

Abstract

Global commodity shocks are associated with volatility in frontier financial markets, affecting exchange rates and equity indices. This study examined volatility transmission from global commodity shocks to Kenya's USD/KES exchange rate and the NSE 20 Share Index using daily data from November 1997 to December 2024. While GARCH specifications capture clustering, they are sensitive to structural breaks and regime changes, which distort persistence and weaken risk measures. Machine learning approaches provide alternatives capable of capturing nonlinear dependencies, abrupt volatility bursts, and regime-independent dynamics. Empirical evidence demonstrates that the 2008 Global Financial Crisis and COVID-19 induced permanent volatility regime changes. This study examined volatility transmission from global commodity shocks to a frontier financial market, focusing on the USD/KES and the NSE 20 Share Index. Structural break-detection was integrated through the Iterative Cumulative Sum of Squares algorithm, alongside APARCH, FIGARCH models and ML architectures (XGBoost, LSTM). In Kenya volatility is characterized by strong persistence and long-memory dynamics, with limited evidence of leverage effects. Break-adjusted models improve inference by correcting spurious persistence, while machine learning approaches demonstrate superior tracking of volatility during stress regimes. Volatility transmission is nonlinear, break-sensitive, and state-dependent; hybrid ML–econometric methods enhance crisis forecasting and regime-sensitive financial stability analysis.

Keywords:

volatility transmission; frontier markets; structural breaks; GARCH models; machine learning; LSTM; XGBoost; Brent oil shocks