

Spillover effects of the US monetary policy normalization on African stock markets

An effect of a US policy on African stock

Ebere Kalu, Chinwe Okoyeuzu and Angela Ukemenam

Department of Banking and Finance, University of Nigeria, Enugu Campus, Nsukka, Nigeria, and

Augustine Ujunwa

Department of Monetary Policy, Central Bank of Nigeria, Abuja, Nigeria

3

Received 26 September 2019
Revised 22 December 2019
20 February 2020
26 February 2020
Accepted 27 February 2020

Abstract

Purpose – We study the contemporaneous effects of US monetary policy normalization on African stock market using panel data from six African countries.

Design/methodology/approach – Daily data from May 1, 2013 to December 31, 2018 were used in order to accommodate the announcement effects since the US monetary policy normalization announcement was made in May 2013, while the rate hike was in December 2015. The study used the FE, RE and PMG models.

Findings – The results revealed that US 10-year bond yield and Treasury bill rate shocks negatively affect stock prices in Africa. S&P500 shock positively affects African stock prices. The result revealed that the integration of African financial market to the global financial market is a major source of vulnerability. The finding that US Treasury bill rate is a major depressant of the African stock prices reveals the short-termism of foreign portfolio inflows into African economies.

Originality/value – We provide inexorably insight into the interplay of financial systems globally. It can be useful for the purposes of generalization in developing economies in the shape of African countries. More so, this study could be replicated in another economic bloc or region with the aim of further exposing the far-reaching spillover effects of the US monetary policy normalization.

Keywords US monetary policy, Spillover effects, Normalization, Africa

Paper type Research paper

1. Introduction

The 2008–2009 global financial crisis was associated with huge adverse shocks on monetary, financial and economic conditions across the globe (Belke *et al.*, 2017). Conventional monetary policy tools were limited in correcting the adverse effects of the crisis because interest rates in most high-income countries were almost zero at that time. Quantitative easing was an unorthodox or unconventional monetary policy tool used to stimulate demand and increase bank lending, with the ultimate objective of stimulating the economy. Quantitative easing was to reverse increasing unemployment, slowing output and financial system fragility (Hausken and Ncube, 2013).

Unconventional monetary policy or quantitative easing is the buying of assets from private institutions, such as financial and non-financial firms and crediting institutions' account while their banks hold a corresponding claim against the central banks (England, 2016). This automatically increases money supply in the economy (Michaelis and Watzka,



© Ebere Kalu, Chinwe Okoyeuzu, Angela Ukemenam and Augustine Ujunwa. Published in *Journal of Economics and Development*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) license. 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 license may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>

Journal of Economics and
Development
Vol. 22 No. 1, 2020
pp. 3-19
Emerald Publishing Limited
e-ISSN: 2632-5330
p-ISSN: 1859-0020
DOI 10.1108/JED-09-2019-0038

2017). According to Hausken and Ncube (2013), “the USA introduced QE1 in 2008, QE2 in 2010, and “Operation Twist” (OT) in 2011, and more recently the third round of QE (QE3) in 2012, which consisted of a monthly \$85 billion injection through the purchase of mortgage-backed securities and longer-term Treasury securities”, that substantially increased the balance sheet of the central bank.

The quantitative easing in developed economies stimulated a large foreign portfolio flows from developed economies to emerging and frontier economies. As at 2010, the volume of capital flows averaged \$1.1 trillion, a figure surpassed only by the level observed in 2007, usually described as a pre-crisis outlier (Ortiz, 2016). Scholars and practitioners, however, disagree on the impact of private capital flows to emerging and frontier markets. For instance, portfolio flows to emerging markets may support investment, reserve accretion and economic growth. At the same time, it could heighten the risk of asset bubbles. Ujunwa *et al.* (2013) attributed the cause of the Nigerian banking crisis of 2009 to capital flows and argued that capital flows represent a key amplification of financial fragility in developing economies. In their view, it could exacerbate financial system fragility when intermediated through banks and is more fatal to financial system stability when it takes the form of portfolio investment. Despite the arguments for and against private capital flows to emerging and frontier markets, there is a strong advocacy for policy response in the event of an abrupt portfolio reversal, to avoid financial dislocation. For instance, while emerging markets are still grappling with policy response to maximize private inflows, the United States Federal Reserve System (the Fed) announced its decision to unwind the unconventional monetary policy in May 2013 because of economic recovery and output growth in the US.

The tapering decision of the Fed may have implications on emerging markets and other developing economies. According to IMF (2014), “as the recovery gains a firmer footing in some advanced economies, unwinding of exceptional monetary support in these economies will proceed with implications for global financial conditions”. Expectedly, the tapering announcement immediately triggered volatility in the global financial markets, especially; emerging markets (Mishra *et al.*, 2014; Goes *et al.*, 2017; and Matheson, 2015). For instance, Matheson (2015) showed that economic news and monetary shocks from the US led to a rise in Brazil’s 10-year bond yield by around 150bps. Similarly, Mishra *et al.* (2014) showed that “on average, bond yields rose by 2½% points, equity market fell by 13¼%, exchange rates depreciated by 13½%, while reserves declined by 4.1% during May 22–(end of) August 2013”, in Indonesia, Turkey, Brazil, India and South Africa, respectively, after the normalization announcement in the US. Goes *et al.* (2017) also found that US monetary policy normalization had “a statistically large and drawn-out impact on the local currency sovereign bond yields of Brazil and Mexico”.

While studies on the spillover effects concentrated on five emerging markets – Indonesia, Mexico, Brazil, South Africa, Turkey and India, expanding the debate to accommodate other economies with internationally integrated financial markets has become extremely crucial. During ultra-loosed quantitative easing, investors in search of high yield also moved into the African markets. This makes it important to understand the effect of US monetary policy normalization on these markets. This paper strives to fill this important void by selecting African countries with relatively developed stock market, which include South Africa, Nigeria, Egypt, Kenya, Morocco and Ghana.

The decision to use stock prices tends to depart from previous empirical studies. Previous studies focused on 10-year sovereign bond yield, largely because of the instant impact of the announcement on the US 10-year bond yield. US 10-year bond yield added 20 basis points immediately after the announcement and 30 basis points in June 2013 after the Fed confirmed that unwinding would commence by the end of 2013 during the FOMC meeting in June 2013. We however focussed our empirical analysis on stock prices because we also suspect that

tapering would lead to capital flows reversal, currency depreciation, stock price volatility and re-pricing of assets that may depress domestic stock prices [1].

Our analytic framework follows some considerations. First, we looked at the basic statistical properties of the studied variables to be able to establish an evidence-based co-movement amongst them. First, we use aggregative averages, averages of spread and variation and tests for linear association. Second, given the growing importance of investigating stationarity properties in panel estimation, we used two broad-based panel unit root tests. While the first set assumes cross-sectional dependence, the second set assumes cross sectional-independence. The combination is geared towards ensuring robustness of the findings on which the stationarity or otherwise of the panel dataset is based. Last consideration of our analytic framework follows the employment of the traditional panel models of fixed effect (FE) and random effect (RE), with Hausmann test used as an evaluation criterion for the appropriateness of either the FE or the RE model respectively. Given the endogeneity problem, excessive aggregation bias and other drawbacks associated with the FE and RE techniques, we used the pooled mean group (PMG) estimation technique for dynamic panel to ensure robustness of the estimation framework alongside the aforementioned traditional panel techniques. In addition, the PMG estimation technique through the error correction representation that it reports provided a ground for measuring the adjustment profile of African stock against the shocks and dynamics of the US monetary policy normalization.

The structure of the paper is as follows: [Section 2](#) reviews related literature, [Section 3](#) discusses the empirical methodology, [Section 4](#) presents and discuss the results, while [Section 5](#) concludes the paper.

2. Literature review

During the 2007–2008 global financial crisis, monetary authorities in high-income countries, such as the Fed, European Central Bank, Bank of Japan and Bank of England cut their policy rates in order to stimulate demand because of weakening employment and output ([Lim and Mohapatra, 2016](#)). With the interest rate almost at zero and presence of significant risk of very low inflation, the monetary authorities subsequently implemented unconventional monetary policy, which is increasing the quantity of money supply, by injecting money directly into the economy ([England, 2016](#)). The unconventional monetary policy or quantitative easing involved the buying of assets from private institutions such as financial and non-financial firms and credit the institutions' account, "while their bank holds a corresponding claim against the Bank of England also known as reserves ([England, 2016](#))." This automatically amounted to increasing money supply in the economy. This response was possible because the monetary authorities have enabling laws that allow them hold primary market instruments ([Michaelis and Watzka, 2017](#)).

Several studies have assessed the quantitative easing in developed economies aided by developed robust framework for evaluating the effectiveness of the policy. [Michaelis and Watzka \(2017\)](#) used a time-varying parameters vector autoregression model to study the effectiveness of Bank of Japan's unconventional monetary policies and found important time variation in the responses of core CPI and real GDP. [Miyakoshia et al. \(2017\)](#) investigated effect of the Fed, European Central Bank and Bank of Japan quantitative easing on the stock prices of eight Asian emerging markets from 2001 to 2016 and found that quantitative easing increased the stock price of the selected countries.

Other studies investigated the cross-financial market correlations of quantitative easing ([Kryzanowski et al., 2017](#)); the role of quantitative easing in promoting financial flows to developing countries during the post-crisis era ([Lim and Mohapatra, 2016](#)); the effects of the Bank of Japan's quantitative and qualitative easing policies ([Matsuki et al., 2015](#));

effectiveness of the Fed quantitative easing policy (Belke *et al.*, 2017); the fiscal cost of exiting quantitative easing in Japan (Fujiki and Tomura, 2017); impact of quantitative easing in Japan, United States, United Kingdom and Europe (Hausken and Ncube, 2013); effect of quantitative easing on exchange rate (Kenourgiosa *et al.*, 2015); implications of quantitative easing on bank lending (Bowman *et al.*, 2015); counterfactual evaluations of quantitative easing (Barroso *et al.*, 2016 and Pesaran and Smith, 2016) and the side effects of quantitative easing on the bond market (Steeley, 2015). Some scholars also used anecdotal evidence to demonstrate the negative effect of quantitative easing on inflation, interest rates and exchange rates (Brown, 2015 and Moosa, 2014). All these studies posted mixed findings.

In the heat of the debate, the Fed in May 2013 announced its decision to normalize the unconventional monetary policy. The announcement and implementation of the policy has also prompted a new wave of research (see Mishra *et al.*, 2014; Goes *et al.*, 2017 and Matheson, 2015). These studies focused on the spillover effects of monetary policy normalization on emerging markets, relying extensively on the well-established theory of external vulnerability and spillover theory. External vulnerability theory argues for the presence of contagion effect of macroeconomic risk from one country on another through multiple transmission mechanisms such as trade channel, financial channel, integration of international market channel and investment channel. It exemplifies how shocks emanating from a dominant country can rapidly propagate beyond the borders to affect macroeconomic outcomes in other countries and ultimately the global economy.

External vulnerability has been exacerbated by globalization and improvements in information communication technology, which eliminated some trade barriers, increased economic interconnectedness and accelerated the spread of economic risk across national boundaries (Fratzscher *et al.*, 2018; Ahmed and Zlate, 2014; Tong, 2017; Galariotis *et al.*, 2018; Georgiadis, 2016). Spillover from dominant economies could threaten large-scale private sector defaults, trigger distressed assets sales and high bank insolvency, deplete external reserves and cause loss of market confidence in small economies (Jimenez-Rodriguez and Sanchez, 2005 and Lilien, 1982). The identified channels in extant literature are investment, trade, finance and integration of internal markets channels. Innovation in information technology appeared to have increased economic interconnectedness, eliminated some trade barriers and ultimately accelerated the spread of economic risk across national boundaries.

Majority of the studies found significant effect of external shocks on macroeconomic fluctuations (Jimenez-Rodriguez and Sanchez, 2005; Lilien, 1982; Orhan *et al.*, 2016; Ahmed and Zlate, 2014; and Stolbova and Shchepeleva, 2016). Ahmed and Zlate (2014) argued that global risk appetite, absence of capital controls, US unconventional monetary policy and sensitivity to interest rate differentials between advanced and emerging economies are the major determinants of foreign portfolio investment from developed to emerging economies. Recent studies that investigated the spillover effects of US monetary policy normalization on emerging markets relied on the above theoretical framework. The basic assumption is that developments in the United States can affect the emerging financial markets contemporaneously, but developments in the emerging markets would not affect the United States.

Despite the overwhelming empirical evidence on the spillover effects from dominant economies to small economies, some studies have relegated the spillover theory to the background (Raddatz, 2007 and Tong, 2017). They argue that the vulnerability of any domestic economy to external shocks is transitory and does not necessarily result in significant output fluctuation. In their view, the effects of external shocks on macroeconomic fluctuations are passive, as internal shocks are the major predictors of macroeconomic fluctuations. Raddatz (2007), for instance, used the VAR methodology to investigate the effects of external shocks on output volatility and found that internal shocks account largely for output fluctuations, while external shocks accounted for a small fraction of the variance.

Tong (2017) used a panel of 257 banks across 26 countries to examine the effect of US monetary policy on global financial stability and found that internal factors such as capital control reduces the vulnerabilities of countries to external shocks.

Recent empirical studies on international spillovers used different methodologies. For instance, Apostolou and Beirne (2019) used a two-step GARCH-in-mean approach, Hanisch (2019) used a multi-country structural dynamic factor model, Rohit and Dash (2019); Timmer (2018) and Barbosa *et al.* (2019) use the global Var, while Albagli *et al.* (2019) and Avdjiev and Hale (2019) used panel technique. Bhattarai *et al.* (2019) used the Panel Var that US monetary policy shock has negative effect on stock prices and exchange rates in fourteen emerging market economies. Barbosa *et al.* (2019) analyse that cross-border spillovers of monetary policy on sovereign debt crisis in Ireland and Portugal through credit growth and that monetary policy spillover from the US and UK affect the two countries through a heterogeneous transmission mechanisms. Rohit and Dash (2019) examine the role of exchange rate regimes in explaining monetary policy spillover across advanced and emerging economies. They found that spillover is time-varying, and flexible exchange rate regime insulates economies from international shocks. Timmer (2018) also contributed to the spillover debate by examining the effect of US spillover on corporate bond yields in emerging economies and found domestic policy rate is the most effective channel. The global Var and heterogeneous panel are the most used methodologies because they allow for the pooling of different countries at the same time.

The bulk of these papers focussed on developed economies, emerging markets (Indonesia, Mexico, Brazil, South Africa, Turkey and India) and Asian economies. Most African countries have small open economies with financial markets that are integrated with the global financial market. These African economies are not insulated from global shocks, as the experience of the 2007/2008 global financial crisis showed that the major source of transmitting external shocks to the African economy is the stock market and more particularly, portfolio flows. However, empirical literature that clarifies our understanding of the effect of US monetary policy normalization on African stock market is lacking or sparse. This study therefore fills this important gap in literature.

3. Methodology

3.1 Model, variable measurement and justification

The basic functional relationship of this study is as follows:

$$\text{ASTKPRICE} = f(\text{USTBR}, \text{US10YBY}, \text{S\&P500}, \text{EXR})$$

In an estimable form, we present the equation as follows:

$$\text{ASTKPRICE}_{it} = \vartheta_0 + \vartheta_1 \text{USTBR}_{it} + \vartheta_2 \text{US10YBY}_{it} + \vartheta_3 \text{S\&P500}_{it} + \vartheta_4 \text{EXR}_{it} + \varepsilon_{it} \quad (1)$$

where ASTKPRICE represents the stock market index that captures the changing average value of the share prices of all companies on the respective selected African stock exchanges; USTBR is the US treasury bill rate; US10YBY is the US ten-year bond yield; S&P500 is the S&P500 index; EXR is the US dollar to the local currency exchange rate of the selected African countries. ϑ_0 is the intercept, ϑ_1 , ϑ_2 , ϑ_3 , ϑ_4 are the slopes of the respective explanatory variables and ε_{it} is the error term accounting for the unmodellable influencing factors in the panel framework.

Because the objective of the study is to investigate the contemporaneous effects of US monetary policy normalization on African stock market, we use variables that capture the transmission channels of the shocks from dominant economies to small economies. The variables are US Treasury bill, US 10-year bond, S&P 500, stock prices of African stock exchange and US dollar exchange rate to the domestic currencies of the selected countries. Because the focus is on stock prices, we use S&P 500 and stock prices of the selected countries. This is based on our assumption that portfolio reversal could take the form of

portfolio investment, which could depress stock prices in the selected countries (see [Laeven and Tong, 2012](#); [Thanh et al., 2020](#); and [Kose and Unal, 2020](#)). We suspect that tapering would lead to capital flows reversal, currency depreciation, stock price volatility and re-pricing of assets which may depress domestic stock prices. We introduced exchange rate into the equation because we assume exchange rate pass-through effect. Specifically, exchange rate channel is arguable one of the potent channels that global shocks contemporaneously affect stock markets (see also [Nilavongse et al., 2020](#); [Zeev, 2019](#); [Malika and Umar, 2019](#) and [De and Sun, 2019](#)). Studies have also established that the tapering announcement had an immediate impact on US Treasury bill rate and US 10-year sovereign bond yield ([Mishra et al., 2014](#); [Goes et al., 2017](#) and [Matheson, 2015](#)). US 10-year bond yield added 20 basis points immediately after the announcement and 30 basis points in June 2013 after the Fed confirmed that unwinding would commence by the end of 2013 during the FOMC meeting in June 2013. These developments influenced our decision to introduce these variables in line with previous studies ([Mishra et al., 2014](#); [Goes et al., 2017](#) and [Matheson, 2015](#)).

3.2 Estimation framework

First, we explored the pre-estimation characteristics of the panel series by evaluating the descriptive statistics and stationarity properties of the variables with the view to satisfying ourselves of the goodness of the series. While it is common knowledge that the spread and aggregative tendencies of the series can be established through descriptive statistics; it is worthy to note that time series properties in panel data make the estimation of stationarity properties reasonably imperative. The expanding frontier of panel estimation techniques and time series into different topical areas creates a latitude for analysing relations in such a robust manner that was previously unthinkable. The due representation of the pre-estimation elements of the series under study would guide appropriate model selection devoid of specification bias. Second, a battery of panel estimation techniques is adopted to ensure a clear distinction between proof of evidence and power of tests. Given that there are no all-encompassing and exhaustive tests, this study deploys a selection of traditional panel models such as the fixed effect (FE) and random effect (RE) models while strengthening them with dynamic model like the pooled mean group estimation technique as proposed by [Pesaran and Shin \(1999\)](#).

In substituting our variables into the fixed effect model, following [Brooks \(2014\)](#), the FE model is presented below:

$$ASTKPRICE_{it} = \varphi + \varphi_1 USTBR_{it} + \varphi_2 US10YBY_{it} + \varphi_3 S\&P500_{it} + \varphi_4 EXR_{it} + \lambda_i + v_{it} \quad (2)$$

λ_i is a time-varying intercept that captures all of the variables that affect Y_{it} that vary over time but are constant cross-sectionally ([Brooks, 2014](#)).

The random effect model on the other hand follows the form presented below:

$$ASTKPRICE_{it} = \varphi + \varphi_1 USTBR_{it} + \varphi_2 US10YBY_{it} + \varphi_3 S\&P500_{it} + \varphi_4 EXR_{it} + (\varepsilon_{it} + \mu_{it}) \quad (3)$$

ε_{it} measures the random deviation from the global or common intercept term α , subscript “ it ” represents the combination of individuality and time and μ_{it} = the regular error term = the regular error term.

The dynamic panel estimation method used as an addition to the traditional panel estimation technique is the pooled mean group (PMG) test. [Pesaran et al. \(1999\)](#) suggest two estimators that resolve bias in the face of likely heterogeneous panel. These are the mean group (MG) and PMG models. According to [Pesaran et al. \(1999\)](#), the MG estimators are consistent and have asymptotic normal distribution for N and T that are sufficiently large. However, because of its inconsistency in the face of small T, it can become quite biased for which cause the PMG occupies an intermediate position between MG and the fixed effect

model. It does this by the short-run coefficients to vary and the long-run coefficient pooled across cross-sections. Hence, PMG combines the efficiency of pooled estimations while overtaking the inconsistencies arising from pooling heterogeneous dynamic relationship. It is on the basis of this that the PMG is used side by side with the traditional panel technique.

Third, it is quite obvious that elasticities are usually of interest. More so, we are focused on the elasticity of African stock prices to the normalization of US monetary policy. However, the speed at which the process takes place is of policy relevance. How quickly African stock prices respond to changes in the explanatory variables under study is important for understanding not just future effects that may occur as a result of changes in the policy directions of the impacting financial system (US) but also the speed at which such changes are transmitted. This is what the error correction representation from the PMG model unveils in this study. The PMG for this study is as specified in Eqn 4 below:

$$y_{it} = \sum_{j=i}^n \gamma_j y_{i,t-j} + \sum_{j=0}^m \delta_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \quad (4)$$

where: y = ASTKPRICE the stock market index; x = USTBR, US10YBY, EXR.

$x_{i,t}(kx1)$ is the vector of the explanatory variables for the group i , μ representing the fixed effects and the coefficients of the lagged dependent variables. λ_{ij} is scalar, and δ_{ij} is $(kx1)$ coefficient vector.

Eqn 4 is reparametrized in a vector error correction framework as with the x and y variables fully substituted:

$$\begin{aligned} \Delta \text{ASTKP}_{it} &= \sigma_i (\text{ASTKP}_{i,t-1} - \beta_i \text{USTBR}_{i,t-1} - \beta_i \text{US10YBY}_{i,t-1} - \beta_i \text{EXR}_{i,t-1}) \\ &+ \sum_{j=1}^{n-1} \delta_{ij} \Delta \text{ASTKP}_{i,t-j} + \sum_{j=0}^{m-1} \delta'_{ij} \text{USTBR}_{i,t-j} \mu_i + \sum_{j=0}^{m-1} \delta'_{ij} \text{US10YBY}_{i,t-j} \mu_i \\ &+ \sum_{j=0}^{m-1} \delta'_{ij} \text{S\$P500}_{i,t-j} \mu_i + \sum_{j=0}^{m-1} \delta'_{ij} \text{EXR}_{i,t-j} \mu_i + \varepsilon_{it} \end{aligned} \quad (5)$$

We conclude our estimation by not just drawing inferences but looking first at some diagnostic tests largely aimed at confirming the reliability and validity of our estimates.

3.3 Data

The data for the study are a longitudinal dataset of six stock markets' index in Africa selected on the basis of activity and availability. Given that the US normalization took place in May 2013, the study adopts a daily panel series for the US and the studied countries covering May 1, 2013 to December 31, 2018. The lower limit of the sample period is determined by the announcement date of the normalization policy, and upper limit is determined by the need to ensure currency of data.

4. Results

4.1 Statistical and other properties of the series

First, we show the basic descriptive statistics of the series as contained in Table 1 reflecting aggregative averages like the mean, median and the measures of dispersion such as the standard deviation interspersed by the minimum and maximum. One obvious factor is the high standard deviation of the stock prices. This can be linked to the volatility caused by the transmission effect of the normalization policy on the studied stock markets. It is noteworthy that the stock prices of African countries show greater volatility, as shown by the standard

Table 1.
Basic descriptive
statistics

	Mean	Median	Maximum	Minimum	Std. Dev	Skewness	Kurtosis	Jar. Bera	Prob
EXR	52.5	9.6	362.6	0.2	75.7	1.8	6.4	432.2	0.0
STKPRICE	15914.7	6952.5	59772.8	0.0	17917.0	1.0	2.5	68.4	0.0
US10YBY	2.6	2.5	3.8	1.5	0.6	0.2	2.3	11.1	0.0
SP500	1754.5	1794.2	2914.0	735.1	604.4	0.2	1.9	25.2	0.0
USTBR	0.4	0.1	2.5	0.0	0.7	1.8	4.9	290.9	0.0

deviation. This arguably could be attributed to the systemic and operational instability that characterize stock markets in developing countries of which African economies are inclusive.

Figure 1 below further stresses the oscillatory characteristics of the stock market variables in reaction to the normalization policy transmitters. It is evident that volatility pooling abound for all the countries, as periods of low volatility is succeeded by periods of low volatility, vice versa. The graphs show a possible infiltration of additive outlier around 2013, suggestive of the impact of the normalization which took effect on May 2013 in the United States.

Similarly, the possible degree and direction of linear association amongst the studied variables are shown in Table 2. African stock prices are found to positively and significantly correlate with EXR, S\$P500; with US10YBY and USTBR showing positive but non-significant correlation.

Second, Table 3 presents a summary of panel unit root tests following two broad shades of thought. This is a combination of tests that assume cross-sectional dependence with those that assume cross-sectional independence. This study uses four variants of panel unit root tests to expose the stationarity properties of the datasets. Levin *et al.*, (2002), Im *et al.*, (2003)

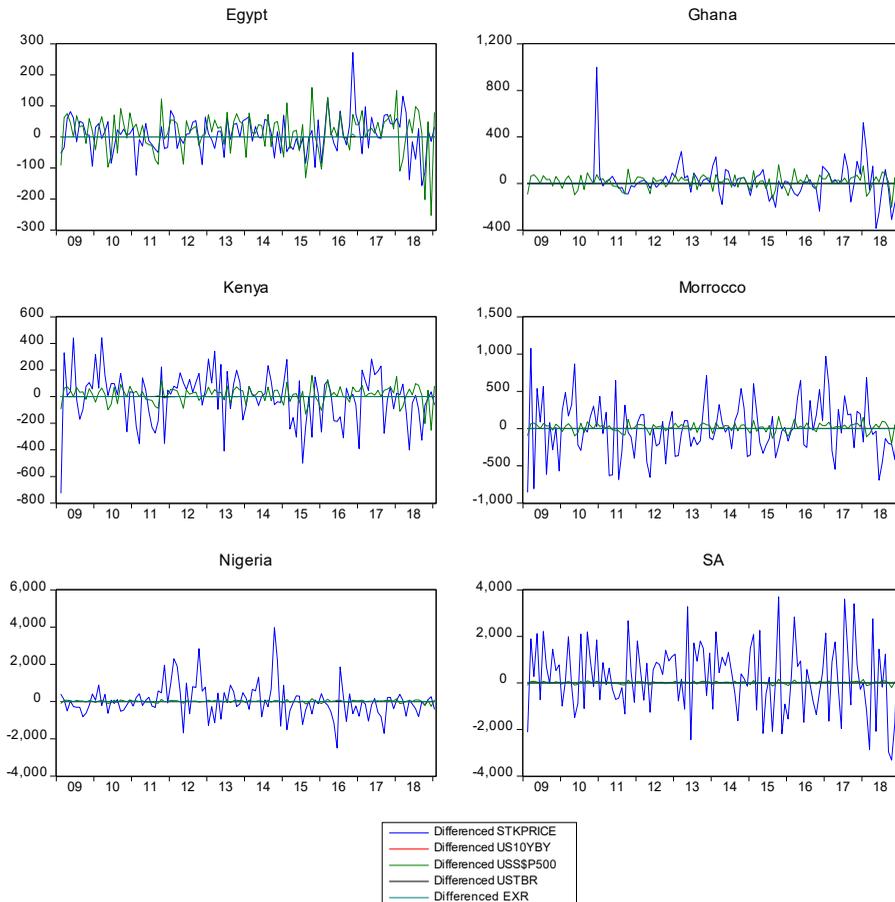


Figure 1. Country-specific first difference plot of the studied variables

and Maddala and Wu (1999) observe that ADF Fisher and Choi (2001) and PP Fisher as used agree to the fact that the series are largely I(0) with the exception of S&P500 that is I(1) following LLC only while others adjudged it to be an I(0). This obviously justifies the use of the FE and RE as well as the PMG panel estimation techniques.

Third, the results of the three-pronged panel estimations are presented in Table 4. It can be observed that the FE and RE are consistent across the variables studied. EXR, US10YBY and USTBR were all found to be negatively significant at the 0.05 level of significance, and S&P500 proved to have positive and significant effect on the stock prices of the investigated African countries.

Fifth, the results of the PMG are presented in column four of Table 4. The results agree with the FE and RE models to a very large degree if not in its entirety. Stock price is found to be a negative function of EXR, US10YBY, USTBR and positive function of S&P500. The point of departure between the FE and RE versus PMG is in the direction of significance. EXR, USTBR and S&P500 maintained their significance across all the models, but US10YBY is found to be non-significant in the PMG model.

Last, the error correction representation of the PMG model is shown at the lower part of column 4 in Table 4. This shows the speed of adjustment of African stock prices to the normalization policy transmitters. The error correction term which is -0.234 or 23.4% as shown in Table 4 is negatively significant indicating that it is rightly signed, suggesting a certain convergence to long-run equilibrium from short-run deviation by African stock prices in reaction to the normalization policy. Given that the data sets are of monthly frequency; it implies that such deviations are corrected within five months. This suggests an appreciable speed of adjustment and responsiveness of stock prices to the shocks and dynamics of the US normalization policy. Summarily, it is empirically evident that the African stock prices over the investigated period responded to the US monetary policy normalization in a very certain and deterministic department.

4.2 Implications of the results

Extensive research efforts have been deployed towards the investigation of the effect of international spillovers on less dominant economies. The focal roles of the US economy in the world trade and financial flows have rendered it as a good specimen for the evaluation of the transmission effect of macroeconomic shocks to foreign economies. The transmission channels identified are trade channel, financial channel, integration of international market channel and investment channel, credit channel, risk-taking channel and expectation channel. Therefore, this paper is predicated on how developments in the US money and capital market, with particular emphasis on the normalization policy spillover affects selected African stock market. This was done using the S&P500, US Treasury bill rate, US

Table 2.
Correlational matrices
of African stock prices
and US normalization
policy reflectors

X	Y	Correlation	t-Statistic	Probability
STKPRICE	EXR	0.334026	7.140564	0.0000
US10YBY	EXR	-0.086578	-1.751078	0.0807
US10YBY	STKPRICE	-0.051393	-1.036907	0.3004
S&P500	EXR	0.079159	1.600032	0.1104
S&P500	STKPRICE	0.200968	4.133727	0.0000
S&P500	US10YBY	-0.271126	-5.675624	0.0000
USTBR	EXR	-0.012843	-0.258808	0.7959
USTBR	STKPRICE	0.096103	1.945419	0.0524
USTBR	US10YBY	0.143780	2.927494	0.0036
USTBR	S&P500	0.720432	20.93115	0.0000

Variables	LLC		IPS		ADF-Fisher		PP Fisher	
	Test stat	Order of integration	Test stat	Order of integration	Test stat	Order of integration	Test stat	Order of integration
EXR	3.25 ($\phi = 0.000$)	I(0)	7.80 ($\phi = 0.000$)	I(0)	77.99 ($\phi = 0.000$)	I(0)	201.49 ($\phi = 0.000$)	I(0)
STKPRICE	3.15 ($\phi = 0.000$)	I(0)	8.33 ($\phi = 0.000$)	I(0)	84.11 ($\phi = 0.000$)	I(0)	190.52 ($\phi = 0.000$)	I(0)
US10YBY	3.71 ($\phi = 0.000$)	I(0)	8.58 ($\phi = 0.000$)	I(0)	87.23 ($\phi = 0.000$)	I(0)	183.53 ($\phi = 0.000$)	I(0)
S&P500	3.50 ($\phi = 0.000$)	I(1)	6.93 ($\phi = 0.000$)	I(0)	68.06 ($\phi = 0.000$)	I(0)	206.75 ($\phi = 0.000$)	I(0)
USTBR	5.56 ($\phi = 0.000$)	I(0)	8.02 ($\phi = 0.000$)	I(0)	81.95 ($\phi = 0.000$)	I(0)	199.17 ($\phi = 0.000$)	I(0)

Table 3.
Summary of panel unit
root tests

Table 4.
Summary of panel
estimations

	FE	RE	PMG
Parameters	STKP = $f(\text{USTBR}, \text{US10YBY}, \text{\$P500}, \text{EXR})$	STKP = $f(\text{USTBR}, \text{US10YBY}, \text{\$P500}, \text{EXR})$	STKP = $f(\text{USTBR}, \text{US10YBY}, \text{\$P500}, \text{EXR})$
US10YBY	$\varphi = -803; t = 2.65; p < 0.05$	$\varphi = -801.9; t = 2.65; p < 0.05$	$\varphi = -0.02; t = 1.27; p > 0.05$
\\$P500	$\varphi = 6.06; t = 8.58; p < 0.05$	$\varphi = 6.06; t = 2.65; p < 0.05$	$\varphi = 0.71; t = 10.58; p < 0.05$
USTBR	$\varphi = -1329.6; t = 3.71; p < 0.05$	$\varphi = -1330.7; t = 3.71; p < 0.05$	$\varphi = -0.09; t = 4.71; p < 0.05$
EXR	$\varphi = -46.8; t = 14.95; p < 0.05$	$\varphi = -46.75; t = 14.92; p < 0.05$	$\varphi = -0.01; t = 3.40; p < 0.05$
<i>Diagnostic Tests</i>			
R ²	98%	24%	NA
F-stat	3433.6(0.0000)	31.5(0.0000)	NA
ECM	NA	NA	NA
Hausmann test		Preferred (Chi-square 0.035885(4) p-value = 0.9998)	$\varphi = -0.234; t = 2.45; p < 0.05$

generic 10-year bond yield and the stock market index of the African countries in focus. Given that the spillover manifests through capital reversals, the introduction of the US to domestic exchange rate of the selected countries was considered essential for the investigation.

Notably, the estimated coefficients of S&P500 are positive and statistically significant, implying positive spillover effect from US stock exchange to African stock market during the period of monetary policy normalization. This seems to run against the *a priori* expectation that portfolio reversals would have bearish and bullish effects on Africa and US stock markets respectively; due to portfolio reversal to the US stock market. This result however could be explained by the timing of the study and global developments like the trade war between the US and China, Trump effects and heightened uncertainties in the global economy. [Mishra et al. \(2014\)](#), for instance, showed that on average, equity market fell by 13¼% in Indonesia, Turkey, Brazil, India and South Africa three months after the normalization announcement. The global tension and international developments would have influenced investors' preference for fixed securities as a hedge against global uncertainty. Such developments would tremendously depress the stock market of developed and developing economies.

The estimated coefficient of US local currency exchange rate was negative and statistically significant across the three models. The result revealed that currency depreciation arising from capital flows due to progressive monetary tightening by the Fed produced depressing effects on African stock markets. This is consistent with the study of [Mishra et al. \(2014\)](#) which revealed that emerging markets exchange rates depreciated by 13½% three months after the normalization announcement. This exchange rate depreciation could also explain the resurgence of moderate inflationary pressure in some African economies.

The US Treasury bill rate is negative, significant and highly persistent in all the models. It shows that investment is a clear channel of external vulnerabilities because rational investors are expected to move their capital to destinations with relatively higher yield and lower risk. The finding also supports our expectation that tapering would lead to capital flows reversal, re-pricing of assets and depressed domestic stock prices in developing economies. The US generic ten-year bond yield had conflicting outcomes across the models. In the FE and RE models, the estimated coefficients of the US10YBY were negative and statistically significant. However, the variable was negative and not statistically significant in the PMG model. The result tends to suggest that bond yield is not a clear channel of external vulnerabilities to the African stock market, which is consistent with the findings of [Tule et al. \(2019\)](#). The result could be explained by the reaction function of monetary and fiscal authorities in developing economies after the tapering signal and the simultaneous lag effect. [Matheson \(2015\)](#) showed that Fed tapering announcement led to a rise in Brazil's 10-year bond yield by around 150bps, and [Mishra et al. \(2014\)](#) revealed that average bond yield rose by 2½% points in emerging markets. According to [Tule et al. \(2019\)](#), the announcement effect of tapering increased US 10-year bond by 36 basis point from 2.13% in May 2013 to 2.49% in June, while Nigeria's 10-year bond yield overshot the previous value immediately after the announcement by 140 basis points from 4.44% in May 2013 to 5.84% in June 2013.

More importantly, the findings of this paper have two implications. First, most foreign capital inflows to the African stock market are short-term investments in search of immediate profit. Second, the findings strengthen the practical validity of the theoretical interlinkage between monetary policy communication, risk-taking channel and expectation channel. Forward-looking monetary policy communication with uncertainties as characterized by the Fed normalization policy has adverse effect on long-term expectation or forecast of investors. This is in addition to the influence on investors' preference for short-term securities – in this case, Treasury bill. This is with the ultimate goal of minimizing risk exposure or hedge against long-term uncertainties.

5. Conclusion

Following Iddrisu *et al.* (2017), the monetary policy objective of most central banks is price stability. In striving to achieve this objective, policy outcome may spill over to other economies. As financial and economic borders continually collapse among nations, cross-border effects of domestic policies become more evident. Consequently, this study is set to measure the implications of the tapering decision of the Fed on African economies. Some very significant discoveries are noteworthy in this study.

First, congruence in proof is observed from the different panel estimation methods used. This goes to show that our results are not skewed in the direction of a single test; given that no single test can provide empirical evidence that can be adjudged conclusive. The results and implications are based on proof of evidence and not on the power of a test or the lack of it. Second, the proven high degree of trade and financial interactions of African countries with the US makes them a very suitable choice in measuring the transmission effect of the monetary policy normalization on these economies. The selection of South Africa, Nigeria, Egypt, Kenya and Ghana for this purpose is considered representative enough given that these are relatively developed stock markets. Third, the variables deployed in this study go to validate the channels for transmitting cross-border policy effects which are the trade channel, financial channel, integration of international market channel and investment channel. These were represented adequately by exchange rate, bond yield and stock prices as used in this study, and our findings in no small measures lend voices to the efficacy of these channels as pointed out in extant literature. The rightly signed error correction representation implies that African stock prices adjust to the shocks and dynamics of the US monetary policy normalization. The speed of adjustment of under 5 months and most significantly the ECM coefficient which falls between 0 and 1 indicate that not only is the adjustment appreciably fast but also there is a showing that the relationship is economically plausible, predictable and without traces of oscillatory explosion.

The major policy implication of this study is that US monetary policy normalization could adversely affect growth trajectory and promote financial fragility in developing economies. Thus, developing economies should develop stronger threshold on the absorptive capacity of their economies, in terms of capital flows and mitigants against the disruptive effect of foreign portfolio investment. Establishing the absorptive capacity threshold of the economy and the building of counter-cyclical buffer (especially fiscal buffers) that are corresponding with the threshold during economic boom would immeasurably assist in defending the disruptive effects of portfolio reversals during burst.

Findings arising from this study inexorably provide insight into the interplay of financial systems globally. It can be useful for the purposes of generalization in developing economies in the shape of African countries. More so, this study could be replicated in another economic bloc or region with the aim of further exposing the far-reaching spillover effects of the US monetary policy normalization.

Note

1. See IMF (2013).

References

- Ahmed, S. and Zlate, A. (2014), "Capital flows to emerging market economies: a brave new world?", *Journal of International Money and Finance*, Vol. 48, pp. 221-248.
- Albagli, E., Ceballos, L., Claro, S. and Romero, D. (2019), "Channels of US monetary policy spillovers to international bond markets", *Journal of Financial Economics*, Vol. 134 No. 2, pp. 447-473.

-
- Avdjiev, S. and Hale, G. (2019), "U.S. monetary policy and fluctuations of international bank lending", *Journal of International Money and Finance*, Vol. 95, pp. 251-268.
- Apostolou, A. and Beirne, J. (2019), "Volatility spillovers of unconventional monetary policy to emerging market economies", *Economic Modelling*, Vol. 79, pp. 118-129.
- Barbosa, L., Bonfim, D., Costa, S. and Everett, M. (2019), "Cross-border spillovers of monetary policy: what changes during a financial crisis?", *Journal of International Money and Finance*, Vol. 89, pp. 154-174.
- Barroso, B.J., Pereira da Silva, L.A. and Sales, A.S. (2016), "Quantitative easing and related capital flows into Brazil: measuring its effects and transmission channels through a rigorous counterfactual evaluation", *Journal of International Money and Finance*, Vol. 67, pp. 102-122.
- Belke, A.B., Gros, D. and Thomas, O. (2017), "The effectiveness of the Fed's quantitative easing policy: new evidence based on international interest rate differentials", *Journal of International Money and Finance*, Vol. 73, pp. 335-349.
- Bhattarai, S., Chatterjee, A. and Park, W.Y. (2019), "Global spillover effects of US uncertainty", *Journal of Monetary Economics Forthcoming*, doi: [10.1016/j.jmoneco.2019.05.008](https://doi.org/10.1016/j.jmoneco.2019.05.008).
- Bowman, D., Cai, F., Davies, S. and Kamin, S. (2015), "Quantitative easing and bank lending: evidence from Japan", *Journal of International Money and Finance*, Vol. 57 No. 2015, pp. 15-30.
- Brooks, C. (2014), *Introductory Econometrics for Finance*, 3rd ed., Cambridge University Press, New York.
- Brown, B. (2015), *A Global Monetary Plague: Asset Price Inflation and Federal Reserve Quantitative Easing*, Palgrave Macmillian, UK.
- Choi, I. (2001), "Unit root tests for panel data", *Journal of International Money and Finance*, Vol. 20, pp. 249-272.
- De, K. and Sun, W. (2019), "Is the exchange rate a shock absorber or a source of shocks? Evidence from the U.S", *Economic Modelling, Forthcoming*.
- England, B.O. (2016), *Quantitative Easing Explained: Putting More Money in Our Economy to Boost Spending*, Mixed Sources, London.
- Fratzscher, M., Duca, M.L. and Straub, R. (2018), "On the international spillovers of US quantitative easing", *The Economic Journal*, Vol. 128 No. 608, pp. 330-377.
- Fujiki, H. and Tomura, H. (2017), "Fiscal cost to exit quantitative easing: the case of Japan", *Japan and the World Economy*, Vol. 42, pp. 1-11.
- Galariotis, E., Makrchoriti, P. and Spyrou, S. (2018), "The impact of conventional and unconventional monetary policy on expectations and sentiment", *Journal of Banking and Finance*, Vol. 86, pp. 1-20.
- Georgiadis, G. (2016), "Determinants of global spillovers from US monetary policy", *Journal of International Money and Finance*, Vol. 67, pp. 41-61.
- Goes, C., Kamil, H., Garcia-Escribano, M., Perrell, R.A. and Zook, J. (2017), "Spillovers from U.S. Monetary policy normalization on Brazil and Mexico's sovereign bond yields", IMF Working Paper WP/17/50, pp. 1-38, Washington D.C.
- Hanisch, M. (2019), "US monetary policy and the euro area", *Journal of Banking and Finance* Vol. 100, pp. 77-96.
- Hausken, K. and Ncube, M. (2013), *Quantitative Easing and its Impact in the US, Japan, the UK and Europe*, Springer, New York.
- Iddrisu, S., Simon, K. and Mohammed, A. (2017), "The impact of monetary policy on stock market performance: evidence from twelve (12)", *African Countries Research in International Business and Finance*, Vol. 42 No. 2017, pp. 1372-1382.
- Im, K.S., Pesaran, M.H. and Shin, Y. (2003), "Testing for unit roots in heterogeneous panels", *Journal of Econometrics*, Vol. 115, pp. 53-74.

- Jimenez-Rodrigues, R. and Sanchez, M. (2005), "Oil price shocks and the real GDP: empirical evidence for some OECD countries", *Applied Economics*, Vol. 37 No. 2, pp. 201-228.
- Kenourgiosa, D., Papadamou, S. and Dimitriou, D. (2015), "On quantitative easing and high frequency exchange rate dynamics", *Research in International Business and Finance*, Vol. 34, pp. 110-125.
- Kose, N. and Unal, E. (2020), "The impact of oil price shocks on stock exchanges in Caspian Basin countries", *Energy*, Vol. 1, pp. 1-11.
- Kryzanowski, L., Zhanga, J. and Zhong, R. (2017), "Cross-financial-market correlations and quantitative easing", *Finance Research Letters*, Vol. 20, pp. 13-21.
- Laeven, L. and Tong, H. (2012), "US monetary shocks and global stock prices", *Journal of Financial Intermediation*, Vol. 21 No. 3, pp. 530-547.
- Levin, A., Lin, C.F. and Chu, C. (2002), "Unit root test in panel data: asymptotic and finite sample properties", *Journal of Econometrics*, Vol. 108, pp. 1-25.
- Lilien, D. (1982), "Sectoral shifts and cyclical unemployment", *Journal of Political Economy*, Vol. 90, pp. 777-793.
- Lim, J.J. and Mohapatra, S. (2016), "Quantitative easing and the post-crisis surge in financial flows to developing countries", *Journal of International Money and Finance*, Vol. 68, pp. 331-357.
- Maddala, G.S. and Wu, S. (1999), "A comparative study of unit root tests with panel data and a new simple test", *Oxford Bulletin of Economics and Statistics*, Vol. 61, pp. 631-652.
- Malika, F. and Umar, Z. (2019), "Dynamic connectedness of oil price shocks and exchange rates", *Energy Economics*, Vol. 84, p. 104501.
- Matheson, T. (2015), "Normalization of global financial conditions: the implications for Brazil", IMF Working Paper, WP/15/194, pp. 1-14, Washington D.C.
- Matsuki, T., Sugimoto, K. and Satomac, K. (2015), "Effects of the Bank of Japan's current quantitative and qualitative easing", *Economics Letters* Vol. 133, pp. 112-116.
- Michaelis, H. and Watzka, S. (2017), "Are there differences in the effectiveness of quantitative easing at the zero-lower-bound in Japan over time?", *Journal of International Money and Finance*, Vol. 70, pp. 204-233.
- Mishra, P., Moriyama, K., N'Diaye, P. and Nguyen, L. (2014), "Impact of fed tapering announcements on emerging markets", IMF Working Paper WP/14/09, 34, Washington, D.C.
- Miyakoshia, T., Shimada, J. and LicKui-Wai (2017), "The dynamic effects of quantitative easing on stock price: evidence from Asian emerging markets, 2001–2016", *International Review of Economics and Finance*, Vol. 49, pp. 548-567.
- Moosa, I.A. (2014), *Quantitative Easing as a High Way to Hyperinflation*, World Scientific, New Jersey.
- Nilavongse, R., Rubaszek, M. and Uddin, G.S. (2020), "Economic policy uncertainty shocks, economic activity, and exchange rate adjustments", *Economics Letters*, Vol. 186, p. 108765.
- Orhan, M., Sabdenaliyev, B. and Oskenbayev, Y. (2016), "Impact of US federal reserve policies on frontier markets, handbook of frontier markets", *Evidence from Asia and International Comparative Studies*, pp. 219-244.
- Pesaran, M.H. and Shin, Y. (1999), "An autoregressive distributed lag modelling approach to cointegration analysis", in Strom, S. (Ed.), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*, Cambridge University Press.
- Pesaran, H.M. and Smith, R.P. (2016), "Counterfactual analysis in macroeconometrics: an empirical investigation into the effects of quantitative easing", *Research in Economics*, Vol. 70, pp. 262-280.
- Pesaran, S., Pesaran, M.H., Shin, Y. and Ron, R. (1999), "Pooled mean group estimation of dynamic heterogeneous panels", *Journal of the American Statistical Association*, Vol. 94, pp. 621-634.
- Raddatz, C. (2007), "Are external shocks responsible for the instability of output in low-income countries?", *Journal of Development Economics*, Vol. 84 No. 1, pp. 155-187.

-
- Rohit, A.K. and Dash, P. (2019), "Dynamics of monetary policy spillover: the role of exchange rate regimes", *Economic Modelling*, Vol. 77, pp. 276-288.
- Steeley, J.M. (2015), "The side effects of quantitative easing: evidence from the UK bond market", *Journal of International Money and Finance*, Vol. 51, pp. 303-336.
- Stolbova, M. and Shchepelevaba, M. (2016), "Financial stress in emerging markets: patterns, real effects, and cross-country spillovers", *Review of Development Finance*, Vol. 6, pp. 71-81.
- Thanh, D.S., Canh, N.P. and Maiti, M. (2020), "Asymmetric effects of unanticipated monetary shocks on stock prices: emerging market evidence", *Economic Analysis and Policy*, Vol. 65, pp. 40-55.
- Timmer, Y. (2018), "Emerging market corporate bond yields and monetary policy", *Emerging Markets Review*, Vol. 36, pp. 130-143.
- Tong, E. (2017), "US monetary policy and global financial stability", *Research in International Business and Finance*, Vol. 39, pp. 466-485.
- Tule, M.K., Odonye, O.J., Afangideh, U.J., Ebu, G.U., Udoh, E.A.P. and Ujunwa, A. (2019), "Assessment of the spill-over effects of US monetary policy normalisation on Nigeria's sovereign bond yield", *International Journal of Financial Innovation*, doi: [10.1186/s40854-019-0148-y](https://doi.org/10.1186/s40854-019-0148-y).
- Ujunwa, A., Okoyeuzu, C. and Nwakoby, I. (2013), "The adoption of macroprudential policy in inflationary economies: implication for developing economies", *International Journal of Information Technology and Management*, Vol. 8 No. 2, pp. 1301-1311.
- Zeev, N.B. (2019), "Global credit supply shocks and exchange rate regimes", *Journal of International Economics*, Vol. 116, pp. 1-32.

Further reading

- Bank of England (2016), *Quantitative Easing Explained: Putting More Money in Our Economy to Boost Spending*, Mixed Sources, London.
- Fausch, J. and Sigomius, M. (2018), "The impact of ECB monetary policy surprises on the German stock market", *Journal of Macroeconomics*, Vol. 55, pp. 46-63.
- International Monetary Fund (2014), "Spillover report", IMF Multilateral Policy Issues Report, pp. 27-57, available at: <http://www.imf.org/external/np/pp/eng/2014/062514.pdf>.
- Suhaibulddrisu, S., Harvey, K. and Amidu, M. (2017), "The impact of monetary policy on stock market performance: evidence from twelve (12) African countries", *Research in International Business and Finance*, Vol. 42, pp. 1372-1382.

Corresponding author

Chinwe Okoyeuzu can be contacted at: chinwe.okoyeuzu@unn.edu.ng

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com