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Research article

The asymmetric effects of cross-border equity flow volatility on equity market returns in SANEK countries

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Abstract: We investigated the effects of cross-border equity flow volatility (EFV) on equity market returns (EMR) in SANEK countries (South Africa, Nigeria, Egypt, and Kenya) using the nonlinear autoregressive distributed lag (NARDL) model from 2000Q1 to 2021Q4. This model includes macro-finance variables such as stock price volatility, market capitalization, interest rates, exchange rate risk, and inflation risk. Our findings revealed that cross-border equity flow volatility has a significant impact on equity market returns in SANEK countries, with both short-term and long-term effects observed. The NARDL model revealed that positive shocks have a greater impact on South Africa, while negative shocks have a positive effect on Nigeria. In Kenya, positive shocks have a negative impact on the equity market, whereas in Egypt, they have a positive effect. These findings suggested that cross-border equity flow volatility affects equity market returns differently across SANEK countries. Investors and policymakers should therefore develop customized strategies to deal with global financial market complexities. South African investors should be cautious during positive shocks, while Nigerians may benefit from economic downturns. Kenyan policymakers should stabilize the equity market during positive shocks, while Egypt could leverage the positive effects. Understanding these market dynamics can help investors and policymakers make informed decisions to maximize returns and ensure stability, despite cross-border equity flow volatility.

Keywords: cross-border equity flow volatility; equity market returns; NARDL; SANEK countries

JEL Codes: G11, G12

1. Introduction

Global financial market integration has increased cross-border equity flows, particularly in emerging markets such as SANEK (South Africa, Nigeria, Egypt, and Kenya). Cross-border equity flows (capital movements by investors to buy or sell equities) are essential drivers of market dynamics, affecting capital allocation, market efficiency, and risk diversification (see Bathia et al., 2023; Bathia et al., 2020). Financial integration facilitates capital movement from wealthier markets to capital-constrained markets such as SANEK in search of higher returns (see Lothian, 2006). These flows enable investors to direct resources toward regions with higher growth potential, enabling global capital allocation. Peng et al. (2024) reported that significant cross-border capital flows help bridge the domestic capital gap and improve industrial structures. Emerging markets, including SANEK, have become key destinations for investment flows due to their demographic advantages, expanding consumer bases, and untapped opportunities. South Africa, with its sophisticated financial markets, often serves as a gateway for investments into the continent (Nyasha and Odhiambo, 2015; Chikwira and Mohammed, 2023). The Johannesburg Stock Exchange (JSE) ranks among the top 20 largest stock exchanges worldwide by market capitalization, boasting a value of $1.36 trillion (Chikwira and Mohammed, 2023). Nigeria, a leading oil exporter, presents unique sectoral opportunities despite macroeconomic instability; the Nigerian Exchange Group (NGX) is one of the largest in West Africa but is smaller and less liquid than South Africa's, with a market capitalization of $66.7 billion (Chikwira and Mohammed, 2023). Egypt, strategically located, offers potential and vulnerability to geopolitical shifts, with its equity market anchored by the Egyptian Exchange (EGX), one of the oldest in Africa. Moreover, Kenya, as a hub of East Africa, attracts investors due to its strategic location and innovations in financial inclusion. The Nairobi Securities Exchange (NSE) represents Kenya's equity market, which, although smaller and more nascent than those of other SANEK countries, plays a crucial role in regional economic integration and investment. Collectively, SANEK countries accounted for a substantial 68% share of Africa's total investment inflows in 2023 (Oluwole, 2024). The report highlighted Kenya as the leader in foreign funding for that year, attracting $806 million, followed by Egypt with $675 million, Nigeria with $575 million, and South Africa closely trailing at $565 million (Oluwole, 2024). This underscores the significance of these nations in attracting foreign capital to the African region.

Global equity flows enhance market depth and liquidity (Prabheesh, 2020). Emerging markets such as SANEK offer opportunities for risk diversification for international investors. Research indicates that risk diversification can enhance financial stability through increased integration (Babecky et al., 2013; Nicolo & Juvenal, 2014). Markowitz's (1952) work in financial market theory showed that diversification across multiple assets reduces risk more effectively than focusing on individual assets. SANEK markets often exhibit low correlation with returns from developed markets, making them attractive for portfolio diversification. Moreover, including emerging market equities in global investment portfolios can lower overall risk while potentially increasing returns due to their higher growth prospects. However, Pätäri et al. (2019) and Baele & Inghelbrecht (2009) argued that greater economic integration increases cross-market correlations, diminishing the benefits of international diversification. Additionally, the susceptibility of these markets to global financial shocks, geopolitical risks, and macroeconomic instability highlights the complexity of such investments.

During times of high volatility in cross-border capital flows, domestic financial markets experience instability (Pagliari and Hannan, 2024; Broto et al., 2011). These inflows can lead to asset bubbles, negatively impacting the domestic financial system (Adra et al., 2023). Unfavorable international macroeconomic conditions could trigger financial crises, adversely affecting the domestic

economy (Peng et al., 2024). Risk perceptions now play a more important role in explaining capital flow reversals than ever before (Ahmed and Zlate, 2014). Volatility elicits different responses from investors than stable flows, including herding behavior, sudden reversals, and risk-averse strategies, which impact equity market performance. For example, in South Africa, significant equity outflows, Rand devaluation, and increased bond yields have followed the economic impact of the COVID-19 pandemic (Makrelov et al., 2021). Similarly, Nigeria experienced a 163% increase in capital outflows between January 2021 and January 2022, negatively impacting the economy and leading to a decline in foreign exchange reserves (Adegbesan, 2022). The invasion of Ukraine by Russia has also resulted in increased non-resident capital outflows, exposing Egypt to external risks and putting pressure on its economy (Moody's, 2022). Additionally, in the last quarter of 2021, Kenya faced economic risks due to a net outflow of $8.2 million in foreign equity (Owino, 2022). According to the IMF (2020), equity flows to emerging markets (excluding China) have been more volatile since the global financial crisis. Since 2013, periods of inflows have become shorter, while outflow episodes have extended. Moreover, SANEK has exhibited poor market returns in recent years (World Bank, 2023). Poor market performance in SANEK could exacerbate these challenges, creating a more difficult environment for both investors and policymakers. In general, volatile equity flows and low market returns in SANEK present a bleak economic outlook for the region, potentially reducing investor confidence and attracting fewer foreign investors.

Despite numerous researchers examining the effects of cross-border capital flows on financial market returns, none have investigated the impact of cross-border equity flow volatility on equity market returns. Earlier studies, such as those by Sapian and Auzairy (2015) and Prabheesh (2020), explored the correlation between equity flows and stock market returns. Sapian and Auzairy (2015) employed a bivariate vector autoregressive model and the Granger causality test, while Prabheesh (2020) utilized the Toda and Yamamoto Granger causality test, both finding that cross-border equity flows significantly impact returns. Bathia et al. (2020) highlighted that equity flows play a vital role in driving return dynamics in emerging stock markets. Furthermore, Bathia et al. (2023) indicated that both debt and equity flows are significant drivers of information spillovers across stock and FX markets in emerging markets. On the one hand, Reinhart and Reinhart (2008) demonstrated that sudden disruptions in capital inflows can lead to prolonged declines in asset prices, including stocks. Magud and Vesperoni (2015) noted that cross-border capital flows can cause rapid expansions in the domestic credit market, potentially creating credit bubbles. However, researchers tend to focus on aggregate capital flows while overlooking the volatility of these flows.

To fully grasp the impact of cross-border capital flows on equity markets, it is essential to consider how increased volatility in these flows can affect equity market returns. Pagliari and Hannan (2024) argued that the literature on measuring capital flow volatility is limited, despite its significant effects on macroeconomic and financial stability in emerging economies. While researchers investigating the level of capital flows have examined variations across categories and changes since the Global Financial Crisis (see Bathia et al., 2023; Prabheesh, 2020; Bathia et al., 2020; Sapian and Auzairy, 2015; and Magud and Vesperoni (2015), these factors have not been explored in the context of capital flow volatility. Additionally, researchers have primarily concentrated on the direct effects of capital inflows on asset prices and credit markets, while the indirect effects caused by increased volatility remain largely unexamined.

Here, we address gaps in the literature in several ways. First, we provide a comprehensive investigation of the asymmetric effects of equity flow volatility on equity market returns in four distinct

African markets. By focusing on asymmetry, we move beyond the conventional focus on flow magnitude to examine how variability influences market outcomes. We emphasize the need to recognize market-specific dynamics and offer insights into optimizing the benefits of foreign equity investments while minimizing associated risks. The selection of SANEK countries for this study is justified due to the lack of evidence in this area. Second, we measure equity flow volatility using net flows (inflows minus outflows). This approach provides a more accurate reflection of the movement of equity investments across borders, considering both inflows and outflows (Mamvura and Sibanda, 2020). Third, we distinguish aggregate equity flows and flow volatility, measuring the latter using a GARCH (1,1) model based on historical data, consistent with researchers such as Mamvura and Sibanda (2020) and Lee et al. (2013). Fourth, the NARDL model is employed to analyze the effects of equity flow volatility on equity market returns in SANEK markets, accounting for both short-run and long-run dynamics. The findings reveal that equity flow volatility significantly affects equity market returns, potentially generating both positive and negative effects depending on market conditions. This underscores the need for investors to monitor and manage equity flow volatility to maximize returns and mitigate risks in SANEK markets. This study contributes to research on the impact of equity flow volatility on equity market performance in emerging economies. To our best knowledge, we are the first to examine the impact of cross-border equity flow volatility on equity returns, representing a unique contribution to the literature.

The paper is divided into several sections. In Section 2, we provide a literature review; in Section 3, we explain the econometric methodology; in Section 4, we interpret the results; in Section 5, we discuss the empirical findings; and in Section 6, we conclude the study and provide policy and practical recommendations.

2. Literature review

2.1. Theoretical literature review

2.1.1. Efficient market hypothesis (EMH)

Based on the Efficient Market Hypothesis (EMH), which was proposed by Fama (1965), asset prices fully reflect all available information (Teall, 2018). This theory asserts that a stock's current price incorporates all relevant information regarding its past, present, and projected profits. As a result of new information or opportunities, foreign investments should prompt a swift adjustment in equity prices in the context of cross-border equity flows.

However, opponents of the EMH argue that equity return predictability is influenced by psychological factors, societal trends, market noise, and speculative investor behavior. This has led to debates about whether deviations from market efficiency are irrational or reflect rational changes. Lo (2004, 2005) challenges both EMH and behavioral finance theories, suggesting that investors exhibit periods of both irrationality and rationality. He emphasizes the necessity of considering factors when analyzing investor behavior.

Volatility in equity flows may challenge the efficiency of emerging markets such as South Africa, Nigeria, Egypt, and Kenya. This raises the question: Are market prices adjusting efficiently to foreign capital movements, or does this volatility lead to ongoing mispricing? The Efficient Market Hypothesis (EMH) offers a framework for examining how cross-border equity flows impact market efficiency.

Foreign investors typically seek greater transparency and improved governance, which can enhance information efficiency. However, volatility can also reveal inefficiencies, particularly in smaller or less developed markets like Kenya.

2.1.2. Portfolio theory and risk diversification

Modern portfolio theory, introduced by Markowitz in 1952, highlights the advantages of diversification, encouraging investors to distribute their capital across markets to reduce risk and enhance returns. Asset returns are assumed to follow a normal distribution according to the Markowitz approach. Consequently, investors aim to either minimize risk for a specified level of expected return or maximize expected return for a given level of risk (Rodríguez, 2021). Emerging markets such as South Africa, Nigeria, Egypt, and Kenya present diversification opportunities due to their relatively low correlation with developed markets. During times of global financial instability, however, equity flows can increase systemic risk, diminishing the benefits of diversification.

Diversification theory has been criticized for several weaknesses. Notably, they highlight an asymmetric distribution of returns and the potential for increased correlations between emerging and developed markets during crises, which can undermine the advantages of diversification. Scholars such as Chunhachinda et al. (1997) and Prakash et al. (2003) have emphasized these concerns. In response, some studies have introduced new asymmetric risk measures, like Value at Risk (VaR). VaR assesses the maximum expected loss over a specified time frame under normal market conditions and at a certain confidence level (Sanders and Manfredo, 2002; Mazzoli and Marinelli, 2011). Using these measures, risk can be more accurately assessed due to the non-normal distribution of financial returns.

This theory highlights the role of foreign investors in distributing risks globally while emphasizing the vulnerability of smaller, less liquid markets to capital flight.

2.1.3. International capital asset pricing model (ICAPM)

The International Capital Asset Pricing Model (ICAPM), an extension of the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965), integrates global risk factors into asset pricing, including exchange rate and political risks. This model elucidates the risk-return trade-offs for investors allocating capital across borders. Solnik (1974) was the first to explore the concept of an ICAPM, constructing a multifactor model based on the premise that Purchasing Power Parity (PPP) does not hold. He employed a global market index as a proxy for the market portfolio and included additional exchange rate risk factors. Grauer et al. (1976) later developed a different ICAPM model that excluded exchange rate factors and focused solely on a world market index. Although these ICAPM models vary in implementation parameters, both require that the country under examination be integrated into the global economy.

The ICAPM is essential for understanding how foreign investors assess risks and returns in emerging markets like SANEK. It explains how volatility in equity flows reflects these evaluations. Additionally, the model serves as a foundation for evaluating the impact of global risk factors (such as interest rate changes and geopolitical events) on emerging markets.

2.2. Empirical literature review

The current body of empirical research primarily investigates the relationship between cross-border capital flows and equity market returns than the volatility of these flows and its impact on returns. This oversight creates a significant gap in our understanding of the dynamics introduced by volatility in capital flows. Despite extensive research into the relationship between capital flows and equity returns, the effects of volatility, including its asymmetric nature, have largely remained unexplored.

2.2.1. International studies

The findings of international studies highlight the dynamics between cross-border capital flows, investor sentiment, and financial market performance in emerging economies. All studies emphasize the importance of capital flows. Although the researchers focus on different regions, methodologies, and types of capital flows, their findings share common themes and reveal distinctive contrasts. For example, Bathia et al. (2020) and Prabheesh (2020) emphasized the sensitivity of stock markets to foreign capital flows, while Sapian and Auzairy (2015) examined foreign investors' behavior. Each study encompasses significant causal links. Bathia et al. (2020) noted the explanatory power of cross-border equity and debt flows on emerging market returns, while Prabheesh (2020) found unidirectional causality from FDI to Indian stock returns. Similarly, Sapian and Auzairy (2015) observed bidirectional causality between retail flows and stock returns and the influence of institutional flows on equity performance. Bathia et al. (2020) used a panel GARCH approach to investigate how cross-border capital flows affect financial markets in nine emerging market economies. They focused on the composition of these flows (specifically equity and debt) and assessed their relative impact on emerging stock market returns and volatility. The results indicated that, following the credit crunch, emerging stock markets have become particularly sensitive to cross-border capital flows. Additionally, the analysis shows that considering portfolio flows enhances the explanatory power of stock market models by reducing country-level idiosyncratic risks. Prabheesh (2020) used daily data and the Toda and Yamamoto Granger causality test to examine the correlation between foreign direct investment (FDI) flows and stock market returns in India during the COVID-19 pandemic. They found a one-way causal relationship, indicating the significant impact of changes in FDI flows on Indian stock market returns. However, they do not consider domestic economic conditions or global market trends, suggesting that researchers should include these factors. A study by Sapian and Auzairy (2015) examined the link between foreign portfolio equity and stock returns in Bursa Malaysia. They used a bivariate vector autoregressive model and the Granger causality test. The results showed that 61 foreign institutional investors engaged in momentum trading, while international retail investors pursued contrarian strategies. They also found that equity returns influence retail investor fund flows and vice versa.

Additionally, there was a positive causal relationship between foreign institutional fund flows and equity returns. Rizal et al. (2020), similar to Bathia et al. (2020), linked foreign flows and investor sentiment to market volatility, emphasizing the role of external factors in shaping risk and return dynamics. Rizal et al. (2020) examined the relationship between stock performance, foreign equity inflows, and investor sentiment in Indonesian Islamic equity. They found a negative impact of investor sentiment on stock returns and a positive correlation between stock returns and investor sentiment. However, due to limited data coverage, long-term trends in investor sentiment and equity inflows may not have been fully captured. While the studies collectively affirm the critical role of foreign capital flows in emerging markets, they reveal varying impacts depending on flow types, market contexts, and

investor behaviors. The findings highlight the need for integrating broader macroeconomic and behavioral factors in future research to enhance understanding of these dynamics.

2.2.2. SANEK studies

Researchers conducting SANEK studies focus on Kenya and Nigeria, examining how foreign capital flows affect equity market performance, volatility, and growth. They offer various perspectives, methodologies, and findings, showcasing both common insights and distinct contributions. A key takeaway is that foreign equity flows significantly influence market performance and growth. Gachanja and Kosimbei (2018), Onyeisi et al. (2016), and Iriobe et al. (2018) consistently reported positive effects of foreign investment on market performance in both countries. For example, Gachanja and Kosimbei (2018) examined the influence of foreign equity flows on NSE equity returns from 2007 to 2015 using the VAR statistical method. Their results revealed a causal relationship between foreign equity flows and gains on the NSE, highlighting their positive impact on equity market performance. The researchers underscore the importance of external factors, such as foreign investment, in understanding equity market dynamics, though they do not account for other factors affecting market performance. Despite this limitation, they emphasize the role of foreign capital in stimulating equity market growth and urge policymakers to consider these external effects. Onyeisi et al. (2016) found that cross-border portfolio investment inflows positively impacted the growth of the Nigerian equity market from 1986 to 2014, challenging the notion that foreign investment is connected to domestic stock market growth. Their results emphasize the need for a favorable investment environment. Their study highlights the need for policies and regulations that attract foreign investors, though the study limitations, including a specific time frame and failure to consider potential risks. Using monthly time series data from 2007 to 2017, Iriobe et al. (2018) investigated the link between foreign investments in portfolios and bond stocks on the Nigerian equity exchange, applying the autoregressive distributed lag (ARDL) model. They found that foreign investments in portfolios significantly and positively impacted Nigeria's stock market performance, improving stock market returns and liquidity.

In contrast, Koskei (2017) reported no significant effect of cross-border equity outflows on the returns of Kenyan-listed financial firms, suggesting resilience in Kenya's financial sector. Koskei (2017) studied the impact of cross-border portfolio equity outflows on the equity market returns of 21 Kenyan financial firms using panel data regression, incorporating both time series and cross-sectional data. Based on the results, cross-border equity outflows have no impact on the equity market returns of Kenyan-listed financial companies. Ochienga et al. (2019) found that foreign equity flows have limited influence on equity market volatility in Kenya, with local factors playing a more prominent role. They examined how foreign equity flows impacted Kenya's equity market volatility from 2008 to 2015 using the Vector Error Correction Model (VECM). They analyzed sales, foreign equity gross purchases, inflows, and outflows as independent variables, with equity market volatility as the dependent variable. The findings revealed that foreign equity flows had limited influence on current volatility on the Nairobi Stock Exchange (NSE). During the study period, local factors like sales and inflows had a more significant impact on equity market volatility. This suggests that internal dynamics drive market volatility more than external factors like international equity movements. To maintain stability and reduce volatility in Kenya's equity market, authorities may benefit from focusing on improving local market fundamentals. SANEK studies collectively reinforce the importance of foreign capital in influencing equity market dynamics, but significant heterogeneity exists across countries, timeframes, and investment types.

SANEK studies provide region-specific insights into the effects of foreign equity flows, highlighting their positive impact on returns and growth in Kenya and Nigeria. They demonstrate the resilience of local markets, particularly in Kenya, to external outflows. In contrast, international studies examine investor behavior, volatility, and equity flow composition, focusing on global capital dynamics and investment strategies. In SANEK studies, Gachanja and Kosimbei (2018), Onyeisi et al. (2016), and Iriobe et al. (2018) found that foreign equity flows significantly enhance equity market returns in Kenya and Nigeria. Similarly, international studies by Bathia et al. (2020) and Rizal et al. (2020) highlight the positive impact of foreign equity inflows on stock market returns. Both groups of studies identify significant causal links between foreign capital flows and market dynamics. For example, in SANEK, Gachanja and Kosimbei (2018) reported causality, and international studies by Sapian and Auzairy (2015) revealed bidirectional causality, while Prabheesh (2020) identified unidirectional causality. Therefore, tailored policies are needed to balance the benefits of external capital with the stability of local markets.

2.2.3. Research gap

To the best of our knowledge, there is no literature on the relationship between cross-border equity flow volatility and equity market returns. Researchers have examined the connection between cross-border equity flow and equity market returns but have ignored volatility and focused on the magnitude of these flows. This gap limits our understanding of how cross-border equity flow volatility influences equity market behavior and hinders our ability to develop effective risk management strategies. Thus, we aim to analyze the impact of cross-border equity flow volatility on SANAK equity returns using the NARDL model, investigating both the long-term and short-term effects of explanatory factors. This research provides unique insights into the finance literature and holds significant value for investors and policymakers.

3. Research methodology

3.1. Data sources

The empirical study is based solely on secondary data. A time series of quarterly data from 2000Q1 to 2020Q4 is used. The data is extracted from the World Bank, IMF, and each country's stock market and central bank. EViews' frequency conversion tool is used when quarterly data is unavailable.

3.2. Theoretical development of variables

Dependent Variable: Equity market returns (EMR) is a dependent variable and a function of the remaining six variables.

Equity Market Returns (EMR): Equity returns, as defined by Natarajan et al. (2020), are a measure of a firm's performance, influenced by various financial theories. One widely used financial theory is CAPM, which was developed by Sharpe (1964) and Lintner (1965). CAPM assesses the value of risky securities according to their expected return and level of risk. It helps determine the risk associated with a security and the relationship between predicted return and risk. The financial objective of a firm is to enhance investment returns (Ross, 1977), considering factors such as stock price fluctuations,

market valuations, and shareholder knowledge, while considering potential future events. The World Bank (2023) has observed that historically, SANEK's equity market returns have underperformed. The stagnation in SANEK's equity market suggests a discrepancy between predicted return and risk, emphasizing the importance of identifying contributing factors for informed decision-making, risk mitigation, and enhanced investment returns.

Explanatory Variable: In the regression analysis, we included the variable cross-border equity flow volatility associated with EMR.

Cross-border equity flow volatility (EFV): Cross-border equity flows refer to international transactions and holdings involving debt or equity instruments that are not part of direct investments. Equity flow volatility lacks a theoretical explanation, leading to various models and variables to measure it (Lee et al., 2013). Equity flow volatility is influenced by foreign investors who seek short-term gains but quickly withdraw when uncertainty arises. Consequently, we suggest that cross-border equity flows impact EMR in SANEK.

Control Variables: We also include several control variables in the regression analysis to investigate their relationship with EMR in SANEK. Ruhani and Mat (2022) argued that financial market variables impact EMR. On the other hand, investors and policymakers closely monitor the interaction between equity markets and macroeconomic variables. As a result, we incorporate five control variables: Stock price volatility (SPV), market capitalization (MC), interest rates (IR), exchange rate risk (EXR), and inflation risk (INF).

Stock Price Volatility (SPV): Volatility refers to the degree to which a stock's price rises or falls over a specific period. Investors can predict future swings more accurately by examining stock price volatility, which indicates heightened risk. A stock is considered volatile if its price fluctuates significantly in a short period, reaching historic highs and lows. A stock is considered low volatility if its price rises or falls gradually or remains constant. Investors in SANEK must assess the risks associated with high stock price volatility to forecast future swings. This study explores whether low volatility results in a negative return on the equity market, while high volatility leads to a positive return. Stock price volatility is expected to significantly impact SANEK's EMR.

Market capitalization (MC): One of the key factors determining equity returns is market capitalization (Reinganum, 1999), which is crucial for stock investors as it helps analyze and compare a company's performance. It provides insight into historical success and future forecasts, enabling informed investment decisions and desired returns. Market capitalization is expected to have a positive effect on EMR.

Interest Rates (IR): Fluctuations in interest rates impact equity markets. Low interest rates attract capital to equity markets with higher returns, while high interest rates encourage savings in banks (Eldomiaty et al., 2020). Understanding the relationship between interest rates and equity market returns can help investors predict the effects of changes on their assets. In the context of SANEK, countries with high interest rates are expected to negatively affect EMR, while those with low interest rates are expected to positively affect it.

Exchange Rate Risk (EXR): By utilizing asset pricing, a link can be established between exchange rates and equity returns. Recent theories suggest that portfolio rebalancing creates an inverse relationship between foreign exchange and equity market returns. When exchange rates appreciate, foreign assets become more expensive, prompting investors to rebalance their portfolios, potentially impacting equity market returns. Exchange rates are expected to significantly affect the SANEK EMR.

Inflation Risk (INF): Studies have examined how inflation impacts equity returns. Fisher (1930) believes that higher inflation should increase nominal dividend payouts, positing that nominal stock returns serve as an inflation hedge. In his 1959 analysis, Gordon (1959) argued that investors should set the discount rate based on the dividend or capital yield of the company to determine the return rate. Rising inflation expectations and actual rates are expected to lead to increased dividend payments for equities, resulting in upward revisions in stock prices. However, there is insufficient evidence to support the idea that nominal equity returns effectively hedge against inflation, contradicting classical economic theory (Fama and Schwert, 1977) and resulting in the "inflation-stock return paradox." In countries with high or low inflation rates, inflation is expected to have a negative or positive impact on EMR.

3.3. Estimation techniques

3.3.1. Unit root tests for stationarity

We utilized the ADF test (Dickey and Fuller, 1981) and the Phillips-Perron (PP) test (Phillips and Perron, 1988) to assess the stationarity of the variables and determine the order of integration of the variables. According to Brooks (2008), these tests are important because they provide a better understanding of the structural breakdowns, trends, and stationarity of the data. When using the tests, we assess long-term equilibrium relationships between research variables, ensuring stationarity in time series data. We evaluate data behavior, draw meaningful conclusions about variables' relationships, and enhance the reliability and accuracy of research findings.

3.3.2. Nonlinear autoregressive and distributed lag model (NARDL Model)

We apply the NARDL model to analyze the asymmetric impact of cross-border equity flows on equity market returns in SANEK. The effect of cross-border equity flow volatility on equity market returns is considered by including positive EFV_t^+ and negative, EFV_t^- changes in cross-border equity flow volatility as explanatory variables in the aggregate production function. Positive changes in EFV and negative changes in EFV represent an increase and decrease in EFV, respectively. Understanding these changes is crucial for assessing the impact of cross-border equity flow volatility on the aggregate production function.

$$EFV_t^+ = \sum_{i=1}^{t} \Delta\ EFV_t^+ = \sum_{i=1}^{t} max\ (EFV_i, 0) \quad (1)$$

$$EFV_t^- = \sum_{i=1}^{t} \Delta\ EFV_t^- = \sum_{i=1}^{t} mim\ (EFV_i, 0) \quad (2)$$

In this article, we apply the NARDL technique (Shin et al., 2014) to investigate the presence of an asymmetric long-run equilibrium connection (cointegration) between cross-border stock flow volatility and equity market returns. Equation (3) demonstrates this approach.

$$\Delta EMR_t = \gamma_1 + \sum_{i-1}^{p} \theta 1i \Delta EMR_{t-i} + \sum_{i-1}^{q} \theta 2i \Delta EFV_{t-i}^+ + \sum_{i-1}^{r} \theta 3i\ \Delta EFV_{t-i}^- +$$

$$\sum_{i-1}^{s} \theta 4i \Delta SPV_{t-i} + \sum_{i-1}^{t} \theta 5i \Delta MC_{t-1} + \sum_{i-1}^{u} \theta 6i \Delta IR_{t-i} + \sum_{i-1}^{x} \theta 7i \Delta EXR_{t-i} + \sum_{i-1}^{y} \theta 8i \Delta INF_{t-i}$$

$$+ \tau_1\ EMR_{t-1} + \tau_2 EFV_{t-1}^- + \tau_3 EFV_{t-1}^- + \tau_4\ SPV_{t-1} + \tau_5 MC_{t-1} + \tau_6 IR_{t-1} + \tau_7 EXR_{t-1} + \tau_8 INF_{t-1} + \varepsilon_t \quad (3)$$

where Δ is a first difference operator, EMR_t refers to equity market returns, EFV^{+}_{t-i} and EFV^{-}_{t-i} are the positive and negative shocks in cross-border equity flow volatility, SPV_t is the stock price volatility, MC_t is the market capitalization, IR_t is the interest rate EXR_t is the exchange rate risk, and INF_t is the inflation risk. The optimal lag order, denoted by p, q, r, s, t, u, x, and y, is estimated using either the Akaike or the Schwarz information criterion.

Testing for EFV and EMR's long-run link using F-tests for joint significance of the lagged level variables' coefficients (H_0: $\tau_1, \tau_2, \tau_3, \tau_4, \tau_5, \tau_6, \tau_7, \tau_8 = 0$). Pesaran et al. (2001) provide lower and upper bounds for critical values due to the nonstandard distribution of F-statistics. If the F-statistic exceeds the upper bound of the critical values provided by Pesaran et al. (2001), it implies that cointegration exists between EFV and EMR. This finding suggests a long-run relationship between the two variables, meaning that changes in EFV can be explained by changes in EMR over time. On the other hand, if the F-statistic does not exceed the upper bound of critical values, it fails to establish a cointegration between EFV and EMR, indicating no long-run link between the variables.

Equation 4 shows the error-correction term (ECT) form of the NARDL model given in Equation 3.

$$\Delta EMR_t = \gamma_1 + \sum_{i-1}^{p} \theta 1i \Delta EMR_{t-i} + \sum_{i-1}^{q} \theta 2i \Delta EFV^{+}_{t-i} + \sum_{i-1}^{r} \theta 3i \ \Delta EFV^{-}_{t-i} +$$

$$\sum_{i-1}^{s} \theta 4i \Delta SPV_{t-i} + \sum_{i-1}^{t} \theta 5i \Delta MC_{t-1} + \sum_{i-1}^{u} \theta 6i \Delta IR_{t-i} + \sum_{i-1}^{x} \theta 7i \Delta EXR_{t-i} +$$

$$\sum_{i-1}^{y} \theta 8i \Delta INF_{t-i} + \tau_1 \ EMR_{t-1} + \tau_2 EFV^{-}_{t-1} + \tau_3 EFV^{-}_{t-1} + \tau_4 \ SPV_{t-1} + \tau_5 MC_{t-1} +$$

$$\tau_6 IR_{t-1} + \tau_7 EXR_{t-1} + \tau_8 INF_{t-1} + \emptyset ECT_{t-1} + \varepsilon_t \quad (4)$$

This coefficient of the error-correction term $\emptyset$ reflects how quickly the long-run equilibrium of EMR, EFV, SPV, MC, IR, EXR, and INF is adjusted after a shock. It quantifies the extent to which the previous period's disequilibrium is corrected in the current period. It is important for this coefficient to be negative to achieve dynamic stability.

3.3.3. Diagnostic tests

Diagnostic tests are used to check for autocorrelation, heteroscedasticity, and normality issues in the model. The Lagrange Multiplier (LM) test is used to detect autocorrelation by examining the residuals for any patterns or correlations. The Breusch-Pagan Godfrey's heteroscedasticity test and the Jarque-Bera test are applied to detect violations of the assumption of constant variance and normality in the residuals, respectively (Seddighi, 2013). These tests are important in ensuring the validity and reliability of the model by identifying and addressing significant issues such as autocorrelation, variance violation, and normality deviation.

3.3.4. Diagnostic tests

Cumulative sum (CUSUM) tests are used to assess the quality and stability of variables in both the short and long term. These tests help evaluate the consistency of coefficients in a multiple linear regression model. When the CUSUM statistics plot stays within the 5% significance level range, it implies that the model's coefficients are stable (Bekhet and Matar, 2013). This plot illustrates the relationship between independent and dependent variables. If the plot exceeds the 5% range, it suggests

structural changes or fractures, requiring further analysis and revisions to ensure the reliability and validity of the regression model (Bekhet and Matar, 2013).

4. Results

4.1. Preliminary analysis

4.1.1. Descriptive statistics

EMR descriptive statistics are presented in Table 1. Mean values differ across countries: Egypt has the highest mean value of 19.91%, followed by Nigeria at 12.92%, South Africa at 11.92%, and Kenya at 5.49%. These differences indicate varying performance in equity markets. Egypt's equity market has shown the highest average returns, suggesting a lucrative investment opportunity. Kenya's equity market has the lowest mean value, indicating a lower return on investment. Nigeria and South Africa offer above-average returns. Additionally, Egypt has the highest standard deviation at 44.90, followed by Nigeria at 25.90, Kenya at 14.67, and South Africa at 12.67. This indicates that data points in Egypt are more spread out compared to the other countries, suggesting greater variability. The dispersion is also higher in Nigeria, while Kenya and South Africa have lower standard deviations, indicating a more consistent data set with less variability. As a result of these results, the diversity of economic indicators and potential disparities in the economies of the countries is highlighted.

Table 1. Summary EMR descriptive statistics.

Description	South Africa	Nigeria	Egypt	Kenya
Mean	11.92361	12.92062	19.91879	5.488911
Median	11.49041	11.31008	6.099678	4.001684
Maximum	38.90451	72.00127	169.8130	50.01639
Minimum	−13.60202	−54.94028	−36.27894	−30.14827
Standard Deviation	12.66639	25.90219	44.89926	14.67380
Skewness	0.260682	−0.025693	1.568807	0.629339
Kurtosis	2.525287	2.419544	5.080803	3.708763
Jarque-Bera (JB)	1.822966	1.245090	51.97266	7.650919
Probability	0.401928	0.536577	0.000000	0.021808
Observations	88	88	88	88

Source: Authors' Estimation using EViews 13.

Skewness evaluates how symmetric data is around the mean. For a symmetric normal distribution, it is expected to be near zero. The Nigerian equity market returns have a negative skewness coefficient of −0.025693, indicating a negatively skewed series. This means that returns are concentrated on the left side of the mean, with fewer returns above the mean. This implies that the Nigerian equity market is riskier than usual, indicating high volatility. Investors should exercise caution when making decisions in this market. Kurtosis measures whether a series has a peak or a flat distribution, with the accepted benchmark being 3. South Africa's and Nigeria's equity market returns have lighter tails since the dataset values are less than 3. Moreover, Egypt's and Kenya's equity market returns exhibit leptokurtic behavior, with more value concentrated in their right tail compared to a normal distribution. Due to several outliers,

this distribution has long tails. As a result, Egypt's and Kenya's equity market returns have a high number of outliers, making their tails longer than those of South Africa's and Nigeria's.

4.1.2. Test for stationarity

Table 2 shows the order of integration of each variable based on the ADF and PP tests. The results indicate that all variables in South Africa, Egypt, and Kenya are integrated at first differences (I(1)). This suggests a long-term relationship between the variables, indicating that they are not stationary at their current levels. Therefore, further analysis using cointegration techniques may be necessary to examine this long-term relationship.

Table 2. ADF and PP Unit root test results.

Variables	South Africa		Nigeria		Egypt		Kenya	
	ADF Test		ADF Test		ADF Test		ADF Test	
	t-statistic	Status	t-statistic	Status	t-statistic	Status	t-statistic	Status
*ln*EMR	−3.859516***	I(1)	−2.694907*	I(0)	−3.023262**	I(1)	−3.324292**	I(1)
*ln*EFV	−3.771634***	I(1)	−2.819496**	I(0)	−10.66998***	I(1)	−9.573919***	I(1)
*ln*SPV	−3.634084***	I(1)	−3.379679**	I(1)	−2.660492*	I(1)	−8.132874***	I(1)
*ln*MC	−3.181788**	I(1)	−2.359929**	I(1)	−3.549536***	I(1)	−2.232892**	I(1)
*ln*IR	−5.711913***	I(1)	−7.592940***	I(1)	−4.408257***	I(1)	−5.683744***	I(1)
*ln*EXR	−7.464003***	I(1)	−9.285302***	I(0)	−12.90792***	I(1)	−8.951810***	I(1)
*ln*INF	−5.866137***	I(1)	−9.688557***	I(1)	−3.951970***	I(1)	−12.24228***	I(1)
Variables	South Africa		Nigeria		Egypt		Kenya	
	PP Test		PP Test		PP Test		PP Test	
	t-statistic	Status	t-statistic	Status	t-statistic	Status	t-statistic	Status
*ln*EMR	−4.126386***	I(1)	−2.855863**	I(0)	−3.99563***	I(1)	−4.526390***	I(1)
*ln*EFV	−17.20008***	I(1)	−2.796081**	I(0)	−10.98684***	I(1)	−9.594056***	I(1)
*ln*SPV	−3.874867***	I(1)	−3.568030***	I(1)	−4.479260***	I(1)	−8.083118***	I(1)
*ln*MC	−4.623448***	I(1)	−4.493023***	I(1)	−3.791220***	I(1)	−3.905235***	I(1)
*ln*IR	−5.739662***	I(1)	−7.670413***	I(1)	−4.354741***	I(1)	−5.464769***	I(1)
*ln*EXR	−7.478403***	I(1)	−9.285297***	I(0)	−12.49424***	I(1)	−9.515240***	I(1)
*ln*INF	−4.126386***	I(1)	−2.855863**	I(0)	−3.99563***	I(1)	−4.526390***	I(1)

Note. (***), (**), and (*) indicate significant at 1%, 5% and 10%. All the variables are log linearized. Source: Authors' computation using EViews 13.

In Nigeria, the ADF and PP test results indicate that certain variables are integrated at level I(0) or first difference I(1) without contradiction. This suggests that some variables may have a stationary relationship at their levels while others may require further investigation through cointegration to determine their long-term relationship. These findings imply that certain variables may have a stable link over time while others may exhibit a more dynamic relationship.

4.1.3. NARDL results

Estimation algorithms are used to examine the impact of cross-border equity flow volatility on equity market returns in SANEK countries. Eviews 13 software is used for the analysis. The dataset

includes quarterly data from 2000Q1 to 2021Q4 for South Africa, Nigeria, Egypt, and Kenya.

Bounds tests for asymmetric cointegration

It is important to determine if there is a cointegration nexus between the variables before testing the short- and long-run asymmetric relationships. A NARDL bound test is used to identify cointegration. Table 3 shows the results.

Table 3. Bounds Test for SANEK.

Variables	South Africa	Nigeria	Egypt	Kenya
Bounds F Test	<….I(0)……I(1)...>	<….I(0)……I(1)...>	<….I(0)……I(1)...>	<….I(0)……I(1)...>
1% Critical Value	2.860…… 4.100	2.860…… 4.100	2.860…… 4.100	2.860…… 4.100
F-statistics	5.532830	5.533019	4.539238	5.593120

Source: Authors' Estimation using EViews 13.

Based on the F-test results, Egypt has the lowest value of 4.539238, followed by South Africa at 5.532830. Nigeria has a value of 5.533019, while Kenya has the highest value of 5.593120. These values indicate significant differences among the countries compared to the critical value range of 2.860–4.100, confirming substantial variation. This suggests a long-term relationship between variables in each country, indicating a persistent relationship that is not random.

Long-run and Short-run NARDL results

South Africa*:* The negative coefficient of EMR(-1) in Table 4 for the long run and the positive coefficient of EMR(-1) for the short run indicate that long-term equity market returns in South Africa negatively impact future returns, while short-term returns positively impact current returns. This highlights the importance of considering both long-run and short-run dynamics.

Table 4 confirms that EFV_P(−1) has a significant coefficient of 0.451926, whereas EFV_N(−1) has an insignificant coefficient of −0.513982. The study indicates that positive volatility shocks in cross-border equity flows significantly boost equity market returns in South Africa, while negative shocks do not have a significant impact. This suggests that positive volatility changes drive returns. In the short run, EFV_P has an insignificant coefficient of 0.039862, while EFV_N has a significant coefficient of 0.300568. Additionally, EFV_P(−1) has an insignificant coefficient of −0.547072, and EFV_N(−1) has an insignificant coefficient of 0.365454. The insignificant coefficient of EFV_P indicates that positive shocks in cross-border equity flow volatility do not significantly impact equity market returns in the short run. However, the significant coefficient of EFV_N suggests that negative shocks positively and significantly affect equity market returns in South Africa. The insignificant coefficients of EFV_P(−1) and EFV_N(−1) suggest that cross-border equity flow volatility is not a significant factor affecting equity market returns. The study emphasizes that immediate effects of shocks on cross-border equity flow volatility are more influential than lagged effects, highlighting the importance for South African investors to monitor and respond to negative shocks.

The SPV coefficient SPV_P(−1) is significant at −1.361392, and SPV_N(−1) is significant at 0.662113 in South Africa. The negative coefficient for SPV_P(−1) indicates that positive changes in stock price volatility negatively impact equity market returns, while the positive coefficient for SPV_N(−1) shows that negative changes positively affect returns. South African equity market investors are more receptive to negative stock price volatility, underscoring the importance of

understanding its direction and magnitude. In the short run, the SPV coefficient SPV_P is significant at −2.370201, while SPV_N is insignificant at −0.433938. Additionally, SPV_P(−1) is significant at 2.403465, while SPV_N(−1) is insignificant at 0.204719. These findings suggest that immediate reactions to negative shocks in the equity market are crucial for South African investors. The significant negative coefficient of −2.370201 for short-run stock price volatility (SPV_P) indicates that an increase in SPV_P leads to a decrease in equity market returns. Conversely, the significant positive coefficient of 2.403465 for SPV_P(−1) suggests that a decrease in SPV_P in the previous period leads to an increase in equity market returns. Therefore, it is important for investors to closely monitor and react to negative shocks to potentially benefit from significant returns in the short run.

Table 4. South Africa long run and short run results for EMR from the NARDL (2,2,2,2,1,2,0) model.

Long run			Short run		
Variables	Coefficient	Pro.	Variables	Coefficient	Pro.
EMR(−1)	−0.646309	0.0000***	EMR(−1)	0.437985	0.0018***
*ln*EFV_P(−1)	0.451926	0.0268**	*ln*EFV_P	0.039862	0.5438
*ln*EFV_N(−1)	−0.513982	0.2008	*ln*EFV_N	0.300568	0.0040***
*ln*SPV_P(−1)	−1.361392	0.0327**	*ln*EFV_P(−1)	−0.547072	0.7629
*ln*SPV_N(−1)	0.662113	0.0800*	*ln*EFV_N(−1)	0.365454	0.2262
*ln*MC_P(−1)	0.125439	0.0061***	*ln*SPV_P	−2.370201	0.0038***
*ln*MC_N(−1)	0.061127	0.0174**	*ln*SPV_N	−0.433938	0.6208
*ln*IR_P(−1)	−4.610574	0.0009***	*ln*SPV_P(−1)	2.403465	0.0425**
*ln*IR_N(−1)	−2.303165	0.0438**	*ln*SPV_N(−1)	0.204719	0.7706
*ln*EXR_P(−1)	0.376187	0.0208**	*ln*MC_P	0.083174	0.2470
*ln*EXR_N(−1)	0.035392	0.8405	*ln*MC_N	0.164839	0.0152**
*ln*INF_P	−0.317059	0.0714*	*ln*MC_P(−1)	−0.281644	0.0084***
*ln*INF_N	1.656366	0.4705	*ln*MC_N(−1)	−0.055807	0.3909
			*ln*IR_P	−0.643842	0.6384
			*ln*IR_N	−1.629566	0.1426
			*ln*EXR_P	−0.013167	0.9522
			*ln*EXR_N	0.069609	0.5913
			*ln*EXR_P(−1)	−0.181999	0.1850
			*ln*EXR_N(−1)	−0.090887	0.4126
			ECT_{t-1}	−0.646309	0.0000***
			@QUARTER=1	0.373213	0.5243
			@QUARTER=2	0.964965	0.0671*
			@QUARTER=3	0.971516	0.0569*
			C	10.19346	0.0004***
			@TREND	−0.128329	0.7919
R−squared	0.911993		F−statistic	13.81691	
Adjusted R−squared	0.845987		Pro(F−statistic)	0.000000	
Durbin−Watson stat	2.275902				

Note. (***), (**), and (*) indicate significant at 1%, 5% and 10%. All the variables are log linearized.

Source: Authors' computation using EViews 13.

The model was selected based on Akaike information criteria (AIC).

In other findings, the market capitalization coefficients for MC_P(−1) (0.125439) and MC_N(−1) (0.061127) have significant positive asymmetric effects on EMR in South Africa in the long term. South African investors respond strongly to increases in market capitalization but exercise caution during decreases, highlighting the importance of understanding these uneven effects for investment strategies. The short−term coefficient MC_P has a slightly positive value of 0.083174, while MC_N is significantly positive at 0.164839. MC_P(−1) has a significantly negative value of −0.281644, and MC_N(−1) has a slightly negative value of −0.055807. These findings indicate that positive shocks in MC have a slightly positive effect on EMR, while negative shocks have a significantly positive impact. Additionally, lagged MC variables also demonstrate asymmetric effects on EMR in South Africa.

The coefficients for interest rates, IR_P(−1) and IR_N(−1), are significant at −4.610574 and −2.303165, respectively. The negative coefficients indicate that changes in interest rates impact equity returns more during market declines. In the short run, the IR coefficients IR_P and IR_N are insignificant at −0.643842 and −1.629566, respectively. Therefore, interest rate fluctuations in South Africa do not significantly affect short-term equity market returns, making them unreliable as short-term indicators for investors. It is important to monitor SPV_P shocks, as they significantly impact equity market returns and can lead to short-term gains.

The coefficient EXR_P(−1) is significant at 0.376187, while the EXR_N(−1) coefficient is insignificant at 0.035392. These coefficients show that exchange rate fluctuations significantly impact equity market returns in South Africa. A positive change in the exchange rate (EXR_P) has a stronger effect on the equity market, leading investors to increase their investments. Conversely, a negative change in the exchange rate (EXR_N) has a less significant effect, indicating that investors are more cautious when the currency depreciates. Understanding the asymmetrical effects of exchange rate risk on equity market returns helps investors manage potential market losses more effectively. In the short term, the coefficient for EXR_P is insignificant at −0.013167, as is the coefficient for EXR_N at 0.069609. Additionally, EXR_P(−1) is insignificant at −0.181999, and EXR_N(−1) is insignificant at −0.090887. The study indicates that South Africa's exchange rate fluctuations have minimal short-term impact on equity market returns, suggesting that exchange rate risk may not accurately predict short-term market returns.

The coefficient for inflation risk (INF_P) is significant at −0.317059, while INF_N is insignificant at 1.656366. These findings indicate that inflation risk significantly influences equity market behavior in South Africa. A negative INF_P coefficient implies that as inflation rises, investors become more cautious and are less inclined to reallocate their funds to the equity market. The insignificant INF_N coefficient suggests that deflationary pressures do not significantly impact investor behavior in the South African equity market, assisting in informed decision-making.

The results of the NARDL error correction term (ECT) multiplier demonstrate that short-run instability can be corrected through system convergence in the long run. The ECT_{t-1} value of −0.646309 is significant at the 1% level and implies a high rate of adjustment from disequilibrium to long-run equilibrium, implying a quick correction of disturbances or shocks. ECT_{t-1} values over 0 indicate self-correction, indicating that the system is in good long-term shape without external intervention.

The South Africa model has an adjusted R-squared of 0.845987, indicating that 84.60% of the dependent variable's variability can be explained by the independent variables. F-statistics of 13.81691 indicate the significance of the regression model's ability to predict the dependent variable, and Durbin-Watson errors of 2.588633 indicate no significant serial correlation.

Nigeria*:* Table 5 shows that the negative coefficient of EMR(−1) in the long run and the positive coefficient of EMR(−1) in the short run indicate that future returns in Nigeria are negatively affected

by long-term EMR, while short-term returns positively impact current returns. This highlights the importance of considering both long-term and short-term dynamics.

Table 5. Nigeria Long Run and Short Run Results for EMR from the NARDL (2,1,3,2,2,3,0) model.

Long run			Short run		
Variables	Coefficient	Pro.	Variables	Coefficient	Pro.
EMR(−1)	−0.213299	0.0008***	EMR(−1)	0.451552	0.0001***
*ln*EFV_P(−1)	1.705241	0.0211**	*ln*EFV_P	0.487410	0.6658
*ln*EFV_N(−1)	0.910098	0.1970	*ln*EFV_N	−1.194918	0.0078***
*ln*SPV_P(−1)	3.931266	0.0022***	*ln*SPV_P	1.401703	0.9314
*ln*SPV_N(−1)	0.239209	0.7550	*ln*SPV_N	4.953876	0.6513
*ln*MC_P(−1)	0.421217	0.3803	*ln*SPV_P(−1)	−0.271570	0.7626
*ln*MC_N(−1)	1.236924	0.0230**	*ln*SPV_N(−1)	1.007113	0.6513
*ln*IR_P(−1)	−2.323051	0.1943	*ln*SPV_P(−2)	−0.733397	0.7626
*ln*IR_N(−1)	1.466820	0.1215	*ln*SPV_N(−2)	−6.436208	0.0063***
*ln*EXR_P(−1)	−0.182576	0.4116	*ln*MC_P	5.713804	0.0000***
*ln*EXR_N(−1)	−0.184391	0.4072	*ln*MC_N	1.457804	0.3945
*ln*INF_P	−0.359502	0.3232	*ln*MC_P(−1)	−0.922595	0.5235
*ln*INF_N	−0.180669	0.3094	*ln*MC_N(−1)	−3.374161	0.0915*
			*ln*IR_P	−3.856177	0.0341**
			*ln*IR_N	−0.940212	0.4602
			*ln*IR_P(−1)	3.496924	0.0327**
			*ln*IR_N(−1)	−2.163378	0.0963*
			*ln*EXR_P	−8.74e−05	0.8779
			*ln*EXR_N	−0.098840	0.6044
			*ln*EXR_P(−1)	0.084292	0.5783
			*ln*EXR_N(−1)	0.164427	0.1969
			*ln*EXR_P(−2)	0.163270	0.2001
			*ln*EXR_N(−2)	0.000770	0.1273
			ECT_{t-1}	−0.213299	0.0000***
			@QUARTER=1	0.575132	0.7118
			@QUARTER=2	0.553358	0.7418
			@QUARTER=3	0.805809	0.6398
			C	12.34183	0.0441**
			@TREND	−0.083350	0.9403
R−squared	0.904733		F−statistic	10.20910	
Adjusted R-squared	0.816113		Pro(F-statistic)	0.000000	
Durbin-Watson stat	2.501929				

Note. (***), (**), and (*) indicate significant at 1%, 5% and 10%. All the variables are log linearized.

Source: Authors' computation using EViews 13.

The model was selected based on Akaike information criteria (AIC).

The results in Table 5 reveal that EFV_P(−1) has a significant coefficient of 1.705241, while EFV_N(−1) has an insignificant coefficient of 0.910098. These coefficients indicate that a positive

shock in EFV_P(−1) leads to a larger increase in EMR, demonstrating a stronger positive effect. In contrast, a negative shock in EFV_N(−1) has a smaller impact on EMR, indicating an insignificant effect. Therefore, positive EFV_P(−1) plays a more crucial role in influencing EMR compared to negative EFV_N(−1) in the Nigerian context. The analysis indicates that increased cross-border equity flow volatility positively impacts Nigeria's equity market returns, as shown by the EMR and EFV coefficients. The short-run coefficient results indicate that EFV_P has an insignificant coefficient of 0.487410, whereas EFV_N has a significant coefficient of −1.194918. These findings suggest that positive shocks in EFV do not significantly impact equity market returns in Nigeria, as indicated by the insignificant coefficient of EFV_P. Conversely, negative shocks in EFV, represented by EFV_N, appear to have a significant negative effect on equity market returns, with a coefficient of −1.194918. The study suggests that investors may be more receptive to negative EFV shocks, leading to a decline in equity market returns. This finding contributes significantly to the literature.

Other findings indicate that the coefficient SPV_P(−1) has a significant impact of 3.931266, whereas SPV_N(−1) has an insignificant impact of 0.239209 on EMR in Nigeria. The results demonstrate that stock price volatility in Nigeria positively affects equity market returns, while a decrease in volatility has no significant impact. This implies that investors should monitor changes in volatility to manage risks effectively. In the short term, the SPV coefficient values are as follows: SPV_P at 1.401703, SPV_N at 4.953876, SPV_P(−1) at −0.271570, SPV_N(−1) at 1.007113, and SPV_P(−2) at −0.733397. All these values are not significant, except for SPV_N(−2), which has a significant value of −6.436208. This suggests that stock price volatility in Nigeria does not significantly impact equity market returns in the short term. Negative SPV coefficients indicate potential declines, but these declines are not statistically significant.

The coefficient MC_P(−1) is not significant at 0.421217, while MC_N(−1) is significant at 1.236924. This suggests that changes in MC do not significantly impact equity market returns in Nigeria. However, the coefficient for MC_N(−1) indicates that negative changes in market capitalization have a significant asymmetric effect on equity market returns. Nigerian investors should exercise caution when market capitalization declines, as it can negatively affect returns, and closely monitor stock price volatility for informed investment decisions. Other results show that the short-run coefficient MC_P has a significantly positive value of 5.713804, MC_N has an insignificantly positive value of 1.457804, MC_P(−1) is insignificantly negative at −0.922595, and MC_N(−1) has a significantly negative value of −3.374161 with asymmetric effects on EMR in Nigeria. These results indicate that an increase in MC has a significant positive effect on equity market returns in the short run, with a coefficient of 5.713804. In contrast, the coefficient for negative market capitalization is insignificant and slightly positive at 1.457804. Additionally, the lagged market capitalization variables indicate mixed effects, with MC_P(−1) having an insignificant negative coefficient of −0.922595, and MC_N(−1) having a significantly negative coefficient of −3.374161. Overall, these results suggest that market capitalization plays a significant role in determining equity market returns in Nigeria, both in the short run and over a lagged period.

Other findings suggest that the long-run coefficients for interest rate variables IR_P(−1) and IR_N(−1) are not statistically significant at −2.323051 and 1.466820, respectively. An increase in IR_P(−1) leads to a decrease in equity market returns of 2.323051, while a decrease in interest rate IR_N(−1) leads to an increase in equity market returns of 1.466820. However, these coefficients are not statistically significant, indicating that changes in interest rates do not have a significant impact on equity market returns in Nigeria. In the short run, the coefficient for the interest rate IR_P is statistically

significant at −3.856177, while IR_N is not statistically significant at −0.940212. Additionally, IR_P(−1) is statistically significant at 3.496924, and IR_N(−1) is statistically significant at −2.163378. The results also reveal that interest rates have significant asymmetrical effects on equity market returns in Nigeria. Specifically, the coefficient for positive interest rate shocks (IR_P) is significantly negative at −3.856177, indicating a strong inverse relationship between interest rates and equity market returns in the short run. On the other hand, the coefficient for negative interest rate shocks (IR_N) is not statistically significant at −0.940212, indicating a lack of consistent impact on market returns. Furthermore, lagged interest rates (IR_P(−1) and IR_N(−1) also exhibit significant effects on equity market returns. Positive shocks have a coefficient of 3.496924, while negative shocks have a coefficient of −2.163378. The results reveal that Nigerian interest rates significantly influence the equity market's performance, with positive shocks causing short−term increases in returns and investors reallocating capital to higher-yielding investments.

The coefficients for exchange rate risk on equity market returns in Nigeria, EXR_P(−1) and EXR_N(−1), are not significant at 0.182576 and 0.184391, respectively. A 1% increase in EXR_P(−1) leads to a 0.182576% decrease in EMR, while a 1% increase in EXR_N(−1) leads to a 0.184391% decrease in EMR. These findings suggest that fluctuations in the exchange rate have a minimal impact on equity market returns in Nigeria. In the short run, the coefficients for EXR are as follows: EXR_P is −8.74e−05, EXR_N is −0.0 98840, EXR_P(−1) is 0.084292, EXR_N(−1) is 0.164427, EXR_P(−2) is 0.163270, and EXR_N(−2) is 0.000770. These results indicate that exchange rate risk does not significantly impact equity market returns in the short run, as the coefficients for EXR_P and EXR_N are both statistically insignificant. The lagged exchange rate coefficients have insignificant effects, suggesting past exchange rate movements do not impact market returns. Therefore, investors in the Nigerian equity market may not need to consider exchange rate risk in short−term investment decisions.

In the long run, the inflation risk coefficients INF_P and INF_N in Nigeria have insignificant asymmetric effects on EMR of −0.359502 and −0.180668, respectively. Therefore, changes in inflation have little impact on equity market returns in Nigeria. Consequently, investors should not base their investment decisions primarily on inflation risks but should consider other factors, such as market capitalization and stock price volatility.

The coefficient of ECT_{t-1}, −0.213299 and significant at the 1% level, indicates a short run cointegration link among variables. This demonstrates a rapid adjustment to long-run equilibrium following a short-run shock, suggesting that deviations from equilibrium will be promptly corrected. These findings strongly support the presence of a short run cointegration relationship between the analyzed variables.

The fitted model for Nigeria has an adjusted R-squared of 0.816113, indicating that 81.61% of the dependent variable's variability can be explained by the independent variables. The high adjusted R-squared suggests a good fit for Nigeria's data. The F-statistic of 10.20910 and Durbin-Watson statistic of 2.588633 indicate a significant link between the dependent and independent variables, with no evidence of serial correlation in the model's residuals.

Egypt: As indicated by the negative coefficient of EMR(−1) in the long run and the positive coefficient of EMR(−1) in the short run in Table 6, long-term EMR in Egypt has a negative impact on future returns. These outcomes highlight the importance of considering both long- and short-term dynamics.

Table 6. Egypt Long Run and Short Run Results for EMR from the NARDL (2,0,0,2,0,0,1) model.

Long run			Short run		
Variables	Coefficient	Pro.	Variables	Coefficient	Pro.
EMR(−1)	−0.288953	0.0000***	EMR(−1)	0.752732	0.0000***
*ln*EFV_P	32.82558	0.0229***	*ln*MC_P	−3.353586	0.0529*
*ln*EFV_N	9.367910	0.4308	*ln*MC_N	1.284222	0.0685*
*ln*SPV_P	1.172463	0.0697*	*ln*MC_P(−1)	−0.500616	0.7643
*ln*SPV_N	−0.615140	0.3408	*ln*MC_N(−1)	−1.109228	0.0891*
*ln*MC_P(−1)	−0.276015	0.3317	*ln*INF_P	−0.121516	0.6876
*ln*MC_N(−1)	0.535512	0.1240	*ln*INF_N	−1.735352	0.0054***
*ln*IR_P	7.843238	0.0329**	ECT_{t-1}	−0.288953	0.0000***
*ln*IR_N	−2.314801	0.4369	@QUARTER=1	−0.393189	0.8351
*ln*EXR_P	0.806921	0.2334	@QUARTER=2	−0.631179	0.8056
*ln*EXR_N	−0.486525	0.5955	@QUARTER=3	0.399046	0.8033
*ln*INF_P(−1)	−1.098048	0.0020***	C	−20.30895	0.0018***
*ln*INF_N)(−1)	−1.069685	0.0983**	@TREND	2.616331	0.0010***
R-squared	0.776866		F−statistic	8.704051	
Adjusted R-squared	0.687613		Pro(F−statistic)	0.000000	
Durbin-Watson stat	2.302301				

Note. (***), (**), and (*) indicate significant at 1%, 5%, and 10%. All the variables are log linearized. Source: Authors' computation using EViews 13. The model was selected based on Akaike information criteria (AIC).

The coefficient results show that EFV_P has a significant value of 32.82558, while EFV_N has an insignificant value of 9.367910. The positive coefficient of EFV_P indicates that an increase in cross-border equity flow volatility has a significant positive impact on equity market returns in Egypt in the long term. Conversely, the insignificant coefficient of EFV_N suggests that negative shocks in cross-border equity flow volatility do not have a significant effect on equity market returns. These findings highlight the asymmetric nature of the relationship between EFV and EMR in Egypt, with positive shocks playing a more influential role in driving equity market returns. This finding is a unique contribution to the literature and may be important.

In Egypt, the coefficient for long-term stock price volatility, SPV_P, is significant, while SPV_N is insignificant. These findings indicate that positive shocks in stock price volatility significantly affect equity market returns in Egypt, leading to higher long-term returns. However, the insignificant coefficient of SPV_N suggests that negative shocks in stock price volatility do not significantly affect equity market returns. This study emphasizes the importance of analyzing and monitoring positive stock price volatility in Egypt, as it significantly impacts equity market returns.

Other results indicate that the coefficient for positive market capitalization, MC_P(−1), is insignificant at −0.276015, and MC_N(−1) is insignificant at 0.535512 in Egypt in the long run. The results suggest that a decrease in positive market capitalization has a minor negative impact on equity market returns in Egypt, while an increase in negative market capitalization has a slight positive impact. In the short run, the MC coefficients show significant values: MC_P at −3.353586, MC_N at 1.284222, MC_P(−1) at −0.500616, and MC_N(−1) at −1.109228. These values indicate asymmetric effects on EMR in Egypt. In the short run, a decrease in MC has a greater negative impact on Egyptian equity market returns compared to an increase in MC. Additionally, the lagged effects of MC significantly

influence EMR, as a reduction in MC in the previous period had a detrimental impact on EMR. Policymakers should focus on measures to maintain and increase MC to enhance returns in the Egyptian equity market.

The interest rate coefficient, IR_P, has a significant effect of 7.843238 on EMR in Egypt in the long run. In contrast, IR_N has an insignificant effect of −2.314801 on EMR. An increase in IR_P leads to an approximate 7.84-unit increase in equity market returns in Egypt, while an increase in IR_N does not significantly impact equity market returns. This suggests that positive changes in interest rates have a greater influence on equity market returns in Egypt than negative changes. These findings indicate that investors in the Egyptian equity market may be more influenced by positive economic indicators and potential returns than by negative market capitalization or interest rate changes.

EXR_P has a coefficient of 0.806921, while EXR_N has a coefficient of −0.486525. These coefficients do not have a significant asymmetric effect on equity market returns in Egypt. Positive shocks in EXR_P do not lead to noticeable increases in equity market returns, indicating that investors do not view a positive exchange rate change as advantageous. Similarly, negative shocks in EXR_N do not significantly impact equity market returns, suggesting that investors are not excessively concerned about a depreciating exchange rate. Therefore, exchange rate risk does not significantly affect equity market returns in Egypt. The study emphasizes that positive changes in interest rates and economic indicators are the main factors influencing equity market returns, suggesting that investors may place less importance on exchange rate fluctuations.

The inflation risk coefficient INF_P(−1) has a significant effect of −1.098048, while INF_N(−1) has a significant effect of −1.069685 on EMR in Egypt in the long run. These findings suggest that Egyptian equity investors are particularly sensitive to inflation risk. A decrease in inflation (INF_P) has a more pronounced negative impact on EMR compared to an increase in inflation (INF_N), indicating that investors are more concerned about the potential erosion of purchasing power and overall economic stability. Policymakers should prioritize controlling inflation and promoting economic stability to attract and retain investors in the Egyptian equity market in the long run. In the short run, the coefficient INF_P has an insignificant effect of −0.121516, while INF_N has a significant effect of −1.735352 on EMR in Egypt. The results reveal that an increase in inflation risk has a greater negative impact on Egyptian equity market returns, urging policymakers to manage inflation to ensure stability and positive returns.

The ECT_{t-1} coefficient, −0.288953, is significant at the 1% level and suggests a short run cointegration relationship among variables. This shows a rapid return to long-run equilibrium after a short-run shock, indicating that deviations from equilibrium will be quickly corrected. These data strongly suggest that the variables being studied have a short run cointegration connection. In addition, the negative ECT_{t-1} coefficient indicates the presence of a negative correction mechanism that will reverse any deviations from long-run equilibrium. This suggests a strong stabilizing force that will quickly bring the variables back to their steady state relationship.

The adjusted R-squared value of 0.687613 in Egypt indicates that 68.76% of the dependent variable's variation can be explained by independent variables. The F-statistic of 8.704051 supports a significant link between variables, rejecting the null hypothesis. The Durbin-Watson statistic of 2.302301 confirms no significant serial correlation between model errors.

Kenya: In Table 7, the negative coefficient of long-run EMR (−1) indicates a negative impact on future returns, while the positive coefficient of short-run EMR (−1) shows a positive influence on current returns, highlighting the importance of both long-run and short-run dynamics.

Table 7. Kenya Long Run and Short Run Results for EMR from the NARDL (2,0,1,2,2,0,0) model.

Long run			Short run		
Variables	Coefficient	Pro.	Variables	Coefficient	Pro.
EMR(−1)	−0.403031	0.0000***	EMR(−1)	0.631272	0.0000***
*ln*EFV_P	−9.660373	0.0436**	*ln*SPV_P	−0.806810	0.3861
*ln*EFV_N	1.255421	0.8415	*ln*SPV_N	1.773058	0.0046***
*ln*SPV_P(−1)	0.166494	0.5206	*ln*MC_P	1.240660	0.0885*
*ln*SPV_N(−1)	−0.470297	0.0108**	*ln*MC_N	2.006566	0.0315**
*ln*MC_P(−1)	0.204758	0.4760	*ln*MC_P(−1)	−0.567381	0.4807
*ln*MC_N(−1)	1.098834	0.0053***	*ln*MC_N(−1)	−1.964890	0.0353**
*ln*IR_P(−1)	2.148278	0.0527*	*ln*IR_P	−0.482481	0.7663
*ln*IR_N(−1)	−0.040167	0.9484	*ln*IR_N	0.282898	0.6748
*ln*EXR_P	0.004202	0.9771	*ln*IR_P(−1)	−1.884502	0.0693*
*ln*EXR_N	0.052706	0.8141	*ln*IR_N(−1)	0.492009	0.4369
*ln*INF_P	0.189703	0.0037***	ECT_{t-1}	−0.403031	0.0000***
*ln*INF_N	−0.587799	0.5105	@QUARTER=1	−0.098345	0.9306
			@QUARTER=2	−0.622649	0.5981
			@QUARTER=3	−0.548149	0.5199
			C	10.19346	0.2636
			@TREND	−0.674612	0.3662
R-squared	0.830120		F-statistic	9.773007	
Adjusted R-squared	0.745180		Pro(F-statistic)	0.000000	
Durbin-Watson stat	2.588633				

Note. (***), (**), and (*) indicate significant at 1%, 5%, and 10%. All the variables are log linearized. Source: Authors' computation using EViews 13. The model was selected based on Akaike information criteria (AIC).

The long-run coefficient results show that EFV_P has a significant impact of −9.660373, while EFV_N has an insignificant impact of 1.255421. These findings suggest that positive shocks to cross-border equity flow volatility significantly negatively affect equity market returns in Kenya in the long run. However, negative shocks to EFV do not appear to impact EMR significantly. Therefore, investors should be cautious when EFV increases, as this may lead to a decrease in equity market returns. This finding is a notable contribution to the literature.

The results show that in Kenya, the long-term effects of stock price volatility coefficients SPV_P(−1) and SPV_N(−1) on equity market returns are asymmetric. The insignificant coefficient for SPV_P(−1) suggests that positive shocks to stock price volatility do not significantly affect equity market returns in the long run. In contrast, the significant coefficient for SPV_N(−1) indicates that negative shocks have a major negative impact on equity market returns. Therefore, investors should be cautious when stock price volatility decreases. In the short term, the SPV_P coefficient has no significant impact on equity market returns, while SPV_N has a significant asymmetric effect. The study also reveals that stock price volatility significantly affects short-term equity market returns, with increased volatility leading to negative returns and decreased volatility leading to positive returns. This underscores the importance of market analysis for investors and policymakers.

We found that the coefficient for long-run positive market capitalization, MC_P(−1), is not significant, while MC_N(−1) has a significant positive effect on equity market returns in Kenya. It indicates that Kenyan equity investors tend to overreact to negative market capitalization shocks, despite previous shocks having a small impact on equity market returns. Furthermore, the short-run coefficient for positive market capitalization in Kenya is significantly positive, with MC_P and MC_N values of 1.240660 and 2.006566, respectively. However, MC_P(−1) has an insignificant negative coefficient, while MC_N(−1) has a significant negative coefficient. These findings suggest that market capitalization strongly influences returns in Kenya. Specifically, the positive coefficient for MC_P indicates that an increase in market capitalization leads to a significant increase in returns. The negative coefficient for MC_P(−1) suggests that a decrease in market capitalization in the previous period has an insignificant effect on returns. Similarly, the positive coefficient for MC_N indicates that negative market capitalization has a significant impact on returns, while the negative coefficient for MC_N(−1) indicates that a decrease in negative market capitalization during the previous period negatively affects returns. These asymmetric effects highlight the importance of considering past market trends when analyzing investment decisions in Kenya.

In Kenya, the interest rate coefficient IR_P(−1) is significant in the long run, while IR_N(−1) is insignificant. These findings indicate that interest rate shocks can significantly impact equity market returns in Kenya. Specifically, a positive shock in interest rates (IR_P(−1)) is expected to have a notable positive effect on EMR, suggesting that higher interest rates may lead to increased returns over time. Conversely, a negative shock in interest rates (IR_N(−1)) shows no significant effect on EMR, indicating that lower interest rates may not substantially impact returns. In the short term, the coefficients IR_P and IR_N are not significant, while IR_P(−1) remains significant, and IR_N(−1) is insignificant. Therefore, changes in interest rates do not significantly affect Kenyan equity market returns in the short run, implying that monetary policy decisions may not strongly influence market returns in the short term. However, the significant coefficient for IR_P(−1) highlights the importance of considering historical data when making investment decisions. Past changes in positive interest rates can negatively impact returns. In summary, the observed asymmetric effects underscore the complex relationship between interest rates and equity market returns in Kenya.

In Kenya, the coefficients EXR_P and EXR_N are insignificant in the long run. A 1% increase in EXR_P is not expected to significantly impact equity market returns. Similarly, a 1% decrease in EXR_N is also not expected to affect EMR. Thus, exchange rate risk does not play a significant role in determining long-term equity market returns in Kenya.

Inflation risk coefficient INF_P is significant, while INF_N is insignificant in Kenya in the long run. Inflation risk, as measured by INF_P, has a positive and significant impact on equity market returns in Kenya. A 1% rise in inflation is anticipated to have a substantial positive effect on EMR. The coefficient for INF_N is insignificant, indicating that a 1% decrease in inflation does not significantly affect equity market returns in Kenya. Therefore, inflation risk plays a moderate role in determining long-term market returns in Kenya.

The ECT coefficient is statistically significant at 1% and negative, indicating short run cointegration among variables. The ECT_{t-1} coefficient is −0.403031, implying rapid long-run equilibrium changes after short-run shocks, with a 40.03 percent adjustment towards the long-run equilibrium in each period.

The adjusted R-squared in Kenya is 0.745180, indicating that 74.52% of the dependent variable's variability can be explained by the independent variables. The F-statistic of 9.773007

indicates a significant link between the independent variables and the dependent variable, while the Durbin-Watson statistic of 2.588633 suggests no significant serial correlation in the model's errors.

Multiplier impact

The multiplier impact graphs illustrate the dynamic changes in equity market returns (EMR) in each of the SANEK member countries in response to positive and negative shocks to cross-border equity flow volatility (EFV).

From analyzing Figure 1 of the multiplier impact of EFV on the EMR, it is evident that South Africa and Nigeria exhibit a stronger response to positive shocks than to negative shocks. This indicates that these countries have greater resilience to fluctuations in cross-border equity flow volatility and can recover swiftly. When considering equity investments in South Africa and Nigeria, investors and policymakers should take these dynamics into account.

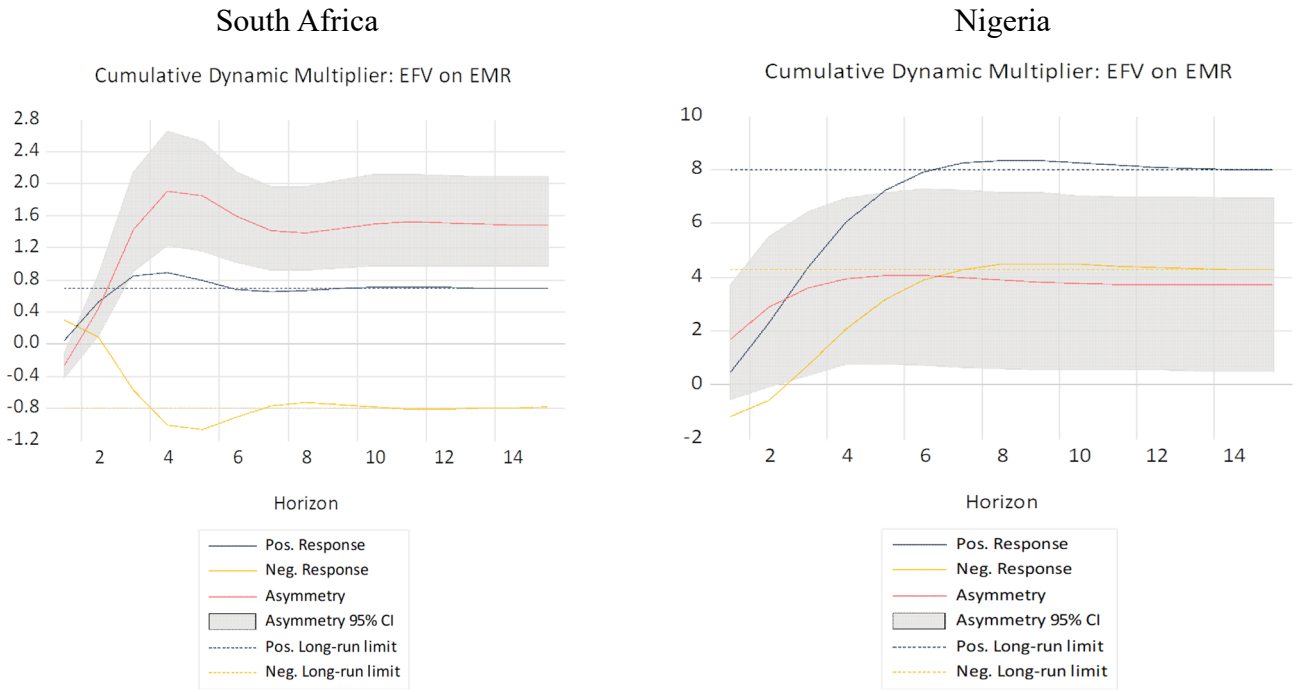


Figure 1. Cumulative dynamic multiplier for South Africa and Nigeria: EFV on EMR.
Source: Authors' Estimation using EViews 13.

In Figure 2, negative shocks significantly impact EMR in SANEK countries like Egypt and Kenya. This highlights their vulnerability to external shocks and the importance of effective risk management strategies. Investors and policymakers should assess the risks of equity investments in Egypt and Kenya due to this susceptibility. Implementing efficient risk management strategies is crucial for minimizing the impact of negative shocks on these economies.

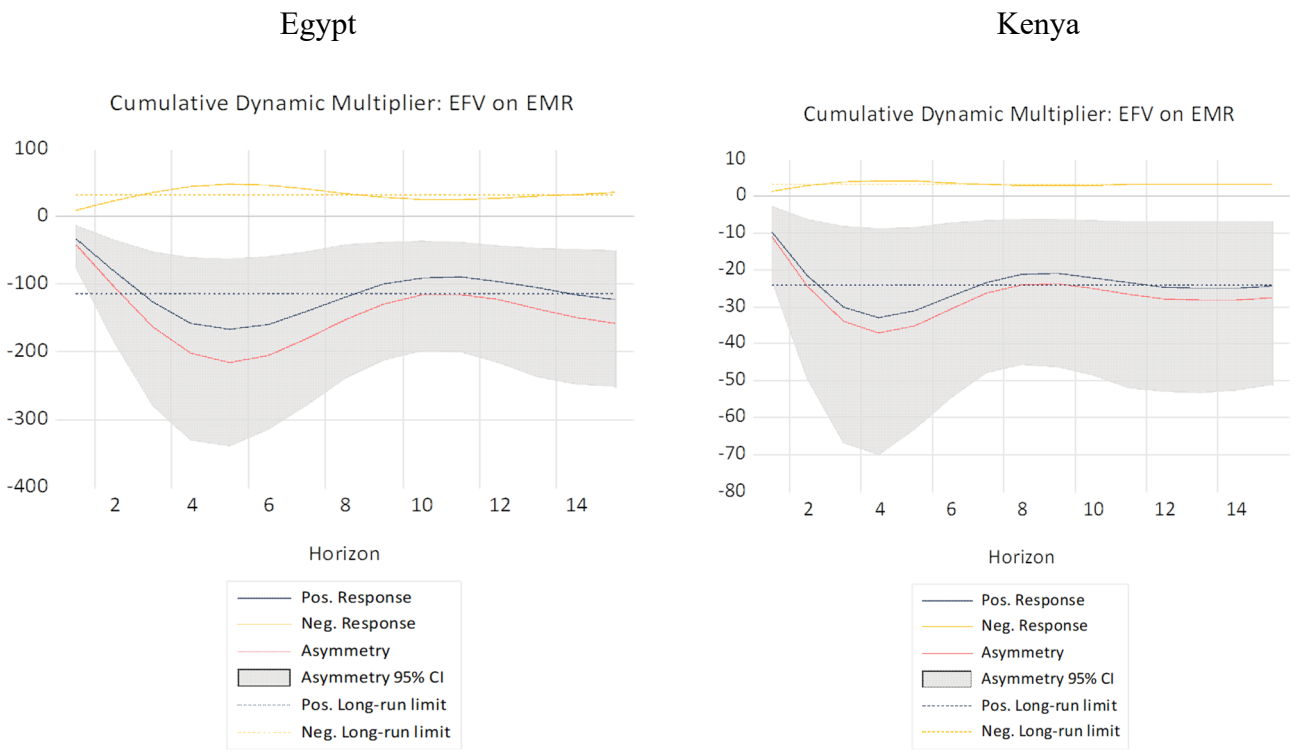


Figure 2. Cumulative dynamic multiplier for Egypt and Kenya: EFV on EMR. *Source: Authors' Estimation using EViews 13.*

Overall, the analysis of the multiplier impact provides insights into the dynamics of equity market returns in individual SANEK countries and the role of cross-border equity flow volatility in shaping their performance.

Diagnostic test results

The Breusch-Pagan-Godfrey test in Table 8 shows that all p-values are greater than 0.05, indicating no evidence of conditional heteroskedasticity in the data for any of the countries. The regression models demonstrate consistent error variance across levels of independent variables, confirming homoskedasticity. This enables further analysis using these models. Overall, the analysis of the multiplier impact provides insights into the dynamics of equity market returns in individual SANEK countries and the role of cross-border equity flow volatility in shaping their performance.

Table 8. Diagnostic test.

Variables	South Africa	Nigeria	Egypt	Kenya
Serial Correlation	2.664965 (0.0803)	2.004770 (0.1436)	1.539855 (0.2230)	3.760607 (0.3102)
Breusch-Pagan-Godfrey test	1.218389 (0,2588)	1.265683 (0.2243)	3.418687 (0.3901)	2.759673 (0.2106)
Normality (Jarque-Bera) test	5.429675 (0.066216)	0.882344 (0.643282)	0.427714 (0,807464)	0.761589 (0.83318)

Source: Authors' Estimation using EViews 13.

Based on the Jarque-Bera normality test, the p-values for all four countries exceed the significance level of 0.05, indicating no significant evidence to reject the null hypothesis of normality in the error terms of the regression models. Thus, the assumption of normality is satisfied. Similarly, the p-values for serial correlation in all four countries are greater than 0.05%, suggesting no significant evidence of serial correlation in the error terms.

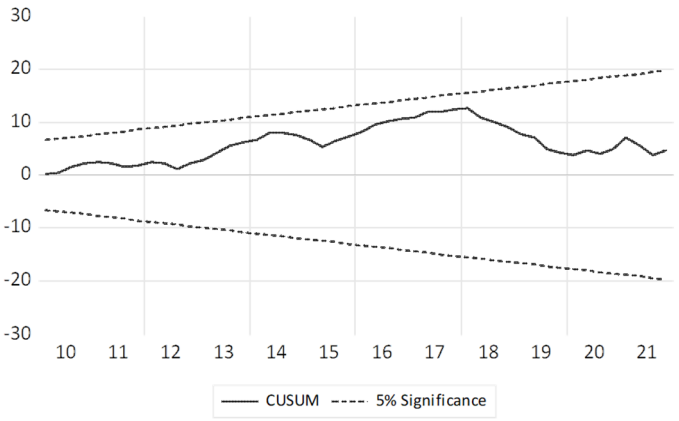
Structural stability tests

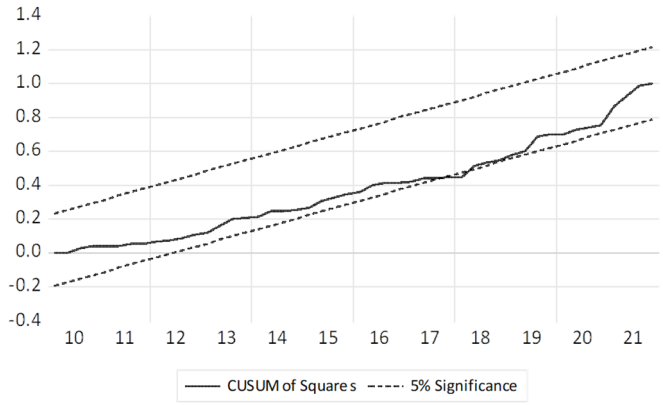
Using recursive estimation, we confirmed the results of the structural stability test. Brown et al. (1975) utilized cumulative sum recursive residual plots to evaluate the stability of regression associations over time. These CUSUM plots visually represent changes in the regression association over time. Additionally, cumulative sum of squares (CUSUMSQ) plots are frequently used to assess the stability of the estimated regression coefficients (Brown et al., 1975). Figure 3 presents the outcomes of the CUSUM and CUSUMSQ stability tests.

We assess the reliability and stability of the regression models by examining the sum of squared residuals and the sum of residuals over time. A consistent regression relationship can be seen in Figure 3 by comparing the CUSUM and CUSUMSQ plots. Consequently, it can be inferred that the estimated regression coefficients remain stable throughout the analysis.

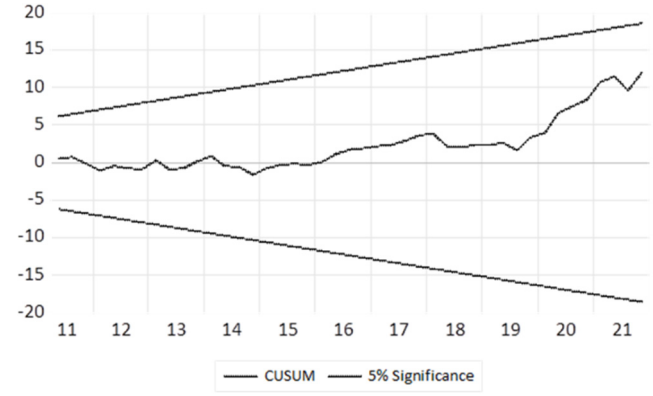
The significance of the CUSUM and CUSUMSQ statistics at the 5% level supports the validity of the regression associations. The results suggest that the regression models used are reliable, indicating that these methods are valuable for detecting and monitoring changes in regression associations over time.

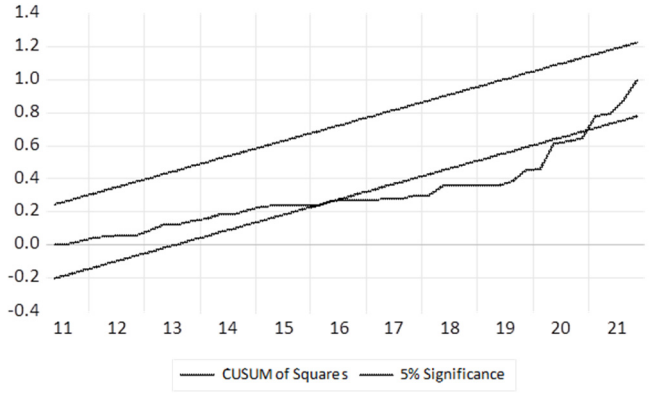
South Africa



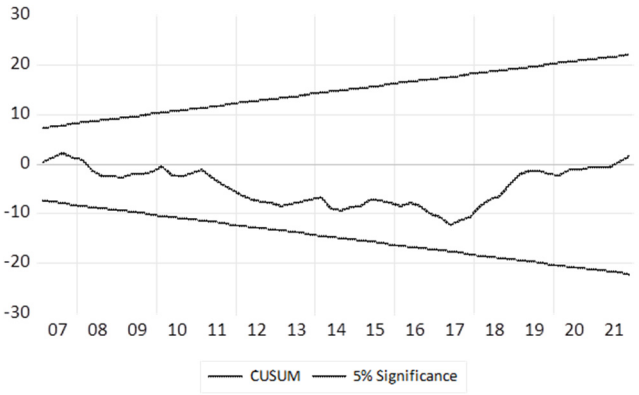


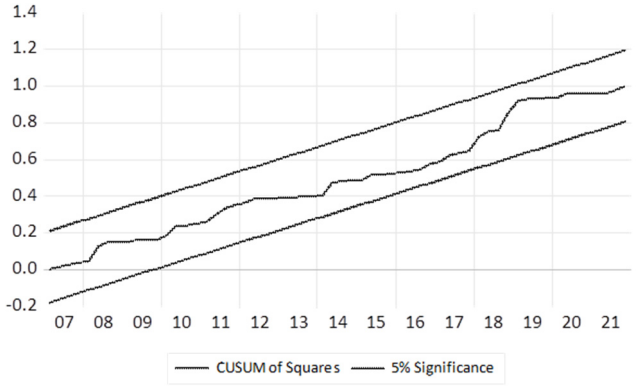
Nigeria



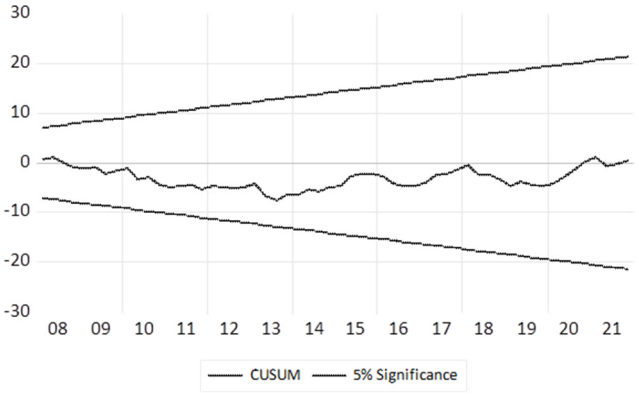


Egypt





Kenya



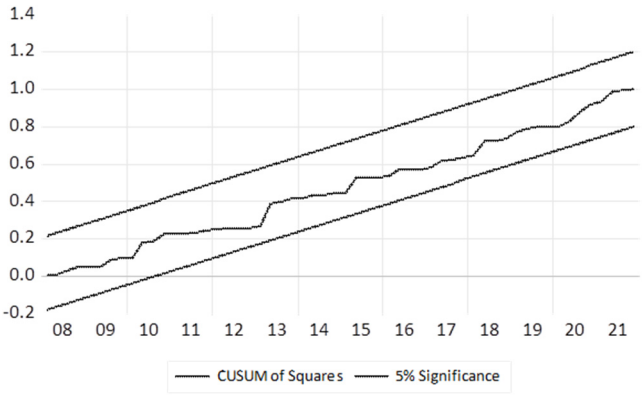


Figure 3. CUMUM and CUMSUMQ Structural Stability Tests. *Source: Authors' Estimation using EViews 13.*

5. Discussion

Rizal et al. (2020) established a connection between stock returns and foreign inflows in Indonesian Islamic equity, while Prabheesh (2020) discovered a causal relationship between foreign capital inflows (FPI) and stock market returns in India. Similarly, Sapian and Auzairy (2015) identified a positive correlation between foreign capital and equity market returns but did not explore the non-linear relationship between equity flows and market returns in the Malaysian stock market. In contrast, we concentrate on the volatility of equity capital flows than the magnitude or volume of these flows, revealing how sudden fluctuations and uncertainties influence equity market returns in emerging markets. Moreover, researchers have failed to consider asymmetric factors. Here, we utilize the NARDL method to demonstrate how positive changes in cross-border equity flow volatility impact returns in South Africa's equity market. In Nigeria, positive shocks lead to an increase in equity market returns, while in Egypt, positive shocks drive equity market returns. Conversely, in Kenya, positive shocks from cross-border equity flow volatility negatively affect equity market returns. The findings highlight the importance of considering both positive and negative shocks when assessing the relationship between equity market returns and equity flow volatility, providing a unique and valuable contribution to literature.

Stock market investors in South Africa are more tolerant of long-term negative volatility than of positive volatility. Short-run SPV coefficients indicate that immediate responses to negative shocks are critical for investors, potentially resulting in substantial short-term returns. The results also reveal that stock price volatility in Nigeria positively impacts equity market returns, while a decrease in volatility has an insignificant effect. However, short-run SPV coefficients suggest potential declines, emphasizing the importance of managing risks. Other studies indicate that positive stock price volatility shocks significantly affect equity market returns in Egypt, whereas negative shocks do not. Investors should monitor these asymmetric relationships for higher returns. Additionally, the results reveal that stock price volatility in Kenya significantly affects equity market returns in the long run. Negative shocks negatively impact returns, while increasing volatility positively affects them, highlighting the need for caution among investors.

Acheampong et al. (2014) found a positive link between market size (measured by market capitalization) and stock market returns in Ghana using OLS. Their results revealed that market capitalization has long-term positive effects on EMR in South Africa, with strong investor responses to positive increases. However, the short-run coefficients show insignificant positive effects. The researchers also found that market capitalization significantly affects Nigerian equity market returns, with positive short-run effects but negative long-run effects. Negative changes can adversely affect returns, highlighting the importance of monitoring MC changes and stock price volatility for investors. In Egypt, market capitalization has insignificant long-term effects on equity returns, suggesting that other factors may play a greater role. Short-run MC coefficients have asymmetric effects on Egyptian equity market returns, with a decrease in MC negatively impacting returns. Kenyan equity investors tend to overreact to negative market capitalization shocks, affecting both long-term and short-term returns. Investing in Egypt and Kenya requires an understanding of market capitalization dynamics, and participants should consider adopting new strategies to mitigate negative effects. Unlike Acheampong et al. (2014), who used OLS, we employed the NARDL model to provide a more comprehensive understanding of how market capitalization influences returns. This will be beneficial for investors looking to optimize their strategies.

Assefa et al. (2017) discovered a negative relationship between interest rates and stock market returns in developed countries using GMM. In Kenya, interest rate shocks significantly impact equity market returns; positive shocks lead to increased returns, while negative shocks have no significant effect. Interest rate changes do not significantly affect Kenyan equity market returns, suggesting that monetary policy decisions may not influence short-term returns. In South Africa, equity returns are primarily influenced by long-term market declines, with short-term fluctuations playing a minor role. In Nigeria, interest rate changes have immediate and lagged effects, showing a significant negative relationship in the short run. Positive interest rate changes impact equity market returns in Egypt more than negative changes. Moreover, making investment decisions requires understanding the unique economic factors and market dynamics of each country. South African investors should avoid short-term market fluctuations, Nigerian investors should be cautious of interest rate changes, and Egypt's preference for positive interest rate changes indicates a more optimistic market outlook. In contrast to Assefa et al. (2017), who used GMM, we employed the NARDL model to capture the nonlinear relationship between interest rates and equity returns, suggesting that the NARDL model is better suited to understanding the relationship in SANEK markets.

El-Diftar (2023) found a long-term relationship between exchange rates and stock market returns in the Emerging 7 countries, except for Indonesia, which showed a notable negative impact. Their results indicated that changes in exchange rate risk significantly affect equity market returns in South Africa, where positive changes encourage investment and negative changes prompt caution. However, short-term returns suggest that exchange rate risk may not significantly impact investors in South Africa. In Nigeria, exchange rate risk and lagged exchange rate coefficients have a minimal long-term effect on equity market returns and do not significantly affect short-term returns. In Egypt, the coefficients EXR_P and EXR_N have an insignificant asymmetric effect on equity market returns, suggesting that investors should focus on other economic indicators. In Kenya, exchange rate risk does not significantly impact equity market returns, as the long-term exchange rate coefficients EXR_P and EXR_N are not significant. Here, we utilized the NARDL model instead of GARCH to analyze exchange rate risk and equity market returns, challenging previous research and offering a more nuanced perspective.

In India, Sreenu (2023) discovered a negative correlation between inflation rates and stock returns. Similarly, in South Africa, the equity market responds negatively to deflationary pressures, indicating cautious investor behavior. In Nigeria, the inflation risk coefficients INF_P and INF_N have minimal asymmetric effects on EMR, suggesting a minor impact on equity market returns. Egyptian equity investors are sensitive to inflation risk, as reduced inflation negatively impacts EMR in the long term. Short-term INF coefficient results reveal that increased inflation risk significantly affects equity market returns negatively. In Kenya, a 1% increase in inflation significantly affects equity market returns, while a 1% decrease has no effect. Therefore, investors in Kenya may perceive inflation as a sign of economic growth and stability. Overall, the findings from South Africa, Nigeria, Egypt, and Kenya highlight the varied effects of inflation on equity market returns in SANEK markets. Investors in these countries should carefully consider the correlation between inflation and EMR when making investment decisions.

6. Conclusions and policy recommendations

We examined the effects of cross-border equity flow volatility on equity market returns in SANEK from 2000Q1 to 2021Q4. The NARDL statistical model was used to analyze both short-term and long-term asymmetric impacts. Our findings suggest that South African investors can enhance their returns by

adjusting their portfolios in response to changes in cross-border equity flow volatility. Positive shocks have a more significant long-term effect on Nigeria, whereas negative shocks have a more pronounced short-term impact. Egypt's equity market is susceptible to external shocks, while Kenyan investors are more sensitive to volatility, resulting in decreased returns and higher risk aversion. Understanding and managing stock price volatility is crucial for maximizing returns and capitalizing on market opportunities. In Egypt, investors can strategically position their portfolios by leveraging asymmetric relationships to optimize returns and mitigate risks. In Kenya, extreme volatility leads to significant declines in returns. Market capitalization plays a vital role in determining equity market returns in South Africa, Nigeria, Egypt, and Kenya, with changes having both positive and negative effects on market performance. The NARDL model underscores the importance of tracking trends for informed investment decision-making. Market capitalization shocks can cause shifts in returns, and investors may be more inclined to take risks during economic downturns if interest rates decrease. Egyptian investors are more responsive to positive interest rate changes during periods of economic strength. Nigerian interest rate changes may have enduring effects on the market, necessitating prompt and delayed analyses. Interest rate shocks directly impact returns in Kenya. Based on the model, South Africa, Nigeria, Egypt, and Kenya's equity markets are significantly affected by exchange rate fluctuations. Positive changes stimulate investment, while negative changes prompt caution. Exchange rate risk coefficients have minimal impact on Nigerian returns, Egyptian returns, and Kenya's equity market. Inflation risk significantly affects investor behavior and equity market returns in South Africa, leading to a decrease in the market and a reluctance to invest. The results also indicate that inflation risk in Nigeria has a minimal asymmetric effect. The model highlights inflation risk as a critical factor in Egypt's investment decisions, advising investors to monitor and adjust their portfolios accordingly. The model suggests that Kenyan equity market investors may benefit from increased inflation risk, resulting in higher returns.

Policy and Practical Recommendations: The findings on cross-border equity flow volatility (EFV) and equity market returns (EMR) in South Africa, Nigeria, Egypt, and Kenya reveal that the effects of EFV are asymmetric. This suggests that each country requires customized strategies. Below are targeted policy and practical recommendations for policymakers and investors in each country:

South Africa

Our findings indicate that, in the long run, positive EFV shocks significantly increase equity market returns, while negative shocks have no significant effect. In the short run, positive EFV shocks are insignificant, but negative shocks have a significant positive effect.

Policy Recommendations:

Leverage Positive Shocks: Introduce incentives for foreign investors during periods of positive volatility, such as tax breaks or streamlined investment processes.

Enhance Market Stability: Enhance financial market infrastructure to support growth driven by positive equity flow and volatility shocks, including improved regulations for large transactions and derivatives markets.

Monitor Negative Shocks: Establish risk mitigation frameworks, such as volatility smoothing funds, to address potential market imbalances resulting from negative shocks.

Practical Recommendations for Investors:

Monitor Market Volatility: Use predictive tools to identify periods of heightened positive equity flow volatility to capitalize on expected returns.

Hedge Negative Shocks: Employ financial instruments like options or futures to mitigate risks during periods of negative shocks.

Diversify Portfolios: Reduce exposure to sectors sensitive to equity flow volatility and prioritize industries that benefit from positive volatility, such as financial services.

Nigeria

Our findings suggest that, in the long run, positive EFV shocks significantly drive equity returns, while negative shocks are insignificant. In the short run, positive EFV shocks are insignificant, but negative shocks significantly reduce returns.

Policy Recommendations:

Stabilize Cross-Border Flows: To mitigate the destabilizing effects on the equity market caused by high volatility in cross-border equity flows, foreign exchange controls should be implemented during these periods.

Support Positive EFV: Promote policies that attract sustainable foreign investment by enhancing the ease of doing business and minimizing bureaucratic obstacles.

Mitigate Negative EFV Effects: Protect markets from negative equity flow volatility by introducing macroprudential measures, such as liquidity buffers or capital requirements.

Practical Recommendations for Investors:

Prioritize Risk Management: Develop strategies to mitigate negative shocks using currency swaps, equity derivatives, or diversification across asset classes.

Engage in Defensive Investments: Concentrate on resilient sectors such as consumer staples and healthcare during periods of negative EFV.

Enhance Data Utilization: Use real-time EFV data to adjust portfolio allocations based on market conditions.

Egypt

Our findings indicate that long-run positive equity flow volatility shocks significantly boost equity market returns, whereas negative shocks have an insignificant effect.

Policy Recommendations:

Encourage Foreign Investment: Create policies that promote stable and predictable positive equity flow volatility, such as bilateral investment treaties or tax incentives for foreign investors.

Strengthen Capital Market Infrastructure: Enhance market liquidity and efficiency by broadening the range of financial instruments, such as exchange-traded funds (ETFs), to attract foreign participation.

Enhance Transparency: Enhance the transparency of cross-border equity flow reporting to build investor confidence and promote sustained positive equity flows.

Practical Recommendations for Investors:

Focus on Growth Sectors: Allocate investments to sectors likely to benefit from positive EFV shocks, such as technology and renewable energy.

Leverage Long-term Trends: Develop strategies to leverage the ongoing positive trends in EFV, such as investing in index funds linked to high-performing equity markets.

Kenya

Our findings indicate that long-term positive EFV shocks have a significant negative impact on equity market returns, whereas negative shocks do not have a significant effect.

Policy Recommendations:

Curb Negative Effects of Positive EFV Shocks: Introduce market stabilization tools, such as capital flow management measures, to reduce the negative impacts of positive EFV shocks.

Promote Local Investment: Encourage local institutional investors to take a more significant

role in the equity market to reduce dependence on cross-border equity flows.

Improve Investor Education: Initiate programs to educate investors about the risks related to EFV and provide them with tools to manage volatility effectively.

Practical Recommendations for Investors:

Adopt Defensive Strategies: Invest in less volatile asset classes like bonds and real estate to hedge against volatility shocks in positive equity flows.

Monitor EFV Indicators: Utilize predictive analytics to anticipate periods of increased volatility and adjust portfolio strategies accordingly.

Invest in Stability: Focus on companies with strong fundamentals and less sensitivity to cross-border equity flows.

Author contributions

The concept was conceptualized by D.P., who also developed the methodology and software. S.M. and P.B.D.M. validated the idea. D.P. conducted the formal analysis and wrote the original draft of the manuscript. S.M. and P.B.D.M. reviewed, edited, and supervised the writing process. All authors have read and approved the manuscript.

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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