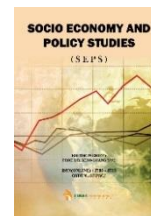




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RESEARCH ARTICLE

ECONOMIC INFLATION AND INTERNATIONAL TRAVEL DYNAMICS: AN ECONOMETRIC ANALYSIS OF NIGERIA (2015-2020)

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ABSTRACT

This study investigates the complex relationship between economic inflation and international travel in Nigeria from 2015 to 2020 through a detailed econometric analysis. It examines variables such as the Headline Inflation Rate (HIR), Core Inflation Rate (CIR), Food Inflation Rate (FIR), Percentage of Passengers Travelling Abroad (PPF), and Percentage of Aircraft Flying Abroad (PAF). The study aims to discern trends, establish relationships, and determine the cointegrating association between these variables. Using secondary data from the Federal Airport Authority of Nigeria (FAAN) and the Central Bank of Nigeria, the study employs econometric tools like the Autoregressive Distributed Lag (ARDL) model, unit root tests, descriptive statistics, and Cointegration analysis. The results reveal dynamic trends in travel and inflation rates, offering qualitative insights into the economy's status. Unit root tests confirm the stationarity of variables, and ARDL co-integration tests establish a long-term connection between HIR, CIR, FIR, PPF, and PAF. Significant coefficients from long-term estimates highlight the impact of inflation on foreign travel. The ARDL (2, 6, 0, 5, 3) model captures complex interactions, enhancing model robustness. The study contributes significantly to understanding Nigeria's economic dynamics, providing valuable insights for economists, legislators, and stakeholders. Policy recommendations focus on economic stability and strategic planning in aviation to manage economic cycles, laying a foundation for future research and policy development.

KEYWORDS

Economic dynamics, Economic stability, Inflation, International travel, Passengers

1. INTRODUCTION

Nigeria's socio-economic landscape is intricate, with many facets. The dynamics of international migration are one such phenomenon that constantly shapes and reshapes the country's social, economic, and demographic features. The evaluated literature offers a thorough examination of many aspects of migration, illuminating topics such as the effects of global events like the COVID-19 pandemic and geopolitical conflicts on migration trends and healthcare workforce crises. Investigation on the relationship between inflation and overseas travel; the study uncovered complex relationships between economic variables like GDP, inflation rates, and foreign investments (Rairni and Ogunjirin, 2012). The study identified population growth, remittances, and unemployment as major factors that affect overseas migration (Darkwah and Verter, 2014). These studies, along with others, have collectively illuminated the diverse factors influencing migration trends in Nigeria.

The findings from the literature emphasize the significant effects of migration on several industries, including tourism, healthcare, and education. Research on the social effects of international migration, need for a complex understanding of how migration modifies source societies (Awofeso, 2010 ; Odoemene and Osuji, 2015 ; Nwosu et al., 2022). As examined the complex relationships between labour migration and immigration rules demonstrate how regulatory frameworks influence migration trends (Torneo, 2016). The study uses Nigerian nurses as a case study, also highlights the unintentional societal changes brought about by foreign migration, which give rise to a phenomenon known as "exile culture" (Adeyanju and Olatunji, 2022)

The literature also highlights the difficulties caused by brain drain, especially in fields like education and healthcare. The urgent need to address structural flaws in Nigeria's medical education system and the complex dynamics of migration as a means of survival were highlighted in studies by (Awire and Okumagba, 2020 ; Akanle, 2022). According to the socio-political processes affecting migration paint a complicated picture of the impacts of EU migration policies on West African governments (Idrissa, 2019). The impact of migration on gross domestic product (GDP) within the context of globalization and the ongoing war in Ukraine (Rayevnyeva et al., 2023). The study categorized migration into labour, educational, and refugee types, analyzing its overall influence on GDP alongside variables such as interest rate (IR), active population (AP), export (E), and consumer price index (CPI). Using vector autoregressive (VAR) models and Granger causality tests, the findings revealed that migration negatively affects AP but has a positive impact on GDP. Impulse response and decomposition analyses indicated a 10–14% mutual influence between migration and GDP, offering valuable insights for forecasting and understanding structural migration trends. In a related vein, the role of macroeconomic variables, including inflation, on housing markets in Vilnius, highlighting its effect on nominal house prices (Laurinavičius et al., 2022). However, its implications for travel behaviours remain underexplored.

Additionally, traditional econometric approaches to analyze migration and economic trends (Cimpoeru, 2020 ; Lapid et al., 2022). Panel data regression to assess macroeconomic factors influencing migration in European countries (Cimpoeru, 2020). Time-series models to investigate factors driving the movement of overseas Filipino workers (Lapid et al.,

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2022). Although these methods provide robust statistical insights, they often fall short of capturing the complex, non-linear dynamics underlying foreign travel behaviours. The interaction of historical, political, and economic factors influencing migration appears frequently in the reviewed studies. According to the literature review, while previous research provides a broad overview of migration in Nigeria, there is a glaring void in the detailed investigation of the connection between economic inflation and foreign travel. This gap in the literature serves as the foundation for the current study, which explores the complex relationships between economic inflation and international travel in Nigeria in an effort to close this knowledge gap and add to the body of current knowledge. Because of this, the complex patterns of movement in Nigeria that the reviewed literature elucidates call for a thorough and focused investigation of the factors influencing migration, especially the connection between economic inflation and foreign travel.

Nigeria's complex socio-economic environment is always changing, and among the many factors influencing it, migration abroad is one of the most influential factors influencing Nigeria's social, economic, and demographic structure. The extant body of literature, although exhaustive in its examination of diverse aspects of migration, has notably neglected a thorough examination of the correlation between economic inflation and international travel in Nigeria. Several studies have shed light on the various factors that affect migration patterns in Nigeria. These variables range from economic ones like GDP, inflation rates, and foreign investments to the effects of global events like the COVID-19 epidemic and geopolitical wars. Numerous studies have been conducted on the effects of migration on the tourist, healthcare, and education sectors, as well as the social implications. The complex relationship between economic inflation and international travel, however, is still uncharted ground despite the abundance of research that has been accumulated. The literature assessment emphasized the critical need for a more focused examination of how economic inflation affects Nigerian migratory patterns. The intricacies uncovered by previous research require a sophisticated comprehension of the factors driving migration and its wider consequences. By performing an econometric analysis of passenger dynamics and examining the complex linkages between economic inflation and international travel, the current study intends to close this gap. Through this approach, the intent is to make a significant contribution to the current corpus of knowledge, which would enable a more thorough comprehension of the dynamics of migration and its many effects on Nigerian society.

The aim of the study is to conduct an in-depth econometric analysis of passenger dynamics in Nigeria, specifically exploring the intricate relationship between economic inflation and foreign travel from 2015 to 2020. The specific objectives of the study include: (i) to examine the trends of HIR, CIR, FIR, PPF, and PAF with the purpose of discerning their trajectories and patterns; (ii) to confirm the stationarity of PPF, PAF, HIR, CIR, and FIR by ensuring the reliability and precision of subsequent series analyses; (iii) to ascertain whether there exist stable correlations between HIR, CIR, FIR, PPF, and PAF; and (iv) to determine the cointegrating relationship between CIR, PAF, FIR, and HIR on PPF over the long term.

2. METHODS

2.1 Method of Data Collection

In this research, secondary data has been used. Secondary data was collected from the records of the Federal Airport Authority of Nigeria (FAAN) from 2015-2020 and the Central Bank of Nigeria Statistical Bulletin 2021. The variables considered include the percentage of passengers travelling abroad (PPF), the percentage of aircraft flying abroad (PAF), the headline inflation rate (HIR), the core inflation rate (CIR), and the food inflation rate (FIR).

2.2 Method of Data Analysis

In macroeconomics, many time series variables often exhibit non-stationarity in real-world scenarios. A time series dataset is considered stationary if its mean and variance remain constant over time, indicating a critical statistical property. Conversely, a time series is deemed non-stationary if its mean and variance change over time, and the covariance between two time periods depends on the interval between them rather than the absolute time. To evaluate the stationarity of a time series dataset, several statistical methods are employed, including the Augmented Dickey-Fuller (ADF) test, the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, and the Phillips-Perron test. In this study, the ADF test will be used to assess the stationarity of the data collected for analysis. This test examines the null hypothesis that the time series data has a unit root, indicating non-stationarity. The objective is to determine whether the key variables

remain stable over the specified period, ensuring the quality and reliability of subsequent time series analyses and providing a solid foundation for investigating the relationship between economic inflation and international travel in Nigeria.

2.2.1 The Augmented Dickey-Fuller (ADF) test

In the realm of time series analysis, particularly when exploring economic variables over time, the Augmented Dickey-Fuller (ADF) test stands as a pivotal tool to discern the presence of a unit root. The presence of a unit root indicates non-stationarity, suggesting that the mean and variance of the time series data are not constant over the observed period (Johansen and Juselius, 1992).

The augmented Dickey-Fuller statistic, denoted as:

$$\Delta y_t = \rho \Delta y_{(t-1)} + \delta + \varepsilon_t \quad (1)$$

Where, Δy_t represents the first difference of the time series variable,

ρ symbolizes the coefficient on the lagged first difference,

δ is the intercept term, and

ε_t is the white noise error term.

The ADF test rejects the null hypothesis (H_0) of a unit root, indicating non-stationarity. The augmented Dickey-Fuller test with an intercept term is a conventional method, rejecting the null hypothesis if the test statistic is less than the critical values. The process repeats until a stationary time series is obtained, ensuring a robust evaluation of stationarity.

2.2.2 Cointegration Test

Cointegration in time series analysis examines stationary linear combinations of integrated variables by indicating long-run equilibrium and shared stochastic trends. It enhances the accuracy of long-term projections by exploring short- and long-term relationships. Two common cointegration methods are the Johansen-Juselius methodology and the Engle-Granger technique. This study employs the Autoregressive Distributed Lag (ARDL) approach, suitable for variables integrated at different orders, as advocated by (Narayan, 2005).

The ARDL model can be expressed mathematically as follows:

$$\Delta y_t = \alpha + \beta_1 \Delta y_{t-1} + \beta_2 \Delta x_{t-1} + \dots + \beta_k \Delta x_{t-k} + \varepsilon_t \quad (2)$$

Where, Δy_t and Δx_t represent the first differences of the variables under consideration,

α is the intercept term,

$\beta_1, \beta_2, \dots, \beta_k$ are the coefficients, and

ε_t is the white noise error term.

By utilizing the ARDL methodology, the research guarantees an exhaustive investigation of the enduring associations among variables, providing a sturdy basis for well-informed evaluations and projections.

2.3 The Autoregressive Distributed Lag (ARDL) Cointegration Approach

When estimating the Autoregressive Distributed Lag (ARDL) model, it is important to make sure the errors match the features of white noise. This can be achieved by determining the ideal lag length (p) using a selection criterion, such as the Schwarz Bayesian Criterion (SBC), Akaike Information Criterion (AIC), or Final Prediction Error (FPE). By choosing a lag time that reduces bias or information loss, these requirements help the model operate more precisely. This is because a time-series sequence with independently distributed random variables and a constant mean and variance is known as white noise. It is essential to the reliability of the ARDL model that the mistakes show characteristics of white noise. After determining the proper lag length (p), the ARDL model is developed and calculated. The ARDL ($m, n; p$) model with p exogenous variables can be represented in the following generalized form:

$$\begin{aligned} \Delta y_t &= \alpha + \beta_1 \Delta y_{t-1} + \beta_2 \Delta x_{t-1} + \dots + \beta_m \Delta y_{t-m} + \gamma_1 \Delta x_{1,t-1} + \gamma_2 \Delta x_{2,t-1} + \dots \\ &+ \gamma_n \Delta x_{n,t-n} + \varepsilon_t \end{aligned} \quad (3)$$

Where, Δy_t and Δx_t denote the first differences of the dependent and exogenous variables, respectively. The model includes lagged terms for both the dependent and exogenous variables (m and n lag lengths, respectively). The coefficients, $\alpha, \beta_1, \beta_2, \dots, \beta_m, \gamma_1, \gamma_2, \dots, \gamma_n$, capture the impact of past values on the current changes, and ε_t represents the white noise error term.

Through the application of the generalized ARDL model and strict lag length selection criteria, the study guarantees a reliable and accurate depiction of the long-term interactions between variables within the framework of Nigerian foreign travel dynamics and economic inflation.

3. RESULTS

Table 1: Descriptive Statistics of Percentage of Passengers that Travelled to Foreign Countries(PPF), Percentage of Aircraft that travelled to Foreign Countries(PAF), Headline Inflation Rate (HIR), Core Inflation Rate (CIR) and Food Inflation Rate (FIR) from 2015-2020.					
	LOG(HIR)	LOG(FIR)	LOG(CIR)	LOG(PAF)	LOG(PPF)
Mean	0.0126	2.6280	2.3529	0.2716	0.1443
Median	-0.0097	2.6422	2.3115	0.4011	0.4047
Maximum	1.0121	2.9765	2.8197	0.5521	0.6981
Minimum	-0.8698	2.2486	1.9244	-1.5193	-3.6584
Std. Dev.	0.3480	0.2275	0.2503	0.4024	0.8753
Skewness	0.5289	-0.3136	0.2079	-2.8033	-3.1661
Kurtosis	3.3333	2.0746	2.2786	10.5083	12.585
Jarque-Bera	3.6910	3.7492	2.0797	4.9496	7.6826
Probability	0.1579	0.1534	0.3535	0.0841	0.0619
Observations	72	72	72	72	72

The result presented in Table 1 shows the descriptive statistics for five variables from 2015 to 2020. The variables under consideration are: Headline Inflation Rate (HIR), Core Inflation Rate (CIR), Food Inflation Rate (FIR), percentage of passengers traveling abroad (PPF), and percentage of aircraft traveling abroad (PAF). The mean represents the

average value, with LOG(HIR) averaging 0.0126. Variability is measured by standard deviation, with LOG(PPF) showing high variability (0.8753). Skewness indicates asymmetry, with LOG(HIR) positively skewed. Kurtosis and the Jarque-Bera test assess distribution shape and normality, guiding further analysis.

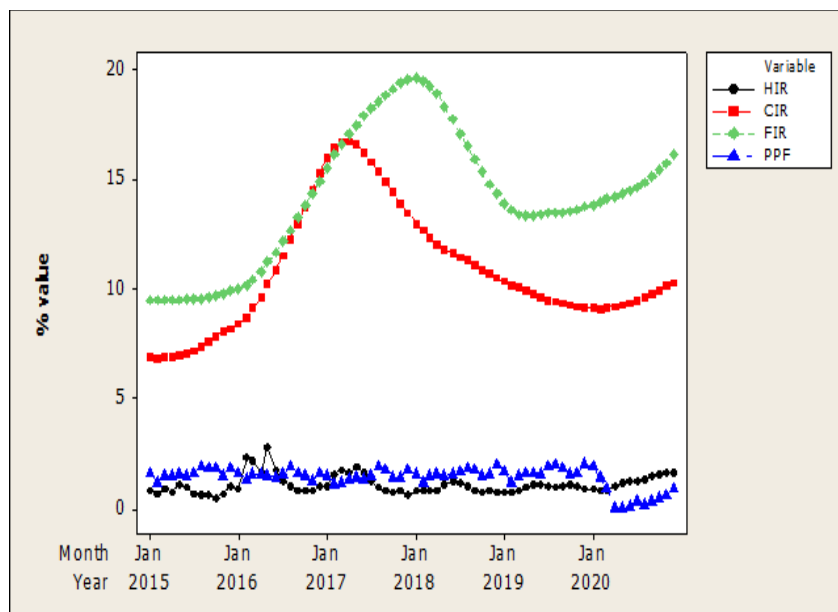


Figure 1: Graph of HIR, CIR, FIR, PPF and PAF from 2015-2020

The result presented in Figure 1 shows that the data from 2015 to 2020 reveals varying trends for different economic indicators. Headline Inflation Rate (HIR) fluctuates mildly between 0.6% and 2.3%. Core Inflation Rate (CIR) remains relatively stable, ranging from 6.9% to 16.8%. Food Inflation Rate (FIR) exhibits moderate to high fluctuation, peaking

between 9.5% and 19.5%. The percentage of passengers (PPF) and aircraft (PAF) traveling overseas shows erratic patterns, indicating volatility. These trends highlight Nigeria's economic dynamics, affecting inflation and travel behavior during the period.

Table 2: Result of Augmented Dickey-Fuller unit root test for the variables					
Variables	Level		1 st Difference		Order of integration
	No Trend	With Trend	No Trend	With Trend	
LOG(HIR)	-5.5091	-5.4886	-	-	I(0)
LOG(CIR)	-5.7518	-5.6999	-	-	I(0)
LOG(FIR)	-2.2087	-	-	-	I(0)

Table 2 (Cont): Result of Augmented Dickey-Fuller unit root test for the variables

Variables	Level		1 st Difference		Order of integration
	No Trend	With Trend	No Trend	With Trend	
LOG(PPF)	-2.6137	-2.9413	-8.287621	-8.2283 Hypothesis: D(LOG(PPF)) has a unit root Exogenous: Constant, Linear Trend Lag Length: 0 (Automatic - based on SIC, maxlag=11) t-Statistic Prob.* Augmented Dickey-Fuller test statistic 8.228391 0.0000 Test critical values: 1% level 4.094550 5% level 3.475305 10% level 3.165046 *MacKinnon (1996) one-sided p-values.	I(1)
LOG(PAF)	-2.4659	-2.9248	-8.6263	-8.5665	I(1)
Critical values					
5%	-2.9030	-3.4744	-2.9036	-3.475305	

The result of the Augmented Dickey-Fuller (ADF) unit root test presented in Table 2 reveals stationarity in key variables. At a 5% significance level, the percentages of passengers (PPF) and aircraft (PAF) traveling abroad have highly negative ADF statistics (-8.2283 and -8.5665), indicating stationarity at first difference (I(1)). Similarly, Headline Inflation Rate (HIR), Core Inflation Rate (CIR), and Food Inflation Rate (FIR) also show significant negative values (-5.4886, -5.6999, -6.7454), indicating stationarity without differencing (I(0)). This ensures reliable time series analysis, avoiding spurious results.

Since the result obtained in Table 2 shows that several variables, previously stationary at zero difference (I(0)), became stationary at first difference (I(1)), enhancing analysis accuracy and preventing spurious regression. Differencing is crucial for handling non-stationarity, facilitating Cointegration analysis. The Autoregressive Distributed Lag (ARDL) approach, suitable for mixed integration orders (I(0) and I(1)), was used to evaluate long-term relationships among variables. Table 3 displays the Cointegration trace test results, indicating a significant long-term relationship between the headline inflation rate (HIR), core inflation rate (CIR), food inflation rate (FIR), percentage of passengers (PPF), and aircraft (PAF) traveling abroad, with an F-statistic of 20.6747.

The result obtained in Table 3 demonstrates a long-term link between variables in the ARDL model, with an F-statistic of 9.940358 exceeding the critical bounds at a 0.05 significance level. This confirms the appropriateness of the ARDL long-run coefficients and the Error Correction Model (ECM). However, the findings presented in Table 4 shows long-term relationships, while Table 5 provides ECM estimates highlighting short-term correction speed. The ARDL (2, 6, 0, 5, 3) model, chosen based on the Hannan-Quinn criterion, includes specific lags for each variable, capturing dynamic interactions and ensuring model reliability. This setup enhances the understanding of economic relationships over time.

Table 3: Result of test for the existence of level relationship amongst the variables in the ARDL

Number of regressors	Value of statistic K=4
Computed F-statistic	20.6747
<u>5% critical value</u>	
Lower bound value	2.26
Upper bound value	3.48

The critical bound values were extracted from (Pesaran et al., 2001).

Table 4: Estimated long-run coefficients: ARDL(2, 6, 0, 5, 3) selected by Hannan-Quinn criterion (HQ).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(PAF)	1.998103	0.046677	42.807349	0.0000
LOG(HIR)	0.017498	0.030194	0.579539	0.5651
LOG(CIR)	-0.608635	0.171802	-3.542662	0.0009
LOG(FIR)	0.404975	0.149365	2.711307	0.0094

The result of the long-run relationship between the PPF and variables such as PAF, HIR, CIR, and FIR presented in Table 4 found that the coefficients for PAF, CIR, and FIR were significant since their p-values were obtained as 1.9998 (p-value=0.000), -0.6086 (p-value=0.0009), and 0.4045 (p-value=0.0094) respectively and their corresponding p-values are less than significant level of 0.05. It was found that PAF, FIR, and HIR have positive coefficients while CIR has a negative coefficient. The result obtained indicates that PAF, CIR, and FIR have significant long-run effect on PPF in Nigeria.

From the result presented in Table 4, the Co-integration equation can be expressed as equation (4): $Cointeq = LOG(PPF) - (1.9981*LOG(PAF) + 0.0175*LOG(HIR) - 0.6086$

*LOG(CIR) + 0.4050*LOG(FIR) (4)

Table 5: Error correction representation of the selected ARDL model: ARDL(2, 6, 0, 5, 3) selected by Hannan-Quinn criterion (HQ).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(PPF(-1))	0.214564	0.096989	2.212259	0.0320
DLOG(PAF)	2.017582	0.066374	30.397044	0.0000
DLOG(PAF(-1))	-0.691976	0.228340	-3.030471	0.0040
DLOG(PAF(-2))	0.127829	0.091695	1.394064	0.1700
DLOG(PAF(-3))	-0.049438	0.093893	-0.526529	0.6011
DLOG(PAF(-4))	0.192344	0.095242	2.019532	0.0493
DLOG(PAF(-5))	0.385313	0.089739	4.293711	0.0001
DLOG(HIR)	0.027809	0.048395	0.574624	0.5683

Table 5 (Cont): Error correction representation of the selected ARDL model: ARDL(2, 6, 0, 5, 3) selected by Hannan-Quinn criterion (HQ).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(CIR)	-10.553409	3.352192	-3.148211	0.0029
DLOG(CIR(-1))	6.533791	7.929395	0.823996	0.4142
DLOG(CIR(-2))	-5.152601	8.305901	-0.620354	0.5381
DLOG(CIR(-3))	-0.679734	7.440878	-0.091351	0.9276
DLOG(CIR(-4))	4.807695	3.365966	1.428325	0.1600
DLOG(FIR)	-8.252612	4.816142	-1.713532	0.0933
DLOG(FIR(-1))	-13.842900	12.782258	-1.082978	0.2845
DLOG(FIR(-2))	11.952176	4.897767	2.440332	0.0186
CointEq(-1)	-1.589231	0.163052	-9.746768	0.0000

The error correction representation of the ARDL (2, 6, 0, 5, 3) model, selected based on the Hannan-Quinn criterion, is shown in Table 5. It reveals significant relationships between variables. A one-unit increase in lagged PPF correlates with a 0.214564-unit rise in its current value. An increase in current PAF by one unit correlates with a 2.017582-unit rise. It was found that the lagged values of PAF, CIR, and FIR significantly impact their current values. The error correction term coefficient (-1.589231) indicates that 1.59% of disequilibrium is corrected each period, suggesting oscillatory convergence. These coefficients elucidate the short- and long-term associations between variables.

3. CONCLUSION

This study explores the relationships between inflation rates and patterns of foreign travel, alongside analysis of Nigeria's economic dynamics. Employing robust econometric tools such as Cointegration analysis, unit root tests, descriptive statistics, and the Autoregressive Distributed Lag (ARDL) model, this research was able to analyze the data obtained for the study. The findings corroborate insights, who uncovered complex relationships among GDP, inflation rates, and foreign investments (Rairni and Ogunjirin, 2012). Factors like population growth and unemployment affecting overseas migration trends in Nigeria (Darkwah and Verter, 2014). This study fills a critical gap identified in the literature, offering nuanced insights into how economic inflation influences international travel dynamics in Nigeria, thereby enriching discussions on the interplay of economic indicators and migration patterns. The study reveals that inflation rates significantly impact Nigeria's percentage of passengers traveling abroad and the percentage of aircraft flying abroad. Policymakers should focus on mitigating inflation to achieve economic stabilization. Aviation stakeholders must engage in strategic planning to adapt to shifting trends, including developing flexible business models, adjusting pricing policies, and optimizing operational efficiency.

A primary limitation of this study is its reliance on secondary data from FAAN and the Central Bank of Nigeria, which may constrain the accuracy of findings if reporting inconsistencies or data gaps exist. While ARDL models are robust for short-term dynamics, they may not fully capture complex structural shifts, which could impact the interpretation of long-term economic relationships in Nigeria's travel sector. Future studies could investigate these complexities further to enhance understanding.

CONFLICT OF INTEREST STATEMENT

The authors hereby declare that they have no conflict of interest regarding the publication of this research.

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