94\)00002-1](https://doi.org/10.1016/0261-5606(94)00002-1).



Source(s): Authors' computation using EViews software

Figure A1. Graphs of GSADF test results

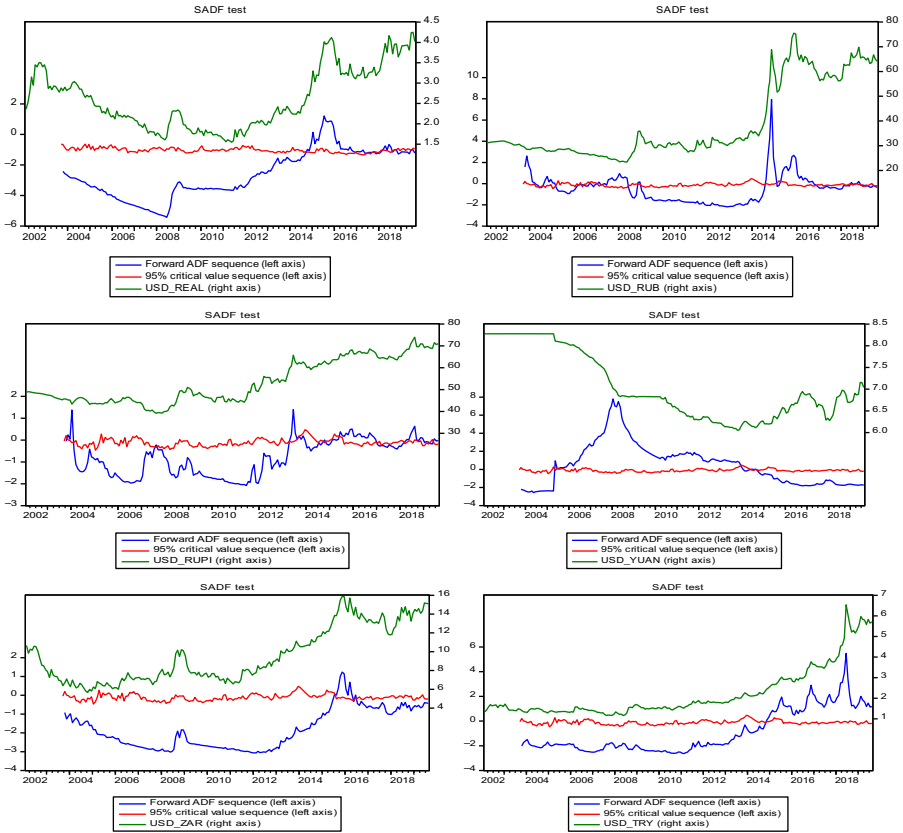


Figure A2.
Graphs of SADF test
results

Source(s): Authors' computation using EViews software

Appendix 3Exchange rate
dynamics of
BRICS and
Turkey

Variables	Descriptions
USD/BRL	Exchange rate from United States Dollar to Brazilian real
USD/RUB	Exchange rate from United States Dollar to Russian ruble
USD/INR	Exchange rate from United States Dollar to Indian rupee
USD/CNY	Exchange rate from United States Dollar to Chinese yuan
USD/ZAR	Exchange rate from United States Dollar to South African rand
USD/TRY	Exchange rate from United States Dollar to Turkish Lira

Source(s): Authors' compilation

261**Table A1.**
Currency exchange
descriptions**Corresponding author**Andrew Adewale Alola can be contacted at: aadewale@gelisim.edu.tr

For instructions on how to order reprints of this article, please visit our website:www.emeraldgrouppublishing.com/licensing/reprints.htmOr contact us for further details: permissions@emeraldinsight.com