# Determinants of Financial Inclusion in Nigeria: An Empirical Analysis

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***Abstract***

*This study investigates the key determinants of financial inclusion in Nigeria, focusing on factors such as the number of bank branches, Automated Teller Machine (ATM) penetration, inflation rate, and interest rate. Utilising data from the Central Bank of Nigeria (CBN), the World Bank's Global Findex database, and the National Bureau of Statistics (NBS), the study applies the Dynamic Ordinary Least Squares (DOLS) regression model to examine the relationship between these variables and financial inclusion. The findings reveal that bank branches and ATMs have a positive and significant relationship with financial inclusion. In contrast, inflation rate and interest do not show a significant impact. The results provide insight into the role of macroeconomic and infrastructural factors in enhancing financial accessibility, which can inform policy interventions to improve financial inclusion across the country.*

***Keywords: Financial Inclusion, Bank Branch, Inflation rate, Interest Rate***

## 1.1 Introduction

Financial inclusion is a cornerstone of sustainable economic development, poverty alleviation, and social equity. It facilitates access to essential financial products and services, such as savings accounts, credit facilities, insurance, and payment systems, at affordable costs. By integrating individuals and businesses into the formal financial system, financial inclusion fosters economic participation, enhances resource allocation, and strengthens financial resilience.

In Nigeria, financial exclusion remains a persistent challenge, with millions of individuals and small businesses unable to access formal financial services. This situation undermines the country's economic growth potential and widens income inequalities. Addressing this gap requires a comprehensive understanding of the factors driving financial inclusion. This study aims to examine the determinants of financial inclusion in Nigeria, focusing on structural and macroeconomic variables such as the number of bank branches, Automated Teller Machine (ATM) penetration, inflation rates, and interest rates. By leveraging empirical evidence, this research provides actionable insights for policymakers to improve financial accessibility and inclusion nationwide.

## 1.2 Statement of the Problems

Despite numerous initiatives by the Nigerian government, financial institutions, and international development organisations to promote financial inclusion, a significant proportion of the population remains excluded from formal financial services. Barriers such as limited bank branch networks, inadequate Automated Teller Machine (ATM) penetration, and the high cost of financial services disproportionately affect rural and low-income populations. Macroeconomic factors, including persistent inflation and fluctuating interest rates, further exacerbate the issue, reducing the affordability and accessibility of financial products.

While previous studies have explored various aspects of financial inclusion in Nigeria, significant gaps remain. Many studies focus on individual determinants in isolation or rely on static analytical models that do not account for dynamic interactions between variables over time. Similarly, limited attention has been given to the combined influence of infrastructural factors such as ATM penetration and bank branches and macroeconomic variables such as inflation and interest rates in a unified framework.

This study seeks to fill these gaps by employing the Dynamic Ordinary Least Squares (DOLS) regression model to provide a nuanced analysis of the determinants of financial inclusion in Nigeria. By combining insights from infrastructural and macroeconomic dimensions, this research offers a comprehensive understanding of the drivers of financial inclusion.

The study contributes to the existing body of knowledge by providing empirical evidence on the relative importance of these determinants, offering actionable insights for policymakers and financial institutions. It underscores the need for a multi-faceted approach that addresses structural and macroeconomic barriers, ultimately informing targeted policies and strategies to enhance financial inclusion and economic participation in the country.

## 1.2 Objectives of the Study

The main objective is to assess the determinants of financial inclusion in Nigeria. The specific objectives of the study are as follows:

1. To assess the relationship between bank branches and financial inclusion.
2. To examine the relationship between ATM penetration and financial inclusion.
3. To evaluate the influence of inflation on financial inclusion.
4. To study the relationship between interest rate and financial inclusion.

## 2.0 Literature Review

### 2.1 Conceptual Issues

Financial inclusion refers to the delivery of affordable and accessible financial services to underserved and low-income populations. These services encompass savings, credit, insurance, and efficient payment systems, which are crucial for fostering economic empowerment and reducing inequality (Demirgüç-Kunt et al., 2018). Conceptually, financial inclusion is shaped by various factors, including financial infrastructure, macroeconomic stability, and the regulatory environment (Sarma & Pais, 2011).

Bank branches play roles in advancing financial inclusion by providing physical access points for individuals to engage with financial services. They deliver essential services, such as account opening, deposits, and credit facilities, particularly in rural and semi-urban areas (Beck, Demirgüç-Kunt, & Martinez Peria, 2007). However, the high operational costs of maintaining bank branches often limit their expansion into underserved regions, exacerbating financial exclusion in remote areas (Allen et al., 2016).

Automated Teller Machines (ATMs) complement bank branches by offering cost-effective and convenient financial services. ATMs enable basic banking functions, such as cash withdrawals and account inquiries, reducing the burden on bank branches and improving access, particularly in remote locations (Claessens, 2006). The penetration of ATMs is thus considered a key indicator of financial infrastructure development (World Bank, 2021).

Macroeconomic variables like the inflation rate and interest rate significantly influence financial inclusion. A high inflation rate erodes the purchasing power of individuals, discouraging savings and reducing the demand for financial services (Ahamed & Mallick, 2019). Similarly, elevated interest rates can make credit products unaffordable, further limiting financial participation, especially for low-income individuals and small businesses (Park & Mercado, 2018).

Financial inclusion frameworks highlight the interplay between these infrastructural and macroeconomic factors. Bank branches and ATMs enhance physical accessibility, while economic stability—manifested through controlled inflation and manageable interest rates—ensures the affordability and sustainability of financial services (Sarma, 2008). Addressing these conceptual challenges is essential for developing holistic strategies that promote financial inclusion and economic participation.

## 2.2 Empirical Review

Empirical studies have consistently demonstrated a positive relationship between financial infrastructure and financial inclusion. The study of Demirgüç-Kunt et al. (2022) found that higher Automated Teller Machine (ATM) penetration and an extensive network of banking services significantly increase financial inclusion by improving accessibility and reducing transaction costs, particularly in developing economies.

In developing countries, macroeconomic variables such as inflation and interest rates have a negative impact on financial inclusion. Ahamed and Mallick (2019) observed that high inflation reduces individuals' purchasing power, discouraging savings and financial product uptake. Similarly, elevated interest rates make borrowing less affordable, limiting access to credit for low-income populations (Park & Mercado, 2018).

Specific to Nigeria, Adegbite and Olayemi (2023) provided evidence that increasing the number of bank accounts and expanding digital financial services significantly enhance financial accessibility, particularly in rural and underserved areas. Their findings highlight the transformative potential of leveraging financial technology (fintech) to overcome traditional barriers to inclusion.

These studies underscore the importance of strengthening financial infrastructure and maintaining macroeconomic stability to promote financial inclusion. They also point to the critical role of policy interventions in fostering a conducive environment for inclusive financial systems.

## 2.3 Theoretical Framework

This study is grounded in the Financial Intermediation Theory, developed by Gurley and Shaw (1960). The theory posits that efficient financial systems play a critical role in reducing transaction costs, mobilising savings, and facilitating investment by channelling funds from surplus units (savers) to deficit units (borrowers). Financial intermediaries, such as banks, enhance economic efficiency by overcoming barriers to direct exchange, such as information asymmetry and high transaction costs.

Additionally, the study incorporates the Supply-Leading and Demand-Following Hypotheses articulated by Patrick (1966). The supply-leading hypothesis suggests that expanding financial services fosters economic growth by creating opportunities for savings and investments, thereby stimulating economic activities. Conversely, the demand-following hypothesis posits that economic growth generates increased demand for financial services, subsequently driving financial inclusion. These theoretical perspectives provide a robust framework for analysing how financial infrastructure such as bank branches and ATMs and macroeconomic variables such as inflation and interest rates influence financial inclusion in Nigeria.

## 3.0 Methodology

This study adopts a quantitative research design, employing the Dynamic Ordinary Least Squares (DOLS) regression model to analyse the relationship between financial inclusion and its determinants. Secondary data from CBN financial inclusion surveys, the World Bank's Global Findex database, and NBS publications were utilised. Financial inclusion is the dependent variable, while the independent variables are bank branches, ATMs, inflation rate and interest rate.

## 3.1 Model Specification

This research was structured to assess the determinants of financial inclusion in Nigeria. This study employed a single regression model and used the econometric procedure for estimation. The model is specified as;

Functional relationship

FIN = f(BRCH, ATM, INTR, INFL) ……………………………….…………….............1

However, the econometric form of the model is specified as;

$FIN_t = \beta 0_t + \beta 1BRCH_t + \beta 2ATM_t + \beta 3INTR_t + \beta 4INFL_t \ \mu_t$……………………..……..2

Where:

FIN = Financial Inclusion

BRCH = Number of Bank Branches

ATM = Number of ATMs

INTR = Interest Rate

INFL = Inflation Rate

$\beta 0$ = Intercept
$\beta 1, \beta 2, \beta 3$ = Coefficient of the parameter estimates
$\mu_t$ = Error Term

## 4.0 RESULTS AND DISCUSSIONS

**Table 1: Summary of Descriptive Statistics**

| | FIN | ATM | BRCH | INFL | INTR |
|---|---|---|---|---|---|
| **Mean** | 1.707757 | 10.11167 | 4.917340 | 12.35833 | 16.89292 |
| **Std. Dev.** | 1.457368 | 6.851667 | 0.826328 | 3.921836 | 2.935324 |
| **Skewness** | -0.886586 | -0.458733 | 0.755342 | -0.001561 | 0.233471 |
| **Kurtosis** | 1.979821 | 1.503816 | 2.190377 | 2.059811 | 4.033807 |
| **Jarque-Bera** | 4.184904 | 3.080312 | 2.937656 | 0.883964 | 1.286793 |
| **Probability** | 0.123384 | 0.214348 | 0.230195 | 0.642761 | 0.525505 |
| **Observations** | 24 | 24 | 24 | 24 | |

***Source: Researcher's Compilation (2025) Employing E-Views 12***

The descriptive statistics presented in Table 1 summarise key variables related to financial inclusion and its determinants: Financial Inclusion (FIN), Automated Teller Machines (ATM), Bank Branches (BRCH), Inflation Rate (INFL), and Interest Rate (INTR). The average level of financial inclusion, measured by FIN, is relatively low at 1.7078, indicating limited access to financial services across the population**.** ATM penetration, with a mean value of 10.1117, suggests moderate availability of ATMs, while bank branches (BRCH) show an average of 4.9173, highlighting the limited physical presence of banks, particularly in underserved areas. The average inflation rate (INFL) is 12.3583, reflecting moderate price level fluctuations, while the average interest rate (INTR) is relatively high at 16.8929, which may discourage borrowing and financial participation. Variability, measured by the standard deviation, shows that ATM penetration has the highest variability (6.8517), indicating significant disparities in ATM distribution across the observations. In contrast**,** bank branches (0.8263**)** exhibit the least variability, suggesting a more consistent presence. FIN, INFL, and INTR have moderate variability, reflecting fluctuations in financial inclusion levels, inflation, and interest rates.

Skewness values reveal the asymmetry of the data distribution**.** FIN and INFL exhibit negative skewness, indicating a concentration of values above their mean, while ATM**,** BRCH, and INTR show positive skewness, suggesting most values lie below their mean.

The kurtosis values indicate that all variables, except INTR, exhibit a platykurtic distribution (flatter tails), implying fewer extreme values. However, INTR shows leptokurtic behaviour (sharper tails), suggesting occasional outliers in interest rate data. The Jarque-Bera test assesses the normality of the data distribution with p-values greater than 0.05 for all variables, the results suggest that the data do not deviate significantly from a normal distribution, supporting the use of parametric statistical methods.

Lastly, the dataset consists of 24 observations for each variable, ensuring consistency across the analysis. The statistics highlight disparities in financial infrastructure, particularly **ATM** penetration, and the relatively high interest rates that could act as barriers to financial inclusion. These insights provide a foundation for understanding the dynamics of financial inclusion in Nigeria and its determinants.

**Table 2: Summary of Unit Root Test Results**

| Variable | ADF Test Statistics | 5% critical value | P-Value | Order of integration | Remark |
|---|---|---|---|---|---|
| FIN | -17.74479 | -3.040391 | 0.0000 | I(0) | Stationary |
| BRCH | -3.267364 | -3.004861 | 0.0293 | I(1) | Stationary |
| ATM | -2.310529 | -1.957204 | 0.0232 | I(1) | Stationary |
| INFL | -3.800611 | -3.004861 | 0.0093 | I(0) | Stationary |
| INTR | -5.243722 | -3.004861 | 0.0004 | I(1) | Stationary |

***Source: Researcher's Computation (2025) Employing E-Views 12***

The table presents the results of the Augmented Dickey-Fuller (ADF) unit root test, which helps determine whether a time series variable is stationary or exhibits a unit root. Stationarity is important in time series analysis because non-stationary data can lead to unreliable statistical results.

- The **FIN** variable (representing financial data) is stationary at the 5% significance level, as the ADF test statistic of -17.74479 is more negative than the critical value of -3.040391, and the p-value of 0.0000, which is less than 0.05. This means that FIN does not need differencing and is already stationary (I(0)).
- The **BRCH** variable (representing branch data) shows a test statistic of -3.267364, which is more negative than the critical value of -3.004861. The p-value of 0.0293 is also less than 0.05, indicating that BRCH becomes stationary after first differencing (I(1)).
- The **ATM** variable (representing automated teller machines) has a test statistic of -2.310529, which exceeds the critical value of -1.957204. With a p-value of 0.0232, which is below 0.05, it also becomes stationary after first differencing (I(1)).
- The **INFL** variable (representing inflation) has a test statistic of -3.800611, which is more negative than the critical value of -3.004861, and the p-value of 0.0093 is less than 0.05. This suggests that INFL is stationary without the need for differencing (I(0)).
- The **INTR** variable (representing interest rates) has an ADF test statistic of -5.243722, which is more negative than the critical value of -3.004861, and the p-value of 0.0004 is well below 0.05. This indicates that INTR is stationary after first differencing (I(1)).

The results indicate that the **FIN** and **INFL** variables are stationary without differencing (I(0)), while the **BRCH**, **ATM**, and **INTR** variables require first differencing to become stationary (I(1)).

**Table 3: DOLS Regression Result**

Dependent Variable: FIN
Method: Least Squares
Date: 01/09/25 Time: 11:29
Sample (adjusted): 2002 2022
Included observations: 21 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| BRCH | 0.371193 | 0.077655 | 4.780013 | 0.0088 |
| ATM | 0.198008 | 0.010977 | 18.03895 | 0.0001 |
| INTR | 0.007967 | 0.031068 | 0.256439 | 0.8103 |
| INFL | -0.006832 | 0.041896 | -0.163068 | 0.8784 |
| D(BRCH) | 0.059849 | 0.118993 | 0.502964 | 0.6414 |
| D(BRCH(1)) | 0.433989 | 0.138990 | 3.122443 | 0.0354 |
| D(BRCH(-1)) | -0.088244 | 0.133931 | -0.658873 | 0.5460 |
| D(ATM) | -0.008898 | 0.051919 | -0.171378 | 0.8722 |
| D(ATM(1)) | 0.078821 | 0.051582 | 1.528078 | 0.2012 |
| D(ATM(-1)) | 0.035771 | 0.046072 | 0.776410 | 0.4809 |
| D(INTR) | -0.052959 | 0.041309 | -1.282006 | 0.2691 |
| D(INTR(1)) | 0.022880 | 0.035590 | 0.642883 | 0.5553 |
| D(INTR(-1)) | -0.064701 | 0.032759 | -1.975058 | 0.1195 |
| D(INFL) | 0.016406 | 0.030011 | 0.546652 | 0.6137 |
| D(INFL(1)) | -0.002948 | 0.021250 | -0.138738 | 0.8964 |
| D(INFL(-1)) | 0.016439 | 0.022988 | 0.715113 | 0.5141 |
| C | -2.249632 | 1.126876 | -1.996344 | 0.1166 |

| | | | |
|---|---|---|---|
| R-squared | 0.997765 | Mean dependent var | 1.897577 |
| Adjusted R-squared | 0.988823 | S.D. dependent var | 1.303090 |
| S.E. of regression | 0.137765 | Akaike info criterion | -1.165715 |
| Sum squared resid | 0.075917 | Schwarz criterion | -0.320150 |
| Log likelihood | 29.24001 | Hannan-Quinn criter. | -0.982206 |
| F-statistic | 111.5858 | Durbin-Watson stat | 2.014697 |
| Prob(F-statistic) | 0.000178 | | |

***Source: Researcher's Computation (2025) Employing E-Views 12***

The table presents the results of a Dynamic Ordinary Least Squares (DOLS) regression, FIN is the dependent variable, and various independent variables, such as BRCH, ATM, INTR, and INFL, are included in the model. The regression was performed using the Least Squares method, and the sample period covers 2002 to 2022 with the following results.

1. BRCH (Branch Variable): The coefficient for BRCH is 0.371193, with a t-statistic of 4.780013 and a p-value of 0.0088, indicating a statistically significant positive relationship between BRCH and FIN. A 1-unit increase in BRCH is associated with an increase of 0.371 in FIN, and the result is significant at the 5% level.
2. ATM (Automated Teller Machine Variable): The coefficient for ATM is 0.198008, with a highly significant t-statistic of 18.03895 and a p-value of 0.0001. This shows a strong positive relationship between ATM and FIN. A 1-unit increase in ATM leads to an increase of 0.198 in FIN, and the relationship is statistically significant at the 1% level.
3. INTR (Interest Rate Variable): The coefficient for INTR is 0.007967, but the t-statistic of 0.256439 and the p-value of 0.8103 indicate that this relationship is not statistically significant. Changes in INTR do not significantly affect FIN.
4. INFL (Inflation Variable): The coefficient for INFL is -0.006832, with a t-statistic of -0.163068 and a p-value of 0.8784. This suggests that INFL does not have a significant effect on FIN.
5. Differenced Variables: The table includes differenced variables (D(BRCH), D(ATM), D(INTR), D(INFL)) and their respective lags.

- For D(BRCH), the coefficient of 0.433989 (with a p-value of 0.0354) is statistically significant, indicating that the first lag of BRCH significantly impacts FIN.
- The lagged terms of ATM, INTR, and INFL do not show significant effects on FIN, as their p-values are greater than 0.05.

6. **Constant (C)**: The constant term is **-2.249632**, with a p-value of **0.1166**, which is not statistically significant at the 5% level.

### 4.1 Model Fit and Statistics

- The **R-squared** value of **0.997765** suggests that the model explains about 99.8% of the variation in FIN, which indicates a very good fit.
- The **Adjusted R-squared** of **0.988823** accounts for the number of predictors in the model, confirming a strong explanatory power.
- The **F-statistic** of **111.5858** and its associated **p-value** of **0.000178** indicate that the overall regression model is highly significant.
- The **Durbin-Watson statistic** of **2.014697** suggests no significant autocorrelation in the residuals.

The DOLS regression results show that **BRCH** and **ATM** significantly positively impact FIN, while INTR and INFL do not show statistically significant effects. Overall, the model is highly significant and a perfect fit.

### 4.2 Post Estimation Tests

**Table 5: Summary of Post-Estimation Tests**

| Test | F-Stat /Coefficient | Prob. |
|---|---|---|
| Normality Test | 0.409124 | 0.8150 |
| Serial Correlation (LM) | 4.111468 | 0.1956 |

| | | |
|---|---|---|
| Heteroskedasticity | 2.776561 | 0.1667 |

***Source: Researcher's Computation (2025) Employing E-Views 12***

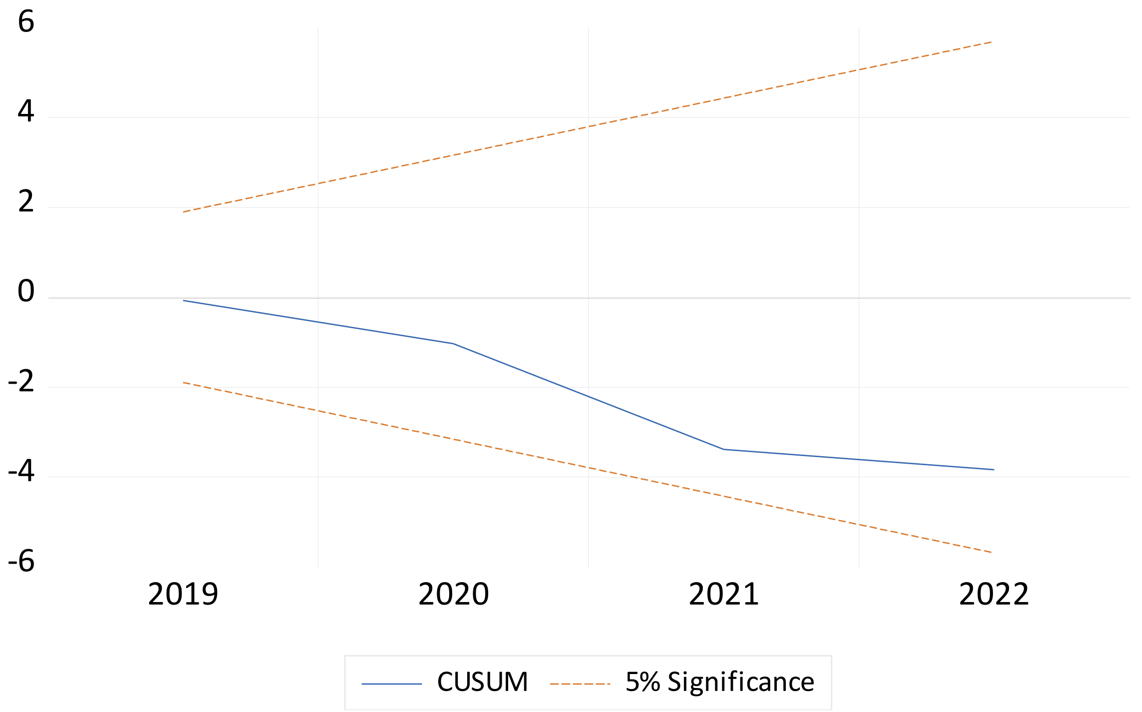
The table presents the results of post-estimation tests for the regression model, which assess various assumptions of the model. Here's the interpretation of each test:

**Normality Test**: The F-statistic for the normality test is **0.409124**, with a p-value of **0.8150**. Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the residuals are normally distributed. This suggests that the model's residuals follow a normal distribution, which is a desirable assumption in regression analysis.

**Serial Correlation (LM Test)**: The F-statistic for the serial correlation test is **4.111468**, with a p-value of **0.1956**. The p-value is greater than 0.05, indicating no significant serial correlation in the residuals. This suggests that the error terms are not correlated over time, which is another desirable assumption.

**Heteroskedasticity Test**: The F-statistic for the heteroskedasticity test is **2.776561**, with a p-value of **0.1667**. Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the residuals have constant variance. This implies that there is no significant heteroskedasticity in the model, meaning the variance of the residuals is consistent across all observations. The post-estimation tests suggest that the model satisfies key assumptions, as there is no evidence of non-normality, serial correlation, or heteroskedasticity in the residuals. These findings support the reliability of the regression model's results.

**Fig.2 Stability Test Result**



The plot above shows that the model is stable and the regression equation is correctly specified as the plot of the chart lies within the critical bounds at 5% level of significance. This indicates that the coefficients are constant.

## Findings

The findings from the DOLS regression analysis show that BRCH (Bank branches) and ATM (Automated Teller Machines**)** have a statistically significant positive effect on FIN (financial variable). Specifically, an increase in BRCH and ATM leads to a significant rise in FIN**,** suggesting that both variables play an important role in influencing financial outcomes. On the other hand, INTR (Interest Rates) and INFL (Inflation) do not have a significant impact on FIN**,** as their coefficients were not statistically different from zero.

The model also explains a substantial proportion of the variation in FIN, with an R-squared value of 0.9977**.** This indicates that approximately 99.8% of the variation in FIN is accounted for by the variables included in the study. Additionally, the overall regression is highly significant, confirming that the model as a whole is a perfect fit for the data and provides reliable estimates.

## Conclusions

This study aimed to examine the factors influencing financial inclusion, specifically focusing on the impact of branch operations **(**BRCH**),** automated teller machines **(**ATM**)**, interest rates **(**INTR**),** and inflation (INFL**).** The findings from the DOLS regression analysis indicate that BRCH and ATM have a significant positive effect on FIN, highlighting the importance of branch operations and the expansion of automated teller machines in driving financial inclusion. In contrast, INTR and INFL were found to have no significant impact on **FIN**, suggesting that changes in interest rates and inflation may not be critical determinants of financial inclusion in this context.

Furthermore, the model demonstrated an exceptionally high explanatory power, with an R-squared value of 0.9977, meaning that most of the variation in FIN is explained by the variables in the model. The regression model itself was highly significant, reinforcing the reliability of the results.

## Recommendations

1. Enhance Branch Operations: Given the significant positive impact of BRCH (branch operations) on financial inclusion, it is recommended that financial institutions invest in expanding and improving their branch networks. This could include upgrading existing branches, increasing branch accessibility, and ensuring better customer service to attract more clients and improve financial inclusion.
2. Expand ATM Networks: The study found that ATM availability has a positive influence on financial inclusion. Therefore, financial institutions should focus on expanding their ATM networks, especially in underserved areas, to provide customers with easier access to banking services. This could increase transaction volumes and improve financial inclusion.

3. Monitor Interest Rate and Inflation Trends: Since INTR (interest rates) and INFL (inflation) have no significant effect on FIN, it may not be necessary to focus heavily on these factors when making strategic decisions. However, financial institutions should still monitor macroeconomic trends and be prepared to adjust their policies or offerings in response to significant changes in these areas.
4. Invest in Technology and Infrastructure: To further capitalise on the positive effects of ATM and BRCH, financial institutions should embrace technological advancements that improve the efficiency of branch operations and ATM systems. Investing in digital banking platforms and modernising infrastructure can enhance customer experience and drive better financial inclusion.
5. Focus on Data-Driven Decision-Making: Given the high explanatory power of the model (R-squared = 0.9977), it is recommended that financial institutions continue using data-driven methods to assess and enhance their financial strategies. Using robust analytical tools and regularly updating models can help refine business operations and better anticipate market trends.

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