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Dolna 17, Warsaw,
Poland 00-773
+48 226 0 227 03
editorial_office@rsglobal.pl

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HOW DOES FINANCIAL INCLUSION AFFECT HUMAN DEVELOPMENT? EVIDENCE FROM ALGERIA

Nid Safa
University of Biskra, Algeria
ORCID ID: 0000-0003-4434-9784

Heriat Bouthaina
University of Biskra, Algeria
ORCID ID: 0000-0001-8926-1394

ABSTRACT

This study explores the relationship between financial inclusion and human development in Algeria from 2004 to 2021, using a composite index of financial inclusion and the Autoregressive Distributed Lag (ARDL) model. The research integrates two dimensions of financial inclusion: access to financial services and usage of financial services, using indicators such as ATMs, bank branches, bank deposits, and domestic credit. The results confirm a long-run cointegration between financial inclusion and human development. In the short run, financial inclusion significantly impacts human development, with a 38.9% adjustment rate towards equilibrium. The findings underscore the vital role of financial inclusion in enhancing human development, with implications for policy aimed at fostering economic growth and improving living standards. The study also emphasizes the importance of strengthening financial systems to maximize these effects.

KEYWORDS

Financial Inclusion, Human Development, Inclusive Finance, Cointegration ARDL, Algeria

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I- Introduction:

In recent years, financial inclusion has emerged as a key driver of economic growth and social development, especially in developing and emerging economies. Defined as "*the access and usage of financial services by individuals and businesses, financial inclusion is seen as a pathway to reducing poverty, fostering economic stability, and promoting social equity*" (Ramananda & sankharaj, 2015). However, according to the United Nations, financial inclusion (FI) is not solely about access to and usage of financial services but also emphasizes the **quality** of those services, this means that financial services are timely and accountable, responsive to clients' needs and capabilities, and safe and user-friendly (Tissaoui, Hakimi, & Zaghdoudi, 2024, p. 2). Access to financial services, including savings, credit, insurance, and payment systems empowers individuals and businesses to engage more actively in the economy smooth consumption, invest in education and health, and manage financial risks. These benefits are particularly significant for low- and middle-income countries where large segments of the population remain financially excluded, hampering their ability to contribute fully to economic and social progress.

The Human Development Index (HDI) is "*a composite measure that reflects a country's average achievements in health, education, and income, is widely used as an indicator of human welfare*" (hakimi & hamdi, 2019) . Financial inclusion is posited to positively impact the HDI by improving individuals' access to resources that foster better living standards, education, and health outcomes. By offering more equitable access

to financial services, financial inclusion has the potential to lift individuals out of poverty, enhance investment in human capital, and reduce inequality, all of which are critical components of human development.

Despite these apparent benefits, the relationship between financial inclusion and human development remains understudied in many low- and middle-income contexts. While financial inclusion has been widely promoted by governments and international organizations, the degree to which it directly contributes to improved human development outcomes—such as better education levels, improved health, and enhanced income equality—varies significantly across countries. Some studies suggest a positive impact of financial inclusion on human development in middle-income nations than in low-income countries, where institutional frameworks are weaker, and the reach of financial services is more limited (Abdelghaffar, Emam, & Samak, 2023). Furthermore, financial inclusion can positively influence human development through multiple interconnected channels. It starts with providing individuals access to financial services, such as savings accounts, credit, and insurance, which promotes the penetration and usage of these services within a population. Through increased access, financial inclusion improves health conditions by enabling individuals to afford healthcare and access health insurance, while also providing economic opportunities through better access to credit, enabling entrepreneurship and job creation. Additionally, financial inclusion enhances knowledge about financial products and services, helping individuals make informed economic decisions. Social safety nets, such as insurance and pensions, offer financial protection, reducing vulnerability to economic shocks. Collectively, these factors boost people's capabilities by giving them the tools to improve their lives, secure employment, and participate more fully in the economy. This leads to poverty reduction as individuals are better able to manage risks and seize opportunities. Ultimately, these improvements in health, education, economic opportunities, and social safety foster higher levels of human development, as reflected in key indicators such as income, education, and life expectancy (fig.1).

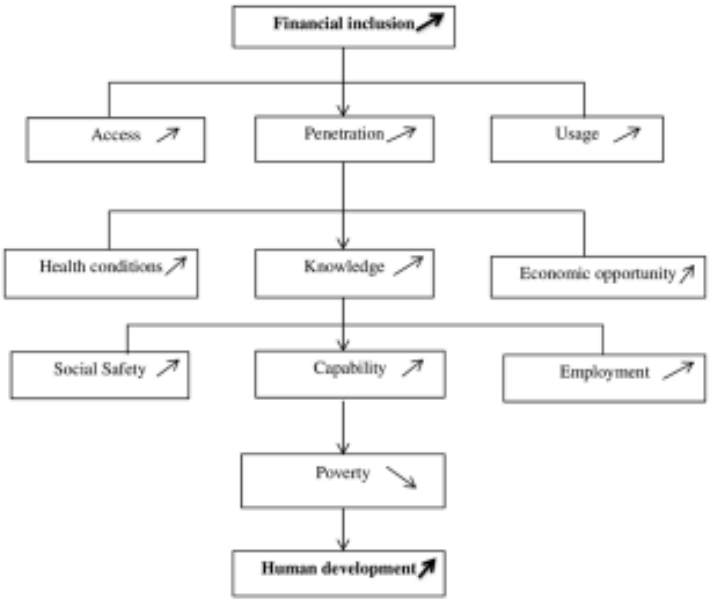

Fig.1 *Channels through Which Financial Inclusion Affects Human Development*
Source: *(Tissaoui, Hakimi, & Zaghdoudi, 2024, p. 2)*

This paper seeks to examine the impact of financial inclusion on the Human Development Index in Algeria. By analyzing data For Algeria, this research aims to shed light on the varying degrees of influence that financial inclusion has on human development and identify the conditions under which financial inclusion has the greatest positive impact. Using advanced econometric techniques, such as the (ARDL), the study will explore the nuanced relationships between financial inclusion and key components of the HDI, including education, health, and income.

II- LITERATURE REVIEW

The relationship between financial inclusion and human development has garnered significant attention in recent years, particularly in cross-country and regional contexts. Several studies have investigated the impact of financial inclusion on various socio-economic factors, offering rich insights into how access to financial services promotes broader developmental outcomes. (Nanda & Ka, 2016) developed a comprehensive cross-country index of financial inclusion (IFI) to measure progress across 68 countries from 2004 to 2012. The study found a general improvement in financial inclusion, with the mean IFI value increasing from 0.292 to 0.332 over the period. Notably, the study demonstrated a strong correlation between financial inclusion and human development, as captured by the Human Development Index (HDI). The introduction of a modified HDI incorporating IFI further underscored the role of financial availability and access as a critical factor in socio-economic development. (Nanda & Ka, 2016) emphasized the importance of overcoming barriers like financial illiteracy and technological backwardness to further improve financial inclusion and human development. Similarly, (Datta & Singh , 2019) examined the financial inclusion scenario across developed and developing countries for the years 2011 and 2014, using a financial inclusion index (FII) based on the dimensions of availability, access, and usage. The study's findings corroborate those of (Nanda & Ka, 2016), showing a positive association between financial inclusion and human development, and further identified key factors such as income and financial literacy that influence inclusion. The study employed a pooled OLS regression model, providing robust evidence for the role of financial inclusion in enhancing socio-economic outcomes across diverse nations. In the African context,(Matekenya, Moyo, & Jeke, 2020) focused on Sub-Saharan Africa and employed the Generalized Method of Moments (GMM) approach to highlight the positive effect of financial inclusion on human development. The study reinforced the notion that financial access encourages investments in health, education, and risk management, thereby promoting human development in one of the world's most economically challenged regions. Policymakers were advised to reduce the cost of access to financial services and invest in infrastructure to broaden inclusion. (Kumari, 2022) explored the case of financial inclusion in India, providing a state-level analysis that revealed stark disparities in financial access across regions. The study demonstrated a strong positive correlation between financial inclusion and human development, suggesting that increased access to financial services is associated with improved standards of living and reduced poverty. This analysis positioned financial inclusion as a critical driver for economic growth and social upliftment in the Indian context.

Further expanding the scope, (Ofosu-Mensah Ababio, Attah-Botchwey, Osei-Assibey, & Barnor, 2021) investigated the bi-directional relationship between financial inclusion and human development in frontier markets. Employing the dynamic panel GMM methodology, the study found that human development acts as a catalyst for scaling up financial inclusion in the banking sector. This reciprocal relationship implies that improving human development enhances financial inclusion, which in turn promotes further socio-economic development, particularly in low-income markets. (Chowdhury & Chowdhury , 2023) focused on South Asia, examining the effect of financial inclusion on human development in Bangladesh, India, and Pakistan. The study found that financial inclusion positively affects key human development indicators such as income levels, life expectancy, and educational attainment. By utilizing panel data and the GMM technique, the study provided actionable insights for policymakers to optimize financial inclusion as a tool to accelerate human development outcomes. (Tissaoui, Hakimi, & Zaghdoudi, 2024) similarly explored the relationship between financial inclusion and human development across low- and middle-income countries. Their study highlighted the threshold effect of financial inclusion, where improvements beyond certain levels yield substantial benefits in terms of human development. The findings suggest that financial inclusion contributes significantly to socio-economic progress in middle-income nations, but the relationship is more nuanced for low-income countries.

In a broader perspective, (Samour, Ali, Tursoy, Radulescu, & Balsalobre-Lorente , 2024) examined the nexus between financial inclusion, human capital, and technological innovation in emerging E7 countries. They found that financial inclusion and human capital development positively affect energy efficiency, indicating that financial access can contribute not only to human development but also to environmental sustainability. The study suggests that financial resources and technological innovation need to be channelled effectively to promote sustainable development goals.

Finally, the interplay between financial inclusion, gender-specific human capital, and productivity growth was explored by (Pal, Mahalik, Mallick, & Heshmati, 2024) in the context of India. Their study revealed that while financial development enhances productivity growth when male education levels are high, it surprisingly hampers productivity when female education levels are higher. This differential impact underscores the complex dynamics between gender, financial inclusion, and economic productivity.

Synthesis and Gaps in the Literature

The reviewed studies converge on the idea that financial inclusion plays a crucial role in promoting human development, energy efficiency, and economic growth. However, they also highlight important nuances. For instance, while financial inclusion generally fosters development, its impact can vary across income levels and regions, as shown in the case of middle-income countries (Tissaoui, Hakimi, & Zaghdoudi, 2024) and emerging economies (Samour, Ali, Tursoy, Radulescu, & Balsalobre-Lorente , 2024). Additionally, the gender-specific effects of financial development on productivity growth (Pal, Mahalik, Mallick, & Heshmati, 2024) suggest that more attention should be paid to the social and educational dimensions of financial policies.

Despite the progress in this field, several gaps remain. First, while most studies focus on the positive aspects of financial inclusion, few explore its potential downsides, particularly in contexts where institutional frameworks are weak. Furthermore, the threshold effects observed in middle-income countries warrant further investigation into the specific conditions under which financial inclusion yields the greatest benefits. Finally, the gender dynamics observed in India call for deeper exploration in other emerging markets, particularly regarding the role of female education in productivity growth.

In the context of Algeria, scanty attempts have been made, as the empirical studies are concentrated on the impact of financial inclusion on economic growth. The present study seeks to fill this lacuna in the literature by modeling both financial inclusion indicators in a single equation to examine the short- and long-run indicators driving human development in Algeria.

III- METHODOLOGY

III.1. Data descriptive and variables

In terms of methodology, the study employed a quantitative approach, utilizing both econometric and descriptive techniques to achieve its objectives. The research relied on primary data sourced from various reports of the Bank of Algeria and the World Bank's development indicators and reports. Regarding the scope, the study concentrated on Algeria for the period between 2004 and 2021. It is important to highlight that the annual time series data was converted into biannual data, resulting in 36 observations. This conversion was achieved using cubic interpolation. Table 1 offers a detailed description of all the variables included in the analysis.

Table 1. Description of variables

Variable	Acronym	Proxy	Source
Human development index	HDI	Human development index	UNDP
Financial inclusion	FI1	- ATMs (per 100,000 adults) - Commercial bank branches (per 100,000 adults)	World Bank
	FI2	- Bank deposit (% of GDP) - private domestic credit (% of GDP)	Bank of Algeria World Bank

Source. Prepared by the researchers

To address the limitations of using individual indicators as proxies for financial inclusion and to avoid potential multicollinearity, this research developed and applied a comprehensive composite index. The "access to financial services" component was constructed using two indicators: ATMs per 100,000 adults and commercial bank branches per 100,000 adults. For the "usage of financial services," the indicators included bank deposits as a percentage of GDP and private domestic credit as a percentage of GDP. These indicators were then integrated in a two-stage process to form the composite index. The data series was normalized using

the min–max method, which minimizes data variability and ensures consistency for index construction. The formula used for this normalization is presented below: (necib & nid, 2024).

$$F_{i,t} = \frac{P\ i,t - Min\ i,t}{Max\ i,t - Min\ i,t}$$

Where $F_{i,t}$ represents the represents the normalized indicator *i* at time *t,* and $P_{i,t}$ an individual financial inclusion indicators, $Max_{i,t}$ is the maximum and $Min_{i,t}$ is the minimum values of each indicator, respectively.

Following the normalization process, the study applied principal components analysis (PCA) to calculate the eigenvalues of the variance-covariance matrix of the indicators, facilitating the construction of the composite index. The PCA technique was employed to reduce dimensionality while preserving the most significant variance components. After normalizing the indicators, PCA is applied to reduce dimensionality and combine the indicators into a single composite index (Abdi & Williams, 2010).

Therefore, the composite index for Algeria was then formulated using the following equations.

$$FI1_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \ldots + W_{in}X_n$$

$$FI2_i = W_{i11}X_{11} + W_{i22}X_{22} + W_{i33}X_{33} + \ldots + W_{in}X_n$$

Where $FI1_i$: estimate of the *i*th factor of access to financial services; $FI2_i$: estimate of the *i*th factor of usage of financial services; Wi : weight on the factor of score coefficient; Xi : variable of interest; n : number of variables.

III. 2. Model specification

The empirical model used to investigate the relationship between human development and financial inclusion is represented as follows:

$$\mathbf{HDI_t = C + \beta_1 FI1_t + \beta_2 FI2_t + \epsilon t}$$

Where:

- HDI_t represents the Human Development Index at time t,
- C is the intercept term,
- $FI1_t$ and $FI2_t$ are the financial inclusion indicators at time t,
- β1 and β2 are the coefficients measuring the impact of financial inclusion on human development,
- ϵt is the error term, capturing unobserved factors or deviations from the model,
- t denotes the time period of the sample.

The proxies for all variables used in the analysis have been previously defined, with the exception of the error term ϵt. The coefficients β1 and β2 quantify the effect of the respective financial inclusion variables on human development.

III.3. Cointegration- autoregressive distributed lag bound testing procedure

The study utilizes the Autoregressive Distributed Lag (ARDL) bounds testing approach to explore cointegration and assess the short- and long-term effects of selected independent variables on human development. The ARDL model, originally developed by Pesaran and Shin (1998) and further refined by Pesaran et al. (2001), is chosen for its advantages over alternative cointegration methods, such as fully modified OLS and Johansen. One of the key strengths of the ARDL approach is its flexibility in handling variables that are either stationary at level I(0), first difference I(1), or a combination of both. Additionally, it allows for different lag lengths for each variable and performs well even with small sample sizes.

The bounds testing procedure is employed to examine the long-term relationship among the variables using an F-test. The null hypothesis assumes the absence of a long-run relationship among the variables, while the alternative hypothesis proposes the presence of such a relationship, as defined below:

- Null Hypothesis $H_0 : \beta_1 = \beta_2 = 0$,
- Alternative Hypothesis $H_0 : \beta_1 = \beta_2 = 0$ (presence of a long-run relationship).

Two critical bounds are used in the analysis: the upper bound I(1) and the lower bound I(0) The results of the F-test are interpreted as follows:

- If the F-statistic exceeds the upper bound I(1), it confirms the existence of a long-term relationship (cointegration) among the variables.
- If the F-statistic falls below the lower bound I(0), it suggests no cointegration.
- If the F-statistic lies between the upper and lower bounds, the result is deemed inconclusive.

This method provides a robust framework for assessing both short-term dynamics and long-term equilibrium relationships in the model.

IV- Empirical results

IV.1. Unit root test

In statistical terms, a time series has a unit root if it follows a random walk, meaning that shocks to the series have a permanent effect. This implies that the series does not revert to a long-term mean and that its variance increases over time (Gujarati, 2011). To test for the presence of a unit root, the study employed the Augmented Dickey-Fuller (ADF) test. The ADF test is crucial for confirming the stationarity of the data, which in turn supports the application of the ARDL method to investigate both short-term dynamics and long-term relationships among economic variables. This test was conducted at both the level I(0) and first difference I(1) stages, as shown in Table 3. The results indicate that all variables become stationary at their first difference. Given this outcome, where the factors are integrated at I(1), the ARDL method is appropriate for further analysis.

Table 2. Unit root test results: ADF

Test / variable	HDI	FI1	FI2
At Level			
With constant	-3.3954 (0.0272)	-0.7434 (0.8095)	-2.9076 (0.0652)
With constant & trend	0.4163 (0.9974)	-3.0381 (0.1511)	-1.9457 (0.5876)
Without constant & trend	2.8125 (0.9972)	-0.7929 (0.3576)	-2.5115 (0.0155)
At First Difference			
With constant	-3.8887 (0.0106)	-4.8318 (0.0018)	-3.0520 (0.0513)
With constant & trend	-6.8913 (0.0002)	-4.5190 (0.0130)	-3.2144 (0.0188)
Without constant & trend	-1.4192 (0.0392)	-2.4566 (0.0178)	-2.3773 (0.0211)
Order	I(1)	I(1)	I(1)

Source. Eviews 10 output

IV.2. Lag length selection

For lag selection we depended on the value of akaike information criterion (AIC): (AKAlKE, 1974)

$$AIC= \hat{\sigma}^2 \exp\left[2(\frac{p+q}{N})\right]$$

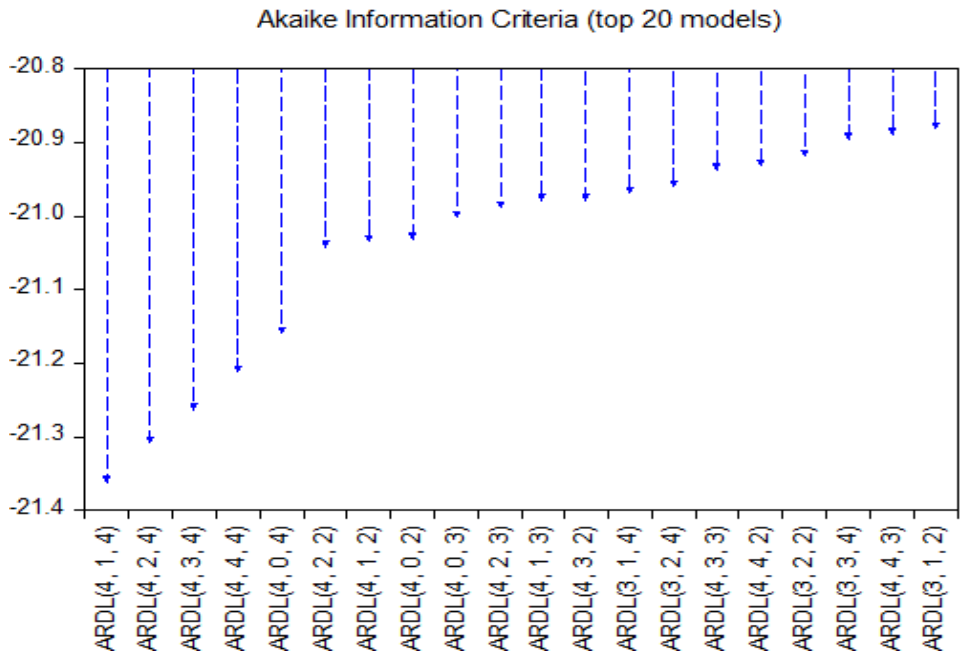

Fig.2. *Lag order selection criteria results*
Source*. Eviews 10 output*

The results presented in Figure 1 indicate the selection of an ARDL model with lag lengths (4,1,4). To analyze the long-term relationships and short-term dynamics among the variables, the ARDL model can be expressed as follows:

$$\mathbf{HDI_t = C_0 + \sum_{i=1}^{4} \propto_1 \Delta\, HDI_{t-1} + \sum_{i=1}^{1} \propto_2 \Delta\, FI1_{t-1} + \sum_{i=1}^{4} \propto_3 \Delta\, FI2_{t-1} + \beta_1\, HDI_{t-1} + \beta_2\, FI1_{t-1} + \beta_3\, FI2_{t-1} + \varepsilon_t}$$

Where:

- Δ denotes the difference operator,
- C_0 is the intercept term,
- $\alpha_1,\alpha_2,\alpha_3$ are the short-run coefficients associated with the changes in the variables,
- $\beta1,\beta2,\beta3$ are the long-run coefficients associated with the lagged levels of the variables,
- ϵt represents the error term.

This ARDL model allows for a comprehensive analysis of both short-term fluctuations and long-term trends in human development and financial inclusion. By examining the coefficients, researchers can gain insights into how changes in financial inclusion affect human development in both the short and long run, providing valuable information for policy formulation and economic planning.

IV.3. Bounds testing for cointegration

The bounds testing analysis evaluates the long-run relationship between the Human Development Index (HDI) and the financial inclusion indicators. As presented in Table 4, the results of the bounds testing indicate that, at a 5% significance level, the computed F-statistic of 4.73684 exceeds the upper critical bound value of 3.873. This outcome signifies the presence of cointegration among the selected variables.

Given this evidence of a long-run relationship, we can proceed to estimate the long-term association between the Human Development Index and the financial inclusion indicators. The selection of the ARDL model, specifically ARDL(4,1,4), is based on the Akaike Information Criterion (AIC), which aids in determining the model that best fits the data while penalizing for complexity.

This analysis underscores the significance of financial inclusion in influencing human development over the long term, providing a foundation for further exploration of the dynamics involved in this relationship.

Table 3. Bound test for cointegration relationship

Test statistics	Value	Level	Critical values	
			I(0)	I(1)
F-statistics	4.736884	10%	2.63	3.35
K	2	5%	3.1	3.87
		1%	4.13	5

Source. Eviews 10 output

IV.4. Long-run estimation

Table 5 presents the empirical results on the long-run impact of financial inclusion index on human development index. From the estimation, access to financial services exerts a positive significant impact on human development index. This relationship aligns with the proposition that improved access to financial services empowers individuals and communities, enabling them to save, invest, and manage risks more effectively. Consequently, these financial activities contribute to higher levels of education, health, and income—key components of the Human Development Index (HDI). By fostering economic stability and reducing vulnerability, access to financial services serves as a catalyst for human development, reinforcing the notion that financial inclusion is integral to enhancing overall well-being and societal progress.

Table 4. Long-run estimates

ARDL (4,1,4) selected based on AIC dependent variable = HDI				
Variable	Coefficient	SE	t-statistic	Probability value
FI1	0.000377	0.000168	2.238593	0.0373
FI2	0.000105	0.000118	0.888422	0.3854
Constant	0.007068	0.000144	49.20281	0.0000
Note: * denote significance at 5% level, respectively**				

Source. Eviews 10 output

IV.5. Short-run estimation

Turning to the short-run estimates in table 6, the lagged error-correction term (ECM_{t-1}) coefficient is negative and highly significant. The coefficient of -0.389 indicates that the disturbance in the model is reduced by 38.9% semestrly towards the equilibrium at the long-term level. In practical terms, this indicates that the deviation of on-call HDI index from their equilibrium in the preceding period (t−1) 1) will be corrected by approximately 38.9% in the current period (t). The R-squared value of 0.97 suggests a strong fit for the model, meaning that the variables under consideration account for about 97% of the variations in on-call HDI index. This demonstrates the model's robustness in explaining the changes in human development index.

Table 5. Results of short-run dynamic model

ARDL (4,1,4) selected based on AIC dependent variable = HDI				
Variable	Coefficient	SE	t-statistic	Probability value
ΔHDI_{t-3}	0.662849	0.113052	5.863217	0.0000
$\Delta FI1$	-3.262568	8.717917	-3.742371	0.0014
$\Delta FI2_{t-3}$	0.000129	3.050849	4.225367	0.0005
ECM_{t-1}	-0.038942	0.008314	4.683935	0.0002
R^2		0.976961		
Adjested R^2		0.968583		
DW		1.613951		

Source. Eviews 10 output

IV.6. Diagnostic tests results

Finally, we conducted several diagnostic tests to validate our findings. As shown in Table 7, at the 5% significance level, our model demonstrates that it is free from serial correlation, heteroscedasticity, and functional misspecification. Additionally, the Jarque-Bera statistic indicates that the residuals of our model are normally distributed.

These diagnostic checks reinforce the robustness of our model and the reliability of our findings regarding the long-run relationship between human development and financial inclusion.

Table 6. Diagnostic tests

Specification	F-statistics	Probability value
Breusch-Godfrey LM test	2.793732	0.0893
Breusch-Pagan (hetroscedasticity)	2.231411	0.0600
Jarque-Bera (normality)	0.155683	0.925111
Ramsey RESET	0.593159	0.4512

Source. Eviews 10 output

Similarly, the results from the CUSUM and CUSUMSQ plots, illustrated in Figures 2 and 3 respectively, indicate that the model is stable. The CUSUM lines remain within the critical boundaries at the 5% significance level, suggesting that there are no structural breaks in the model over the sample period.

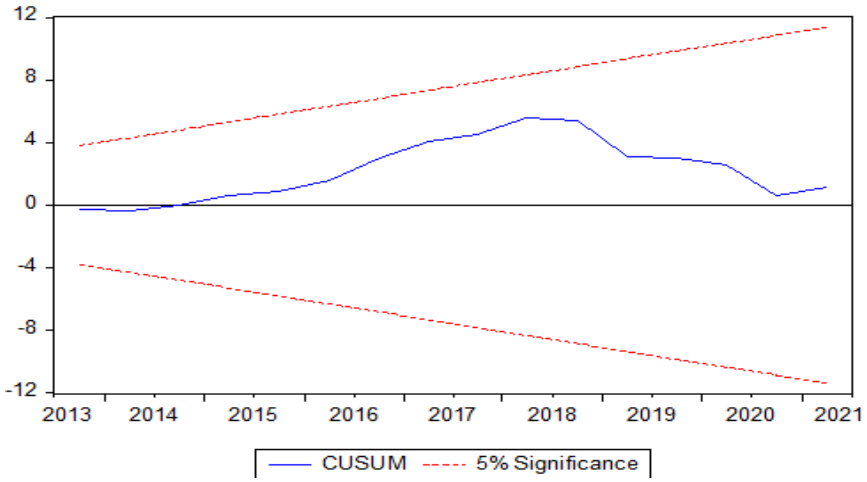

Fig.3. *Plots of CUSUM*

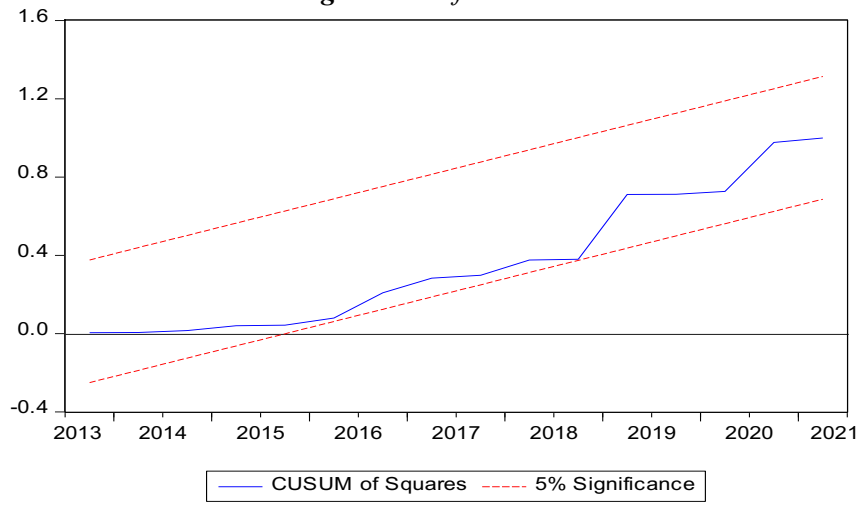

Fig.4*. CUSUM of squares*
Source*. Eviews 10 output*

V- Conclusions

This study offers valuable insights into the relationship between financial inclusion and human development in Algeria, addressing a critical gap in the existing literature. By constructing a comprehensive composite index of financial inclusion and employing the ARDL bounds testing approach, we have demonstrated that access to and usage of financial services significantly contribute to long-term improvements in human development. Our results reveal that enhanced access to financial services promotes higher levels of education, health, and income, key components of the Human Development Index (HDI), while the short-term dynamics highlight the importance of addressing immediate economic fluctuations to sustain this growth.

The findings underscore the essential role of financial inclusion as a driver of human development, especially in emerging economies like Algeria, where inclusive financial systems are crucial for fostering broad-based economic growth and societal progress. Furthermore, this study highlights the need for targeted policies that promote equitable access to financial services, particularly in regions with lower levels of financial inclusion.

Despite the robustness of the results, future research should explore the differential impacts of financial inclusion across various demographic and socioeconomic groups. Additionally, investigating the role of digital financial services and their implications for human development would provide further avenues for enhancing the effectiveness of financial inclusion policies. In sum, this study not only contributes to the academic discourse on financial inclusion and human development but also offers practical implications for policymakers aiming to design more inclusive and resilient financial systems in Algeria and beyond.

REFERENCES

1. Abdelghaffar, R., Emam, H., & Samak, N. (2023). Financial inclusion and human development: is there a nexus? *Financial inclusion and human development, 5*(3), 163-177.
2. Abdi, H., & Williams, L. (2010). Principal Component Analysis. *Wiley Interdisciplinary Reviews: Computational Statistics, 2*, 1- 47.
3. Chowdhury, E., & Chowdhury , R. (2023). Role of Financial Inclusion in Human Development: Evidence from Bangladesh, India and Pakistan. *Journal of the Knowledge Economy, 15*, 3329-3354.
4. Datta, S., & Singh , K. (2019). Variation and determinants of financial inclusion and their association with human development: A cross-country analysis. *IIMB Management Review, 31*(4), 336-349.
5. Kumari, M. (2022). Financial Inclusion and Human Development in India: An Inter-State Analysis. *International Journal of Economics Development Research, 3*(1).
6. Matekenya, W., Moyo, C., & Jeke, L. (2020). Financial inclusion and human development: Evidence from Sub-Saharan Africa. *Development Southern Africa, 38*(5), 683-700.
7. Nanda , K., & Ka, M. (2016). Financial Inclusion and Human Development: A Cross-country Evidence. *Management and Labour Studies, 41*(2), 127- 153.
8. Ofosu-Mensah Ababio, J., Attah-Botchwey, E., Osei-Assibey, E., & Barnor, C. (2021). Financial inclusion and human development in frontier countries. *International Journal of Finance & Economics, 26*(1), 42- 59.
9. Pal, S., Mahalik, M., Mallick, H., & Heshmati, A. (2024). Does Financial Development Induce Total Factor Productivity Growth in an Emerging Economy? The Role of Gender Human Capital. *ournal of Public Affairs*(4).
10. AKAlKE, H. (1974). ANew Look at the Statistical Model Identification. *IEEE. Reprinted, with permiBaion, from IEEE transactions on Automatic control, 19*, 716- 723.
11. Gujarati, D. (2011). *Econometrics by example.* London: Palgrave Macmillan.
12. hakimi, a., & hamdi, h. (2019). Financial development and human development: A non-linear analysis for Oil-exporting and Oil-importing countries in MENA region. *Economics Bulletin, 39*(4), 2484-2498.
13. necib, a., & nid, s. (2024). Estimate The Impact Of Financial Sector Development On Carbon Emissions In Algeria. *management & economic research journal, 6*(1), 595- 614.
14. Ramananda, S., & sankharaj, r. (2015, january). financial inclusion : a critical assessment of its concepts and measurement. *asian journal of research in business economics and management, vol 5*(No 1), 12-18.
15. Samour, A., Ali, M., Tursoy, T., Radulescu, M., & Balsalobre-Lorente , D. (2024). The nexus between technological innovation, human capital and energy efficiency: Evidence from E7 countries. *Gondwana Research, 135*, 89-102.
16. Tissaoui, k., Hakimi, A., & Zaghdoudi, T. (2024). Can financial inclusion enhance human development? Evidence from low- and middle-income countries. *Humanities and Social Sciences Communications 11(1), Springer Nature, ISSN 26629992, 11*(1), 1-14.