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Fixed/Floating Exchange Rate Systems, Health Crisis and Financial Markets of BRICS/Africa: Generalized Linear Model (GLM) Estimations

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Abstract
The fixed and floating exchange rate systems exhibit essential differences. The paper attempts to provide empirical clarification concerning the type of exchange rate regime that has the most favourable impact on stock market returns and prices of the BRICS and African markets using the GLM regression method. The results are based on the inverse Gaussian functions and also identity and 1og functions of the estimated generalized linear model. The fixed exchange regime impacted adversely and significantly on the stock prices of both stock markets. The floating regime impacted favourably and significantly on the stock prices of the BRICS and African stock markets at the inverse Gaussian and Gamma identities. Whereas the fixed regime impacted adversely on stock returns of the BRICS markets at Gaussian identity, it impacted positively but rather insignificantly on the performance of stock returns of African markets. For African stock markets, both the floating and fixed regimes impacted stock returns positively, but the impact of the fixed regime is significant and also of a higher magnitude compared to that of the floating regime (17.313>10.885) HIV and Covid-19 deaths have significant inverse effects on stock prices of African stock markets. For the BRICS markets, the effect of Covid-19 on prices and returns was negative but insignificant. Only stock return effect of HIV was adverse and significant for the BRICS markets. The research findings will be useful for financial marketers

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involved in international financial trade and seeking to align with developments in international financial markets.

Keywords
Stock returns, stock prices, fixed regime, floating regime, Gaussian and Gamma identity

Аннотация
Системы фиксированного и плавающего валютного курса имеют существенные различия. В статье предпринята попытка эмпирического уточнения, какой тип режима обменного курса оказывает наиболее благоприятное влияние на доходность и цены фондовых рынков стран БРИКС и Африки, с использованием метода регрессии GLM. Результаты основаны на обратных гауссовых функциях, а также тождествах и 1og-функциях оцененной обобщенной линейной модели. Фиксированный валютный режим оказал негативное и значительное влияние на цены акций обоих фондовых рынков. Плавающий режим оказал благоприятное и значительное влияние на котировки акций фондовых рынков стран БРИКС и Африки при обратных тождествах Гаусса и Гаммы. В то время как фиксированный режим негативно повлиял на доходность акций рынков стран БРИКС при гауссовом тождестве, он оказал положительное, но довольно незначительное влияние на доходность акций африканских рынков. Для африканских фондовых рынков как плавающий, так и фиксированный режимы положительно повлияли на доходность акций, но влияние фиксированного режима оказалось значительным и большим по величине по сравнению с плавающим режимом (17,313>10,885) ВИЧ и смертность от Covid-19 оказывают существенное обратное влияние на котировки акций африканских фондовых рынков. Для рынков стран БРИКС влияние Covid-19 на цены и доходность было отрицательным, но незначительным. Только влияние ВИЧ на доходность акций было отрицательным и значимым для рынков БРИКС. Результаты исследования имеют большое значение для финансовых маркетологов, которые занимаются управлением своим финансовым бизнесом с целью соответствия изменениям в конкурентоспособности международных финансовых рынков.

Ключевые слова
Доходность акций, цены акций, фиксированный режим, плавающий режим, изменение курсовой политики, доходность акций, цены акций, развитые и развивающиеся рынки, тождество Гаусса и Гаммы

JEL: C30, B24, D20.

Introduction

According to the World Bank (2024), China is the biggest of the BRICS countries in terms of GDP, ranking second globally with the United States holding the top spot. China's GDP was US$18 trillion in 2023. In 2023, India's economy expanded by 7.6%, with a GDP of US$3.6 trillion, making it the world's fifth largest economy. Also, in 2023, the economy of Brazil grew by 2.9% with a GDP of US$2.2 trillion. This makes it the ninth leading economy in the world. Russia's GDP grew at the rate of 3.6% annually in

2022 to US$2 trillion, making it the eleventh largest economy. The smallest economy of the BRICS grouping is that of South Africa. As of 2023, South Africa commands a GDP of US$377.8, and it grew by 0.6% in the same year. The aforementioned countries aside from the US constitute the BRICS association. Africa now has a chance to deepen its connections with the BRICS developing economies thanks to the group's 5th summit, held in South Africa on March 26-27, 2013 and entitled *BRICS and Africa: Partnerships for Integration and Industrialization*. The summit aimed to unlock possibilities for engagement between BRICS and Africa.

The BRICS countries are currently the biggest trading partners of the majority of African nations and their significant foreign direct investment (FDI) source. It makes sense that trade between Africa and China increased substantially, reaching a peak of US$257.67 billion in overall trade in 2022 from $11.67 billion in 2000. Sadly, the global financial crisis of 2008, the COVID-19 epidemic, and the decline in commodity prices caused Africa's persistent trade deficit that has grown to 2.6 billion dollars. The governments of Brazil and Russia have entered the mining and energy industries in Africa through joint ventures; India's government has made significant efforts to support the growth of medium-sized enterprises throughout the continent. Compared to the stock markets of BRICS, African stock markets suffer substantial prices' swings in their financial market trading and investing. Similar to African economies that most often depend on oil and commodity exports, the treasures of the BRICS countries are defined by their commodity exports. Direct stock purchases bring about African investors' exposure to the BRICS business.

China maintained a peg for the Yuan from 1995 to 2005, after which it gradually moved towards liberalizing its currency policy by implementing a narrow trading band. Financial crises have directly and adversely affected many emerging market economies linked to the global financial markets (IMF, 2023a; Al-Sadiq et al. 2021) In 1997, Indonesia shifted to a floating exchange rate system and Thailand decided to adopt a managed-float system for the Baht, which aligns with inflation-targeting objectives. The Philippine government initiated the float of the peso against the US dollar almost 30 years previously, in 1970. South Korea allowed the Won to float freely against other currencies in 1990. Vietnam, on the other hand, has not yet moved to allow the Dong to float freely, citing as reasons the underdeveloped state of its financial market and concerns about the associated risks of foreign currency trade. Malaysia replaced the Malaysian Dollar with the Ringgit in 1993, transitioning from a free-float period until 1998 to a pegged era and eventually de-pegging from the dollar. Myanmar introduced a managed float for the Kyat in 2012 to protect the economy from various exchange rate regimes that could hinder economic growth. Singapore allowed the Singapore dollar to float freely, with the Monetary Authority of Singapore (MAS) monitoring its strength based on the Singapore dollar nominal effective exchange rate (S$NEER) Finally, Brunei operates a currency board system, effectively pegging its exchange rates (IMF, 2023b)

The study employs empirical methods to identify the type of exchange rate regime (fixed or floating) that has the most impact on stock market indices; for this purpose it uses the GLM regression. Hence the need to determine the impact of exchange rate policy regimes as a study variable on stock indices using the GLM before ascertaining the effects of specific regimes. The exchange rate regime adopted by any country is a key factor that determines the exchange rate, performance of the stock market and, ultimately, the welfare of citizens; it is therefore essential for policymakers to be aware of its possible impacts when making their decisions. The conventional standards governing the selection of an exchange rate regime primarily stem from the Optimal Currency Area (OCA) theory, which determines the choice between a fixed and a flexible exchange rate regime. The theory posits that countries with immobile capital and labour factors are more inclined to adopt a flexible exchange rate regime, whereas those characterised by mobile factors of production are more likely to opt for a fixed exchange rate regime. Similarly, Dąbrowski et al. (2024) argue that the degree of openness in the economy directly influences the preference for a fixed exchange rate regime. Sussman & Wyplosz (2024), however, suggest that it is the level of economic diversification which is the key factor influencing the choice of a fixed or flexible exchange rate regime.

Moreover, maintaining a fixed exchange rate regime necessitates a sufficient level of foreign exchange reserves, which is considered a crucial characteristic. Carvalho & D'Amato (2021) emphasize the role of capital mobility as a pivotal criterion in determining the optimal exchange rate regime and, to explicate the choice, introduces the concept of the impossible trinity. The *impossible trinity,* or *trilemma theory,* posits that it is unfeasible for a country to simultaneously achieve three objectives: a fixed exchange rate, independent monetary policy, and integrated financial markets. This framework categorises three scenarios, illustrating the constraints faced when balancing these three goals. Another factor that influences the choice of an exchange rate regime is the nature of shocks. A contemporary version of the OCA theory emphasises the impact and nature of shocks, indicating their pivotal role in determining the appropriate exchange rate regime.

Although the OCA theory primarily addresses countries within the same region sharing a single currency like the European Union with the Euro, it is also relevant for the present study because it focuses on the interconnectedness of the stock markets across countries, and this paper examines the connections among the markets of developing and developed countries. Countries with fixed exchange rates or common currency arrangements surrender control over their exchange rates to non-market regulation, which prevents them from adjusting independently to economic shocks but, presumably, leads to a relative stability. This stability can boost investor confidence and reduce business risk contributing to a more predictable, or less volatile, stock market environment. The opposite will be true if floating regimes are adopted. The OCA theory is extended in its application by integrating stock market investments and exchange rate regimes that influence exchange rate fluctuations in association with their sensitivity to macroeconomic health concerns, which are capable of causing disruptions in the countries involved (Buiter, 2000) Mundell (Miteza et al. 2023) has shown that a flexible exchange rate regime is more suitable for managing real shocks, whereas a fixed exchange rate regime is better equipped to handle nominal shocks.

The study hypothesizes the following: neither the shifts in exchange rate policy regimes, nor infections or deaths from HIV/AIDS and Covid-19 pandemics produced significant effects on the stock prices and capital gains in the BRICS and African stock markets. Assessing the impact of a particular system on financial performance has become most useful for managing the financial market for the purpose of aligning with advancements in international financial market competitiveness. The selection of an appropriate exchange rate regime also requires the ability to foresee how it will impact the level of exchange rate instability and the effect of such instability on the overall macroeconomic performance. Section Two gives an overview of theoretical and empirical literature, emphasizing the relevant concepts and gap analysis. Section three discusses the paper's theoretical framework, model specification, and sources of data. Section four presents the outcomes of the empirical research. The final section summarizes the research findings, formulates policy recommendations, and defines the scope of further study.

Literature Review

The optimal currency area (OCA) theory provides theoretical justification for the present research. Within a fixed exchange rate system, government intervention assumes a pivotal role in maintaining exchange rate stability, contingent upon the maintenance of robust foreign reserves. In contrast, the floating exchange rate system operates with unrestricted autonomy, devoid of government oversight. Exchange rate fluctuation, characterised by appreciation or depreciation, serves as a hallmark of this inherent instability. The exchange rate oscillations introduce a dimension of risk, indicative of the extent to which a currency's value can undergo substantial fluctuations. Heightened volatility implies greater potential for significant abrupt currency price shifts over short periods of time. Conversely, lower volatility signals a more stable scenario where currencies undergo gradual fluctuations (Nguyen et al. 2024) The choice of an exchange rate regime has a profound impact on a nation's political and economic landscape. It ultimately determines the approach and mechanics of macroeconomic adjustments (Al-Sadiq et al., 2021)

African stock markets were not vulnerable to the pandemic's spreading effect, according to Owusu et al. (2024) Gbadebo (2023) established the negative impact of exchange rate fluctuation on Nigerian stock returns, market cap, and volume. Erhijakpor & Dieboghneruo (2023) showed that exchange rate swings have a minimal negative impact on the volatility of the All Share Index over the short and long terms. Agyei et al. (2022) conducted a study to examine the co-movement of exchange rate returns and stock returns in Africa amid Covid-19 in a time-frequency domain. They employed the bi and partial wavelet and wavelet multiple correlation techniques using daily data from February 13, 2013 to May 6, 2021. They found out that the Covid-19 effect did not increase the intensity of the relationship between EXR and STK returns in Africa but caused a significant difference in the lead-lag relationship between the two assets. They also found a strong likelihood of high market integration between African markets in the long run, regardless of markets' conditions and behaviours, South African (Namibian) equities having the lead lag potential in the short run.

In Bizuneh's study (2022), the author examines the duration of fixed exchange rate regimes and identifies the factors that affect the likelihood of moving away from a pegged exchange rate. Using a de facto exchange rate regime classification, the paper comes to several conclusions. First, it discovers that the duration of a pegged exchange rate is non-monotonic, meaning it is not consistently increasing or decreasing over time. Second, the researcher's semi-parametric proportional hazard model reveals that factors such as GDP growth and economic openness are associated with a reduced likelihood of exiting a pegged exchange rate, while rising unemployment and an increase in government claims can heighten the probability of abandoning the peg. The study also points out that the negative impact of economic growth on the hazard rate remains robust when using marginal risk analysis. Factors such as net foreign assets and inflation are found to exert influence on the duration of pegged regimes. Overall, the findings suggest that various factors, including GDP growth, unemployment rate, economic openness, and government budget deficits, play a crucial role in determining the likelihood of a transition from a fixed to flexible exchange rate regime. Economic growth continues to be a significant covariate, even when analysed through marginal risk analysis, alongside the variables of net foreign assets and inflation rate.

In their research into the effects of the pandemics outbreak on stock markets in developed countries, Umar et al. (2022) analysed the impact of Covid-19 on the stock market liquidity of China and the four worst-hit countries. Using daily data for the stock market liquidity spanning from July 1, 2019 to July 10, 2020, and the data for new cases and deaths over the period from December 31, 2019 to July 2020, the GARCH analysis shows that liquidity in the stock markets of all sampled countries was hit hard by the news of the Covid-19 outbreak. They found that for all sampled countries, the increase in liquidity due to temporary shocks reverted to a long-term trend shortly, suggesting that the liquidity shocks due to the incidence of Covid-19 were short-lived. The findings of the VAR analysis show an absence of any short-term relationship between COVID-19 new cases or deaths and liquidity. It was concluded that, since the series are not integrated at the same level, a long-term relationship between Covid-19 and stock market liquidity did not exist, suggesting no evidence of the effect of Covid-19 on stock market liquidity under a high stress regime. They found that the Covid-19 pandemic had a weak impact on Chinese and Italian national currencies but could negatively influence stock market prices. Marozva & Magwedere (2021) concluded that there existed a positive relationship between stock market liquidity and the incidence of the Covid-19 pandemic. Gubareva (2021) shows that despite improvements owing to the bailout packages, liquidity in the bond market has not returned to the pre-Covid-19 level. She also reported a decoupling in the dynamics of credit risk and liquidity risk metrics.

At the individual country level, Takyi & Bentum-Ennin (2020) revealed that the Covid-19 plague had a major and negative impact on the stock markets of ten different countries.

Takyi & Bentum-Ennin (2020) empirical estimates showed that the Covid-19 virus had had a large and negative impact on the stock markets of ten different countries. Vengesai (2022) discovered that Covid-19 had raised return volatility for most sectors using the MDCC-GARCH model. As demonstrated by the findings of Kumeka et al. (2021), the foreign currency market and fluctuating commodity prices had an impact on African stock markets. Khalid et al. (2021) examined the stock market worst affected by Covid-19 among GCC (Gulf Cooperation Council) stock markets and extracted factors that increased the adverse effects. The analytical results show that Bahrain was most affected by the Covid-19 pandemic, with 47351 confirmed cases per million population. They built a forecasting model using an artificial neutral network to establish how the virus would continue spreading until the end of May 2020. The results showed that the Kuwait stock market was the most affected by the pandemic. Also, research around Ebola outbreak events throughout 2014-2016 revealed that US companies with exposure to their operations in West African countries were experiencing negative returns and increased volatility because of those events. Those Ebola-related events affected investors' perceived risk (Silverstone, 2021)

For all companies listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange in China, Maquieira & Espinosa (2022) revealed a more pronounced herd behaviour tendency when market return is high and volatility is low. In another, relatively broader study, Liu et al. (2020) investigated the impact of Covid-19 on the world's 21 leading stock exchanges. Their findings suggest that the stock markets across the globe responded immediately to the threat of COVID-19 and fell across the board. Muigai & Cherono (2019) used a survey of all 61 publicly traded companies in Kenya as well as a follow-up study approach. According to the study's findings, share prices were significantly impacted negatively by exchange rate fluctuation. Moagăr-Poladian et al. (2019) studied the co-movement of exchange rates and stock markets in Central and Eastern Europe simultaneously at the cross-country level. In their study, they employed a dynamic conditional correlation mixed data sampling (DCC-MIDAS) model. The study reveals significant differences between the patterns of correlation in the in the sampled countries. First, the study finds quite a low degree of convergence between foreign exchange markets, with rising correlations during some episodes of the crisis. Secondly, both the 2004 European Union enlargement and the European sovereign debt crisis underpin the stock market co-movements in the central and eastern European countries. Thirdly, the correlations between exchange rate returns and stock markets rose mostly during the European sovereign debt crisis and, to a lesser extent, during the global financial crisis, revealing signs of contagion and lower portfolio diversification opportunities. Nagmi (2019) examined the impact of exchange rate volatility on stock prices. The GARCH model and Granger causality test were applied. The results of the analysis show strong evidence of causation running from exchange rate to stock prices, implying several variations, such as Dubai stock prices experiencing exchange rate volatility while the Saudi stock market witnessed a unidirectional relationship running from stock prices to exchange rate, implying that variations in the Saudi exchange rate determined the stock price volatility.

In sum, the relationship between variables as described in previous literature was between one dependent and one independent variables. The present research combines many variables, which include: the fixed exchange rate system, floating exchange rate system, number of infections and deaths from HIV/AIDS and Covid-19 viruses (as control variables), stock prices and stock returns of BRICS markets and stock markets of selected African countries. It should be noted that serious work on exchange rate regimes and stock markets, as well as on pandemics, has been done in a few developing and more developed countries but the scope of research has been comparatively small. The present study focused on the emerging markets of Africa/ BRICS countries, expanded the number of these markets and also increased the data range from 1995 to 2024.

Methodology

This research is a comparative analysis of the impact of various fixed and floating exchange rate regimes, HIV infections and the Covid-19 pandemic on the financial market in developing and wealthy nations between 1995 and 2024. It uses the Bovespa Brazil stock market index, MOEX Russia index, S&P BSE Sensex index of India, Shanghai stock market index of China, and FTSE/JSE All Share Index of South Africa, i.e. the stock market indices of the developing BRICS markets. Its sample of African stock market indices includes the NSEASI of Nairobi, the CFG 25 market index of Casablanca, Morocco, the EGX 30 index traded on the Egyptian Exchange, the All-Share index (ASI) of the Nigerian Stock Exchange, and the Stoxx index of Tunisia. To determine the regime that has greater influence on stock market performance, it is necessary to gauge the separate effects of exchange rate regimes on stock prices and stock returns of BRICS and stock markets of the developing African countries; for the same purpose, the exchange rate policy regime has been unbundled into the globally practiced fixed and floating ones.

We executed the generalized linear model to accommodate the interactions between dummy and other continuous variables used to determine the unique impacts of the exchange rate regime (floating and fixed) on stock prices and stock returns. When the coefficients of the models are positive, it reveals that the predictor variable enhances the performance of the response variable (SPP, SRR) Contrarily, a negative coefficient of a predictor variable (exchange rate regime: floating and fixed) dampens the performance of the response variables (SPP, SRR) In what follows, we have the generalized linear model (GLM) specification given as:

$$SPP = \varnothing = f(X'\beta) + \varepsilon \tag{1}$$

$$SRR = \varnothing = f(X'\beta) + \varepsilon \tag{2}$$

$$f = g^{-1} \tag{3}$$

Based on the Gaussian family GLM model with identity link function, the canonical parameter transformation ∅ the variance of outcome variable is modelled as in equation (4)

$$E(Stock\ Price \mid X) = \varnothing = g^{-1}\ (X\beta) \qquad (4)$$

$$E(Stock\ Return \mid X) = \varnothing = g^{-1}\ (X\beta) \qquad (4!)$$

where, X = design matrix of regressors; $X'\beta$ = linear predictor, ∅ is the fitted values transforming linear predictor; β is estimated vector of coefficients with maximum likelihood; Y is the dependent variable (stock returns (SR)/stock prices (SP)) conditional on the vector of predictor variables denoted as X; E (Y|X) is the expected value of Y conditional on values of X; g is the link function. The mean of the response variable is modelled as in equation (5)

$$\varnothing(SPP_{ij}) = f(X'\beta) + \varepsilon \qquad (5)$$

$$\varnothing(SRR_{ij}) = f(X'\beta) + \varepsilon \qquad (5!)$$

where: $X' = \begin{bmatrix} ERR \\ HIV \\ COVCASES \\ COVDEATHS \end{bmatrix}$

$$g(E(SPP_d \mid X') = g(\varnothing)R = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HIV_d + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \quad (6)$$

$$g(E(SRR_d \mid X') = g(\varnothing) = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \quad (7)$$

$$g(E(SPP_d \mid X') = g(\varnothing) = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \quad (8)$$

$$g(E(SRR_u \mid X') = g(\varnothing) = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \quad (9)$$

By definition, $g(E(Stock\ Price_d \mid X')$ is the expected value of stock indices conditional on the values of exchange rate regimes and pandemics namely: (*HVV, COVCASES and COVDEATHS*), $\beta_{0,\tau}$ is the constant term of the τ-thquantile; $\beta_{1,\tau}$ to $\beta_{4,\tau}$ are coefficients of independent variables at the τ^{th} quantile; d = BRICS countries; u = African countries. Accordingly, under the Gaussian (Normal) family GLM model with Identity link, the means and variances of the response variables are as specified:

$$E(SPP_d) = \varnothing = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \quad (10)$$

$$E(SPP_u) = \eta = \varnothing = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \quad (11)$$

$$E(SRR_u) = \eta = \varnothing = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \quad (12)$$

$$E(SRR_u) = \eta = \varnothing = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \quad (13)$$

where: η is the linear predictor, β_0 is the intercept, and $\beta_1 - \beta_4$ are coefficients for the independent variables. The variances of response variables are as specified here:

$$Var(SPP_d) = \sigma^*1 \quad (14)$$

$$Var(SPP_u) = \sigma^*1 \quad (15)$$

$$Var(SRR_d) = \sigma^*1 \quad (16)$$

$$Var(SRR_u) = \sigma^*1 \quad (17)$$

where: $\varnothing$ is a dispersion parameter that needs to be estimated from the data, which describes the relationship between the mean and variance of the response variable. Hence, for the Gaussian (Normal) family GLM model with log link, the mean of the response variables are:

$$E(SPP_d) = \varnothing = \exp(\beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \\ + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d) \quad (18)$$

$$E(SPP_u) = \varnothing = \exp(\beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \\ + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u) \quad (19)$$

$$E(SRR_d) = \varnothing = \exp(\beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \\ + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d) \quad (18!)$$

$$E(SRR_u) = \varnothing = \exp(\beta_{0u} + \beta_{1u}ERR_u + \beta_{2d}HVV_u + \\ + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u) \quad (19!)$$

where: η is the linear predictor, β_0 is the intercept, and $\beta_1 - \beta_4$ are coefficients for the independent variables. The variances of response variables are:

$$Var(SRR_d) = \sigma^*1 \quad (20)$$

$$Var(SRR_u) = \sigma^*1 \quad (21)$$

With the inverse Gaussian family GLM model with identity link, the means of the response variables are:

$$E(SPP_d) = \varnothing^{-2} = \eta = \beta_{0d} + \beta_{1d}ERR_d + \\ + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \quad (22)$$

$$E(SPP_u) = \varnothing^{-2} = \eta = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \\ +\beta_{3u}COVCASES_d + \beta_{4u}COVDEATHS_u \quad (23)$$

$$E(SRR_d) = \varnothing^{-2} = \eta = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \\ + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \quad (22!)$$

$$E(SRR_u) = \varnothing^{-2} = \eta = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \\ + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \quad (13!)$$

where: η is the link or linear predictor, β_0 is the intercept, and β_1-β_4 are coefficients for the independent variables. Accordingly, the variances of response variables are:

$$Var(SPP_d) = \sigma\varnothing^2 \quad (24)$$

$$Var(SPP_u) = \sigma\varnothing^2 \quad (25)$$

$$Var(SRR_d) = \sigma\varnothing^2 \quad (24!)$$

$$Var(SRR_u) = \sigma\varnothing^2 \quad (25!)$$

Basing specifications on the inverse Gaussian family GLM model with log link, the means of the response variables are specified as follows:

$$E(SPP_d) = \varnothing^{-2} = \eta = \exp(\beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \\ \beta_{4d}COVDEATHS_d) \quad (26)$$

$$E(SPP_u) = \varnothing^{-2} = \eta = \exp(\beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \\ \beta_{4u}COVDEATHS_u) \quad (27)$$

$$E(SRR_d) = \varnothing^{-2} = \eta = \exp(\beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \\ \beta_{4d}COVDEATHS_d) \quad (26!)$$

$$E(SRR_u) = \varnothing^{-2} = \eta = \exp(\beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \\ \beta_{4u}COVDEATHS_u) \quad (27!)$$

where η is the link or linear predictor, β_0 is the intercept, and $\beta_1 - \beta_4$ are coefficients for the independent variables. Accordingly, the variances of response variables are given in equations (28) and (29) respectively.

$$Var(SPP_d) = \sigma\varnothing^2 \tag{28}$$

$$Var(SPP_u) = \sigma\varnothing^2 \tag{29}$$

With the Gamma family GLM model with identity link, linear predictor of the response variables given by:

$$E(SPP_d) = \eta = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \tag{30}$$

$$E(SPP_u) = \eta = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \tag{31}$$

Here, η is the linear predictor, β_0 is the intercept, and $\beta_1 - \beta_4$ are coefficients for the independent variables. The means of the response variables are given by equations (32) and (33):

$$\begin{aligned} E(SRR_d) = \varnothing^{-1} = \eta = \beta_{0d} + \beta_{1d}ERR_d + \beta_{2d}HVV_d + \\ + \beta_{3d}COVCASES_d + \beta_{4d}COVDEATHS_d \end{aligned} \tag{32}$$

$$\begin{aligned} E(SRR_u) = \varnothing^{-1} = \eta = \beta_{0u} + \beta_{1u}ERR_u + \beta_{2u}HVV_u + \\ + \beta_{3u}COVCASES_u + \beta_{4u}COVDEATHS_u \end{aligned} \tag{33}$$

Consequently, the variances of response variables are given in equations (34) and (35) respectively.

$$Var(SPP_d) = \sigma\varnothing^2 \quad (34)$$

$$Var(SPP_u) = \sigma\varnothing^2 \tag{35}$$

$$Var(SRR_d) = \sigma\varnothing^2 \qquad (34!)$$

$$Var(SRR_u) = \sigma\varnothing^2 \qquad (35!)$$

Data for the study were mostly downloaded from the World Bank database. Table 1 provides the clue to variables definitions and measurements.

A period of 1990-2023 was covered to reveal a reasonable trend in the analysis. After retrieval of data from respective databases as specified in the previous section, data were fed into statistical calculators following specific econometric techniques to investigate the relationship that exists across exchange rate regimes, pandemics, and financial market indicators.

Table 1. Variables' definitions and measurements

Variable		Description	Source
SPP	Stock prices	Natural logarithm of annual market capitalisation values on country basis	World Bank Database
SRR	Stock returns	First differences of annual market capitalisation on country basis	Calculated in spread sheets from retrieved market capitalisation values
COVCASES	Cases of Corona virus-19 infectious	Number of reported cases /number of deaths	World Health Organization
COVDEATHS	Number of deaths from Corona virus-19	Number of people who died due to Corona virus	World Health Organization
HVV	HIV infections	Population of individuals living with HIV/ Prevalence of HIV calculated as (% of population people living with HIV aged 15-49) × total population	World Bank Database
Regime	Exchange rate regime	Fixed and Floating regime	Dummy Variables 1,0

Source: Authors' calibration

Results

Trend Analysis

The trends in exchange rate regimes for global economies have transcended the stages indicated in Table 2. The Gold Standard Era, prevalent in the period preceding World War I, refers to a system of monetary exchange where countries tied their currencies to gold at fixed exchange rates. Under the Gold Standard, participating countries are guaranteed to convert their currency into gold at a fixed price. This had instilled confidence in currencies, as they were backed by a tangible and universally valued commodity. Currencies were pegged to a specific amount of gold, maintaining fixed exchange rates between countries. This stability facilitated international trade and investment. The Gold Standard aimed to maintain equilibrium in international trade. Countries adhering to this system strived to balance their trade accounts, ensuring that exports equalled imports. The discipline of the Gold Standard encouraged fiscal responsibility, as governments were restricted in their ability to print money beyond the gold reserves held by their central banks.

Table 2. Trend analysis of exchange rate regimes

Regime	Period
Gold Standard Era	Pre-World War I
Inter War Period	1918 – 1939
Bretton Woods System	1944 – 1971
Breakdown of Bretton Woods and Rise of Floating Rates	1971 – Present

Source: Authors' calibration from IMF and World Bank's websites

Following World War I, the gold standard system faced challenges caused by economic instability. The Interwar Period 1918-1939 was marked by significant turbulence in exchange rate regimes. This era witnessed various experiments in monetary policy and shifts in monetary systems as countries navigated the aftermath of the war and grappled with economic challenges. The turmoil following World War I led to currency instabilities. As a result, many countries abandoned the gold standard and began to experiment with floating or fluctuating exchange rates adopting diverse exchange rate arrangements. There was no uniformity in approaches: some of them maintained fixed rates, others preferred floated, and some others pursued managed or pegged rates. Several countries faced economic difficulties and so had to devalue their currencies to boost exports and tackle deflationary pressures. This competitive devaluation aggravated the trade tensions. Towards the end of the Interwar Period, discussions began about the need for a new international monetary system, culminating in the Bretton Woods Agreement in 1944, which laid the groundwork for a fixed exchange rate system after World War II.

The Bretton Woods Agreement marked the beginning of a new global monetary system. The core of the Bretton Woods System was the commitment to fixed exchange rates pegged to the US dollar, which was convertible to gold at a fixed rate. Participating countries agreed to maintain their currencies' values within a narrow band of fluctuations against the dollar. The US dollar assumed a central role, serving as the primary reserve currency. Other currencies were pegged to the dollar, which, in turn, was backed by gold. Fluctuations of currency values in this system were only within 1% of the obtainable legal rate (Ufoeze, 2018) Governments were required to intervene in their countries' currency markets to maintain the exchange rates within the prescribed bands. If a country's currency faced persistent pressures, it could devalue or revalue its currency in relation to the dollar, with approval from the International Monetary Fund (IMF) The Bretton Woods System was brought to an end in 1971 when the US suspended the dollar's convertibility to gold in what was referred to as the Nixon Shock. This ended the fixed-rate system and led to a birth of flexible or floating exchange rates. With the rise of floating exchange rates, currency markets began to experience increased fluctuations in exchange rates under the influence of market forces. The governments were to grant autonomy to the monetary policymakers.

The transition from the Bretton Woods system to a new arrangement involved a 90-day pause on wages and prices, followed by a voluntary restraint program, alongside tax measures aimed at boosting the US economy (Edwards, 2024) It also featured two temporary measures: halting the conversion of official US dollar reserves into gold and imposing a 10 percent surcharge on dutiable imports from all nations. Nixon stated that the action was not aimed at any specific country but was a step to ensure that American goods were not disadvantaged owing to unfair rates. This led to a shift towards flexible exchange rates, where most major currencies started floating against each other based on market forces, as initially discussed. Most major currencies switched to floating exchange rates amid the Bretton Woods crisis, in which the value of a currency was determined by market supply and demand instead of being fixedly pegged to gold or other currencies (IMF, 2023b) The shift to floating rates brought about greater volatility in currency values as they were influenced by market forces, including speculation, economic conditions and geopolitical events. Countries gained greater autonomy in setting their monetary policies, including interest rates, money supply, and exchange rate intervention, allowing them to respond more flexibly to domestic economic conditions. The era of floating rates saw the emergence of persistent global imbalances, such as trade deficits and surpluses, leading to debates about their sustainability and impact on the global economy. Countries embraced more flexible exchange rate arrangements, allowing market dynamics to determine currency values. As floating rates became predominant, some countries adopted managed float systems, where central banks intervene occasionally to influence currency values within certain limits. Others opted for hybrid systems, such as currency pegs or bands, combining fixed and floating elements.

Over time, there has been a general trend towards greater exchange rate flexibility, with many countries allowing their currencies to float more freely in response to market forces. This flexibility offers more autonomy in monetary policy and helps cushion against external economic shocks. Developed economies such as Germany and other European countries have also embraced regional monetary unions, such as the Eurozone, where countries share a common currency (the Euro) and coordinate monetary policies. The trend in exchange rate regimes for developed economies has evolved from fixed and semi-fixed systems to more flexible arrangements, allowing currencies to adjust based on market dynamics. The emphasis shifted towards greater autonomy in monetary policy and adaptation to the global economic landscape. Since the mid-1970s, countries outside the developed category have shifted towards pegging their currency to a basket of major currencies rather than using a single currency or adopting flexible regimes. After the financial crises of the 1990s, many countries were given directives to shift towards any of the two exchange rate regimes: flexible or fixed rates coupled with monetary unions or currency boards. Intermediate regimes between these extreme options were deemed less sustainable due to the 'impossible trinity' principle, which poses challenges in pursuing exchange rate stability, capital mobility, and independent monetary policy simultaneously. For developing economies, the transition to the post-Bretton

Woods system might have been less structured as they had diverse experiences with exchange rate regimes.

Estimated coefficients

Table 3 reports the GMM results with stock prices as dependent variable. In the inverse Gaussian functions, the identity and 1og function, as well as the gamma identity, reveal that the shifts in the exchange regime policy had a favourable and significant impact on stock prices in the BRICS stock markets. HIV is negatively related but not significant at (-1.5122) and (-0.0072) coefficients, respectively. Covid cases and deaths had adverse effect on stock prices at the inverse Gaussian but it was not significant, while it was significant at the Gamma identity. Stock return results reported in Table 4 for the identity and 1og functions indicate that exchange rate regime shifts had a direct relationship but were not significant with coefficients of 4.9682 and 7.3507, respectively. HIV had negative but not significant effect on stock returns of BRICS stock markets. Covid cases had an unfavourable impact on stock returns, with an adverse coefficient of (-0.0149) in the Gaussian identity. However, in the Gaussian log, the relationship is favourable with a coefficient of 0.6887. For COVID (deaths), the coefficients are adverse for both identity and log Gaussian, i.e., (-0.1179) and (-0.2398)

Table 3. Stock prices (BRICS stock markets)

Variance function	Inverse Gaussian	Inverse Gaussian	Gamma
Link function	Identity	Log	Identity
ERR	0.2645** (0.0696)	0.0237** (0.0064)	0.2639** (0.0709)
HVV	-1.5122 (0.0065)	-0.0072 (0.00060	-0.0007 (0.0064)
COVCASES	-0.1698 (0.4987)	-0.0149 (0.0425)	-0.1699 (0.4910)
COVDEATHS	-0.1976 (0.2146)	-0.0172 (0.0183)	-0.1023** (0.2114)
_cons	10.551** (0.4593)	2.3579** (0.0396)	10.5531
Log Likelihood	-14317.89	-1456.89	-1111.17
AIC	8.1006	9.1536	6.1249
Deviance	0.0002	0.0726	0.8599
Pearson	0.0740	0.0540	0.5423

Source: Authors' Eviews 13 estimation results

Table 4. Stock returns (BRICS stock markets)

Variance function	Gaussian	Gaussian
Link function	Identity	Log
ERR	4.9682 (17.372)	7.3507 (184.89)
HVV	-0.6763 (1.4867)	-0.0342 (0.0899)
COVCASES	-0.0149 (0.1943)	0.6877 (0.1224)
COVDEATHS	-0.1179 (0.741)	-0.2398 (0.1239)
_cons	-1.3662** (0.0000)	-1.2985** (0.0018)
Log Likelihood	-2199.77	-2145.787
AIC	12.035	11.635
Deviance	6096964	4566516
Pearson	13689.4	18246.0

Source: Authors' Eviews 13 estimation results

From Table 5 it appears that the fixed exchange regime impacted adversely and significantly on the stock prices of developed countries, with coefficients of -0.5253**, -0.0473**, and -0.5252**, all at inverse Gaussian and Gamma identities. Similarly, floating regime estimates in Table 6 show that the floating regime impacted favourably and significantly on the stock prices in the BRICS countries' stock markets with coefficients of 0.4101**, 0.0367**, and 0.401**, all at inverse Gaussian and Gamma identities. Table 7 reported that the fixed regime impacted adversely but insignificantly on the stock returns of the BRICS stock markets, with coefficients of (-5.9368 and -4.0447) all at Gaussian identity. Also, Table 8 shows very clearly that the floating regime impacted favourably but not significantly on the stock returns of the BRICS stock markets with a coefficient of (6.6208) Therefore, the floating regimes impacted favourably on both the stock prices and stock returns of developed countries stock markets. For African stock markets, the floating regime impacted stock returns favourably, while the fixed regime impacted stock returns more favourably than the floating regime, which also had a favourable impact on stock returns.

Table 5. Fixed regime and stock prices (BRICS stock markets)

Variance function	Inverse Gaussian	Inverse Gaussian	Gamma
Link function	Identity	Log	Identity
Fixed	-0.5253** (0.1457)	-0.0473** (0.0134)	-0.5252** (0.1489)
HVV	-0.03471 (0.2365)	-0.00121 (0.5796)	-0.0001 (0.0065)
COVCASES	-0.0885 (0.5018)	-0.0077 (0.0427)	-0.0889 (0.4933)
COVDEATHS	0.1622 (0.2161)	0.0141 (0.0184)	0.1625 (0.2126)
_cons	11.278** (0.4263)	2.423** (0.0363)	11.278** (0.4192)
Log Likelihood	-1477.88	-1477.89	-1111.17
AIC	9.1536	9.1536	6.8899
Deviance	0.0769	0.0769	0.8636
Pearson	0.0744	0.0744	0.8466

Source: Authors' Eviews 13 estimation results

Table 6. Floating regime and stock prices (BRICS stock markets)

Variance function	Inverse Gaussian	Inverse Gaussian	Gamma
Link function	Identity	Log	Identity
Floating	0.4101** (0.1075)	0.0367** (0.0097)	0.4101** (0.1092)
HVV	-0.0095 (0.2195)	-0.0015 (0.2356)	-0.0005 (0.0064)
COVCASES	-0.0823 (0.4996)	-0.0071 (0.0425)	-0.0827 (0.4914)
COVDEATHS	0.1541 (0.2152)	0.0133 (0.0183)	0.1543 (0.2118)
_cons	10.888** (0.4334)	2.3881** (0.0370)	10.888** (0.4271)
Log Likelihood	-1477.89	-1477.89	-1111.17
AIC	9.1536	9.1536	6.889949
Deviance	0.0765	0.0765	0.8591
Pearson	0.0739	0.0739	0.8407

Source: Authors' Eviews 13 estimation results

Table 7. Fixed regime and stock returns (BRICS stock markets)

Variance function	Gaussian	Gaussian
Link function	Identity	Log
Fixed	-5.9368 (36.500)	-4.0447 (283.82)
HVV	0.6710 (1.4924)	0.0329 (0.0998)
COVCASES	-1.0373 (108.35)	1.2422 (2228.7)
COVDEATHS	-1.5582 (46.738)	-2.6186 (461.66)
_cons	5.0764 (92.124)	3.5401 (2501.2)
Log Likelihood	-2199.79	-2199.79
AIC	12.635	12.635
Deviance	6096944	6099984
Pearson	6096944	6099984

Source: Authors' results

Table 8. Floating regime and stock returns (BRICS stock markets)

Variance function	Gaussian
Link function	Identity
Floating	6.6208 (27.269)
HVV	0.6617*** (0.0001)
COVCASES	-0.9176 (108.35)
COVDEATHS	-1.7122 (46.743)
_cons	-1.1592 (95.105)
Log Likelihood	-2199.77
AIC	12.635
Deviance	6097369
Pearson	6097369

Source: Authors' Eviews 13 estimation results

As revealed in Table 9, the exchange rate policy regime has a favourable and significant impact on the stock prices of developing African stock markets as revealed at the inverse Gaussian (identity and log identity) and Gamma identities. HIV also slowed negative coefficients at inverse Gaussian and Gamma identities, -0.0557**, -0.0085**, and -0.0529**. This indicates that HIV has an adverse impact on the stock prices of African countries. Covid Cases had a direct relationship with stock prices in African countries, with positive coefficients of -0.1972, -0.0200, and -0.1988 at inverse Gaussian identity, logarithm, and gamma identity. Covid deaths also had a harmful impact on the stock prices of African countries. Regarding estimates of the stock returns reported in Table 10, the exchange rate policy regime had a direct correlation with the stock returns of developing countries. HIV had inverse effect on stock prices, but not a significant one. Covid cases had an adverse impact on the stock returns of African stock markets, and it was a significant one. Also, an increase in the death rate reduces the stock returns of African stock markets, but the reduction is of a smaller magnitude.

Table 9. Stock prices (African stock markets)

Variance function	Inverse Gaussian	Inverse Gaussian	Gamma
Link function	**Identity**	**Log**	**Identity**
ERR	0.8797** (0.0679)	0.0901** (0.0071)	0.8963** (0.0698)
HVV	-0.0557** (0.0098)	-0.0085** (0.0011)	-0.0529** (0.0104)
COVCASES	-0.1972** (0.0007)	-0.0200** (0.0065)	-0.1988 (0.3795)
COVDEATHS	-0.0799 (0.1928)	-0.0072 (0.0181)	-0.0831 (0.1878)
_cons	7.9517** (0.4001)	2.0906** (0.0383)	7.8998** (0.3930)
Log Likelihood	-1686.58	-1686.58	-1274.49
AIC	8.8333	8.8333	6.6814
Deviance	0.3831	0.3820	3.7289
Pearson	0.3541	0.3535	3.5587

Source: Authors' Eviews 13 estimation results

Table 10. Stock returns (African stock markets)

Variance function	Gaussian	Gaussian
Link function	**Identity**	**Log**
ERR	0.7907 (9.3199)	0.0045 (0.0461)
HVV	1.5122 (1.4144)	0.0072 (0.0063)
COVCASES	-1.3180 (43.381)	-0.0605 (0.3365)
COVDEATHS	-9.562 (21.533)	-0.1907 (0.1698)
_cons	1.029** (46.894)	5.6333** (0.3338)
Log Likelihood	-2188.12	-2199.787
AIC	12.391	12.635
Deviance	4846192	6097716
Pearson	4846192	6097716

Source: Authors' Eviews 13 estimation results

From the results presented in Table 11, it is clear that the fixed regime impacted adversely and significantly on the stock prices of developing African stock markets with coefficients of -1.0410**, -0.1046**, and -1.0264**, all at inverse Gaussian and Gamma identities. Conversely, the results in Table 12 show that the floating regime impacted favourably and significantly on the stock prices of African stock markets, with coefficients of 1.5369**, 0.1485**, and 1.5289**, all at inverse Gaussian and Gamma identities. Table 13 also shows that for the estimated results for stock returns, the fixed regime impacted favourably but not significantly on the performance of stock returns in the stock markets of selected African countries, with coefficients of 17.313 and 0.0796, respectively. Floating regime estimates, as reported in Table 14, also impacted favourably on the stock returns of African countries' stock markets, with coefficients of 10.885 and 0.0558.

We may infer from these numbers that floating exchange rates can provide hedging possibilities, allowing businesses to employ financial products such as forwards, futures, and options to protect themselves against adverse currency swings. Floating exchange rate systems also aid in maintaining macroeconomic stability by enabling currencies to adapt in response to changes in economic conditions, minimizing the possibility of speculative extremities. This flexibility can absorb external shocks and boost investor confidence, resulting in better stock market performance. Floating exchange rate regimes improve market efficiency because exchange rates reflect all available information and market players adjust their expectations accordingly. This results in more accurate asset pricing, including stock prices, which reduces the chance of misalignment between stock prices and underlying fundamentals. Central banks can change interest rates and apply monetary stimulus to promote economic development and financial market stability, thus alleviating economic downturns and boosting stock returns. While fixed exchange rate regimes may provide stability during times of uncertainty, they can also trigger market crises and cause stock prices to fall. Developing markets in economies that have embraced the floating exchange rate regime can have flexibility and resilience provided by the floating rate of the local currency in the face of market shocks, despite the currency risks involved.

As far as the pandemics are concerned, HIV and Covid deaths had significant inverse effects on stock prices of African stock markets. This bolsters the recent finding published by Umoru et al. (2024) that confirms that Covid-19 mortality and HIV cases had a negative effect on stock values, proving that pandemics caused securities' prices to decline. Unlike the BRICS stock markets, African stock markets are more likely to have periods of weak volatility in returns rather than turbulent seasons. In effect, the HIV/AIDS and Covid pandemics have the potential to significantly reduce workforce productivity, increase absenteeism, and worsen labour market participation owing to sickness, caregiving duties, and early deaths. A decrease in incidence of diseases can help create a healthier and more productive workforce, resulting in increased output and profitability. Increased productivity has the potential to boost stock returns across a wide range of industries. The inverse impact of Covid deaths on stock returns means that increased deaths lower stock returns. Lower Covid deaths may signal progress in controlling the pandemic, but even if there is a perception that the pandemic is fading off, it is increasingly urgent that the policymakers implement fiscal stimulus measures and support programs, improving investor sentiment and leading to higher stock returns potentially dampening investor sentiment and leading to lower stock returns. Severe pandemic consequences in the regions badly hit by Covid 19 may influence investors' behaviour in the regions that suffered less. Investors may also remain skeptical about the sustainability of the global economic recovery, resulting in weaker market returns.

Table 11. Fixed regime and stock prices (African stock markets)

Variance function	Inverse Gaussian	Inverse Gaussian	Gamma
Link function	**Identity**	**Log**	**Identity**
Fixed	-1.0410** (0.1550)	-0.1046** (0.1657)	-1.0264** (0.1617)
HVV	-0.0595 (0.0117)	-0.0058 (0.0012)	-0.0571 (0.0122)
COVCASES	-0.0256** (0.0015)	-0.0018** (0.0417)	-0.0224 (0.4362)
COVDEATHS	-0.1698*** (0.0015)	-0.0166*** (0.0000)	-0.1753 (0. 2152)
_cons	10.280** (0.0054)	2.3305** (0.1550)	10.271** (0.4102)
Log Likelihood	-1686.58	-1686.63	-1274.99
AIC	8.8333	8.8335	6.6840
Deviance	0.4814	0.4836	4.7505
Pearson	0.4508	0.4531	4.5752

Source: Authors' Eviews 13 estimation results

Table 12. Floating regime and stock prices (African stock markets)

Variance function	Inverse Gaussian	Inverse Gaussian	Gamma
Link function	**Identity**	**Log**	**Identity**
Floating	1.5369** (0.0977)	0.1485** (0.0093)	1.5289** (0.0951)
HVV	-0.0648** (0.0083)	-0.0068** (0.0009)	-0.0648** (0.0089)
COVCASES	-0.0074 (0.1498)	-0.0311** (0.0014)	-0.0137** (0.0421)
COVDEATHS	-0.0195** (0.0048)	-0.0024** (0.0056)	-0.0324 (0.1704)
_cons	9.2799** (0.3339)	2.2317** (0.0317)	9.2828** (0.3252)
Log Likelihood	-1686.55	-1686.55	-1274.18
AIC	8.8331	8.8332	6.6814
Deviance	0.3232	0.3247	3.1125
Pearson	0.2965	0.2986	2.9587

Source: Authors' Eviews 13 estimation results

Table 13. Fixed regime and stock returns (African stock markets)

Variance function	Gaussian	Gaussian
Link function	**Identity**	**Log**
Fixed	17.313 (12.565)	0.0558 (0.0611)
HVV	-1.5198 (1.3979)	-0.0072 (0.0063)
COVCASES	-0.0267 (0.368)	-0.0482 (0.3373)
COVDEATHS	-0.0266*** (0.0051)	-0.1998*** (0.0000)
_cons	2.0219** (0.0000)	0.6138** (0.0006)
Log Likelihood	-2187.75	-2187.74
AIC	12.388	12.388
Deviance	4835894	4835549.7
Pearson	4835894	4835549.7

Source: Authors' Eviews 13 estimation results

Table 14. Floating regime and stock returns (African stock markets)

Variance function	Gaussian	Gaussian
Link function	**Identity**	**Log**
Floating	10.885 (19.363)	0.0796 (0.0881)
HVV	-0.1024 (0.0063)	-0.0059 (0.0065)
COVCASES	-1.527** (0.0014)	-0.0584** (0.0062)
COVDEATHS	-2.649*** (0.0004)	-0.1903** (0.0020)
_cons	5.192** (40.599)	1.236** (0.3137)
Log Likelihood	-2187.76	-2187.72
AIC	12.388	12.388
Deviance	4835216	4836319
Pearson	4835216	4836319

Source: Authors' Eviews 13 estimation results

Research Hypothesis Testing

There is no significant effect of the shifts in exchange rate policy regime and infections or deaths from HIV/AIDS and Covid-19 pandemics on the stock prices and returns of BRICS and African stock markets. With p values less than the study's adopted level of significance, the null hypothesis is rejected, while the alternative hypothesis is accepted: there is a significant effect of the shift in exchange rate policy regime on stock prices in the BRICS stock markets. Conversely, the hypothesis of a significant effect of infections/deaths from HIV/AIDS and Covid-19 pandemics on stock prices in BRICS stock markets is rejected. The estimated results also confirmed a notable impact of shifts in exchange rate policy regimes and occurrences of infections and deaths from HIV/AIDS and Covid-19 pandemics on stock prices in African markets. Covid-19 cases impacted negatively on stock prices but the impact was not substantial. Additionally, the results confirm that the shifts in exchange rate policy regime and infections and deaths from HIV/AIDS and COVID-19 pandemics significantly affected the stock returns of African stock markets ($p > 0.05$)

Conclusion

The study attempted to find out empirically, which types of exchange rate regime most favorably impact the stock prices and returns across emerging BRICS and African stock markets given the outbreak of pandemics. The pandemics considered in this study were HIV/AIDS and the Covid pandemic. The generalized linear model estimation was executed. The presented findings highlight the importance of considering both fixed and floating exchange rate regimes and pandemics as a critical factor affecting stock price and return movements. The generalized linear model estimations show that the exchange rate policy regime shift had a favourable impact on stock prices and stock returns in BRICS and African stock markets. The impact, however, was found to be significant only for the stock prices. The floating regime impacted favourably and significantly on the stock prices of BRICS and African stock markets. In terms of stock returns, floating had a favourable but insignificant impact. HIV and Covid-19 deaths have significant inverse effects on stock prices of African stock markets. The effect of Covid-19 on prices and returns was negative but insignificant for the BRICS markets, while the effect of HIV on stock returns was significant and adverse. Both BRICS and African countries should adopt exchange rate regimes that are appropriate for their countries and avoid unwarranted shifts in exchange rate policy as these may have undesirable impact on stock prices and stock returns.

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