

Bank Development and Human Development in WAEMU Countries: Evidence from Panel Data Estimation

Séraphin Prao YAO

Professor-Researcher at Alassane Ouattara University (Bouaké) /LAMPE- Laboratory of Economic Policies' Analysis and Modeling, Ivory CoastBP V 18 Bouaké 01, Côte d'Ivoire

Abstract

This study empirically investigates the impact of human development on bank development in WAEMU countries. Over the period 1990 to 2014, empirical results have shown a positive relationship between banking development and human development. Credit to the private sector and the size of the economic system have a positive and significant impact on human development, but this impact remains small. Moreover, the growth rate of GDP per capita and the level of inflation have a positive impact on human development.

Keywords: Banking sector development; Human development; Panel data analysis.

JEL Classification: G29; E51; O11.



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1. Introduction

The analysis of the relationship between finance and economic growth has gained renewed interest from the work of [Gurley and Shaw \(1955\)](#), [Patrick \(1966\)](#), [Golsmith \(1969\)](#), [Hicks \(1969\)](#) and [McKinnon \(1973\)](#). Since then, the study of these two spheres has continued to interest economists. Financial development would have a positive impact on economic development [McKinnon \(1973\)](#); [King and Levine \(1993a\)](#); [Pagano \(1993\)](#); [Neusser and Kugler \(1998\)](#); [Levine et al. \(2000\)](#); [Calderon and Liu \(2003\)](#). It is recognized that the financial sector affects growth through two channels: capital accumulation and productivity enhancement. As such, five main functions are generally associated with the financial system. These include savings mobilization, resource allocation, risk management, transaction facilitation and corporate oversight ([Barry, 2012](#)).

Sub-Saharan Africa has experienced high rates of economic growth in recent years. States have carried out important reforms, which have led to a rapid expansion of their middle classes. In sub-Saharan Africa, in 2015, economic growth was 3.4% against 5.1% in 2014 (Annual report of the franc zone 2015). The countries of the West African Economic and Monetary Union (WAEMU)¹ are also recording good economic performance figures. In 2015, the WAEMU zone recorded a growth rate of 7% against 6.4% in 2014 ([BCEAO, 2015](#)). Overall, all countries in the region performed well. But these good macroeconomic results have little impact on people's well-being. Indeed, the initial distribution of wealth in these countries is not always achieved equally. The inequality that results from this poor distribution has many dimensions, such as the lack of satisfaction of basic needs and social exclusion. Income inequality² is increasing in some WAEMU countries. In Burkina Faso, Mali, Niger and Togo, over the period 2010 to 2014, it rose from 0.303 to 0.310, from 0.320 to 0.388, from 0.250 to 0.289 and from 0.286 to 0.290 respectively. The human development index adjusted to inequalities³ in these countries is increasing. Over the same period, it rose from 0.145 to 0.160 for Burkina Faso from 0.174 to 0.182 for Mali from 0.124 to 0.134 for Niger and from 0.271 to 0.299 for Togo. Faced with the shortcomings of conventional measures of wealth, human development is increasingly seen as the indicator that better reflects the well-being of populations ([Morrison and Murin, 2008](#)). In the WAEMU zone, from 1980 to 2014, the human development index (HDI) is between 0.2 and 0.50 ([UNDP, 2015](#)). Meanwhile, we note the development of the banking sector in the WAEMU zone. The number of generalist banks in the WAEMU region has changed dramatically in recent years. Between 2011 and 2015, the number rose from 84 to 105, an increase of 21 units in five years (Banking Commission, 2013-2015). Net outstanding loans for WAEMU totalled 17657 billion in 2015 ([BCEAO, 2015](#)). In the WAEMU zone, loans granted in relation to bank deposits were 79.4% in 2003 in all WAEMU member countries against 123% at the same date in the EU-15 countries ([Doumbia, 2011](#); [SY, 2006](#)). On average, during the period 1991 to 2006, the banking sectors of the various WAEMU countries held liquidity surpluses ranging from 4% to 18% of total deposits. As a proportion of GDP, these levels range from 0.8% to over 3.7%.

From the above, it is possible to question the link between financial development and human development. Thus the central issue of this study revolves around the following fundamental question: to what extent does banking development stimulate human development in the WAEMU zone?

The main objective of this study is to analyse the impact of banking development on human development. Specifically, it will analyse the influence of banking variables on the level of well-being of the populations of the WAEMU zone.

¹ This Union is composed of 8 countries: Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo.

² Source: World Bank 2015

³ Source: World Bank 2015

In relation to our objectives, we can postulate the following hypotheses:

H1 : Monetary variables positively influence the level of well-being of the populations of the WAEMU zone.

H2 : Banking development has a positive impact on human development in WAEMU countries.

Methodologically, we apply a panel model with a fixed and random effect. This article contributes to the empirical literature on banking development and economic growth in six WAEMU countries over the period 1994-2014. The results obtained indicate that variables reflecting banking development have a positive impact on human development.

This article is organized as follows: Section 2 reviews the literature on the contribution of the banking sector to economic growth. Section 3 presents a statistical study of some macroeconomic variables. Section 4 is devoted to the research methodology. Section 5 is reserved for the presentation of results and economic interpretations. Section 6 is dedicated to the conclusion.

2. Review of literature

2.1. Review of Theoretical Literature

The review of the theoretical literature on the link between banking development and economic development can be grouped into two categories. A first category focused on the study of the link between financial development and growth, in a linear manner. In the case of developing countries, [McKinnon \(1973\)](#) and [Shaw \(1973\)](#), financial liberalization is an essential factor in helping developing countries out of economic underdevelopment. A rich literature on development considers financial development as an important factor in economic growth. However, with regard to the meaning of causality between finance and growth, the agreement is less broad. Financial development could be a response to the needs of the real sector. From this perspective, finance does not cause growth but rather follows growth ([Robinson, 1952](#)). Studies also indicate the possibility of a two-way relationship between the financial sector and economic growth. Thus, [Patrick \(1966\)](#) proposes three hypotheses of links between finance and growth. First, there is the so-called "supply-leading" hypothesis, in which financial development is at the origin of economic growth. Then, he proposes the opposite hypothesis called "Demand-following" where financial development is a consequence of growth. Finally, the so-called "Stage-of-develop" hypothesis states that finance causes growth in less developed economies. However, as economies develop, causality reverses: growth drives finance. [Berthelemy and Varoudakis \(1994\)](#) present a simplified model that takes into account an externality exerted by the real sector on the financial sector to analyze the long-term interaction between financial development and growth. Their model highlighted a poverty trap phenomenon associated with inefficient allocation in an economy where private agents would live in financial self-sufficiency. The results show threshold effects between growth and financial development and the importance of financial sector policy analysis. [Beck and Levine \(2002\)](#) study the relationship between banks, financial markets and economic development. They also conclude that the development of the banking system and the financial market can be beneficial to economic growth if certain conditions are met. A second category of study focused on the search for a non-linear link between financial development and growth. Thus, [Deidda and Fattouh \(2002\)](#) obtain a non-linear relationship in an endogenous growth model with financial intermediation. The effect of intermediation on economic growth is ambiguous when the level of development of the banking sector is low. Agents with risk aversion prefer to bear the costs on transactions imposed by financial intermediaries rather than place themselves on the market. This choice results from the behaviour of banks seeking to reduce risk by diversifying assets. In this case, the development of the banking sector weighs on economic growth relative to the market. However, for a high level of development in the banking sector, the effect on growth is still positive because of the relatively high level of revenues. In the case of poor countries, even the choice of indicators can be problematic because of the effects on people's well-being.

2.2. Review of the Empirical Literature

This section highlights empirical work on the relationship between financial development and economic growth. First the linear relationship, then the non-linear relationship. Regarding the linear relationship, several authors have found that there is a linear relationship between financial development and economic development. Using a sample of 80 countries over a period from 1960 to 1989, [King and Levine \(1993a\)](#) indicate that the size of the informal sector, the level of financial intermediation, the share of credit allocated to private enterprises, strongly influence economic growth, the rate of accumulation of physical capital and the efficiency of capital allocation. For the BRICs, the study by [Mergan and Goçer \(2013\)](#) shows that financial development leads to economic growth. [Abbuya \(2012\)](#) analysed the impact of financial development on economic growth in the Franc zone and concluded that the financial sector has a positive impact on economic growth in the Franc zone countries, especially those in the WAEMU zone.

In contrast, the work of [Hassen et al. \(2013\)](#) have shown that financial development is detrimental to economic growth. However, this lack of a positive relationship must be linked either to underdeveloped financial systems in the region that hamper economic growth or the instability of real GDP per capita growth rates that affect the quality of the relationship between finance and growth. In the case of Mali, [Soumaré \(2009\)](#) shows that bank credit has a negative impact on the country's economic growth. This negative contribution to Mali's growth is due to a poor allocation of bank credit because 2/3 of bank credits to the economy are granted to the commercial sector, more precisely to imports, whereas productive sectors such as industry only benefit from 7%. This would favour the consumption of imported goods at the expense of production. Over the period 1966 to 2000, [Jeanneney and Kpodar \(2004\)](#) study the link between financial development, its instability and their respective impact on economic growth in developing countries. The study shows that there is a positive relationship between financial development and its

instability, determined by internal and external shocks to economies. Financial development will be more conducive to growth and poverty reduction if macroeconomic policy is more stable. It follows that the relationship between the two spheres is not linear.

Regarding the non-linear relationship, Aka (2005) studies the relationship between financial intermediation and economic growth⁴. The panel results indicate that there is a non-linear relationship between financial intermediation and growth, specifying that there is a structural optimum from which financial intermediation stimulates growth less. Indeed, the countries where financial intermediation stimulates growth most are, in general, developing countries where financial systems do not have developed capital markets. In contrast, countries where financial intermediation has a relatively small effect on economic growth are developed countries with developed capital markets. Out of a panel of 71 countries from 1960 to 2006, Eggoh and Villieu (2013) highlight the presence of multiple balances, which may reveal a non-linear relationship between financial development and growth. They argue that economic growth and development are positively linked when the financial sector is close and that this relationship becomes indeterminate when the financial system is developed. The interaction between the real and financial sectors reveals multiple balances, which can produce a non-linearity of the relationship between growth and financial development. Using an interaction variable composed of the product of financial development and the level of institutional development as a determinant of growth, Christophe *et al.* (2015) indicate that the quality of governance, in its different aspects, is a key factor for financial development in the Franc Area. They were able to determine a threshold above which the institutional framework improves the effect of financial development on economic growth, in the order of 0.09.

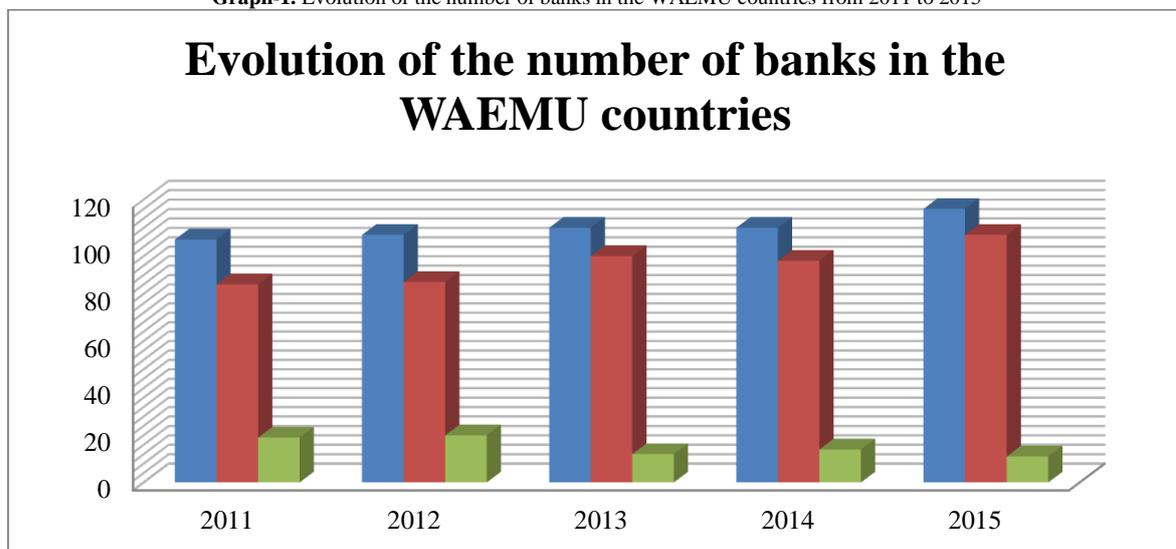
3. Statisticals Study of Macroeconomics Variables

In this section, we will present the evolution of banking development and some macroeconomic variables.

3.1. Evolution of Banking Development

The WAEMU banking sector comprises several types of banks. There are general banks and specialized banks. The WAEMU banking landscape remains dominated by generalist banks with a less noticeable presence of specialised banks (graph 1). The number of generalist banks in the WAEMU region has increased dramatically in recent years between 2011 and 2015. It rose from 84 to 105, an increase of 21 units in five years. The increase in generalist banks in WAEMU is due to the granting of new licences. But this development hides the absorption operations of some banks in order to resist the competition imposed by the large banks firmly established.

Graph-1. Evolution of the number of banks in the WAEMU countries from 2011 to 2015



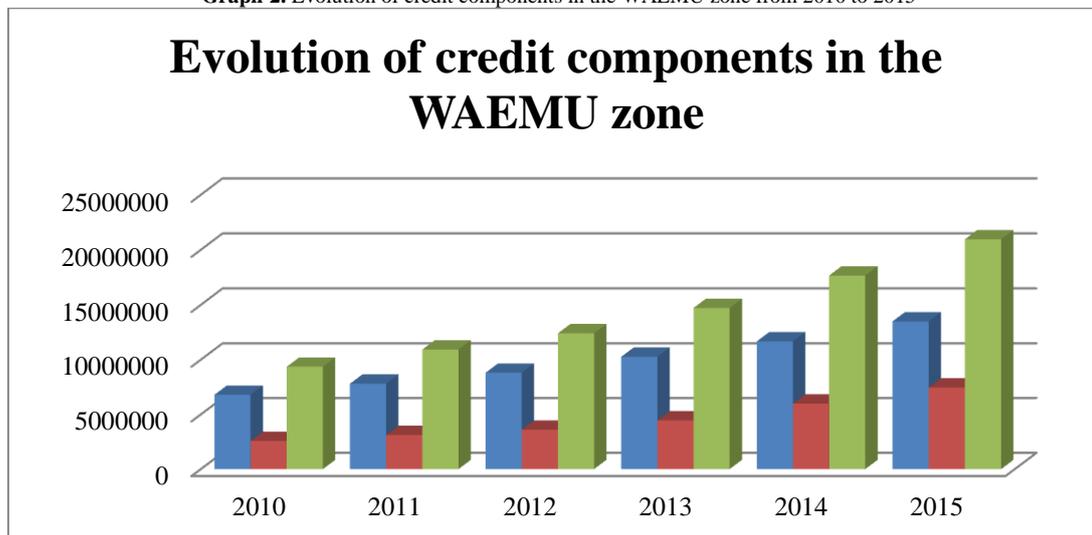
Source: Author based on data from the Banking Commission's annual report (2013, 2014, 2015).

Note: in blue: banks in activity ; in orange: generalist banks and in grey: specialised banks.

At the same time, the number of specialised banks fell from 19 to 11 over the same period. The decline in the number of specialized banks in the WAEMU region, most of which belong to the States, could be attributable to poor management. Credit distribution activity also increased. In the WAEMU zone, credit is the main activity of banks. It enables members to acquire everyday consumer goods, to meet social security contributions and to initiate income-generating activities. The supply of bank credit increased sharply in the area, as shown in Graph 2 below.

⁴ Chapter 1 of his thesis entitled The Role of Capital Markets in Economic Growth and Development.

Graph-2. Evolution of credit components in the WAEMU zone from 2010 to 2015



Source: Author based on data from the BCEAO (2015).

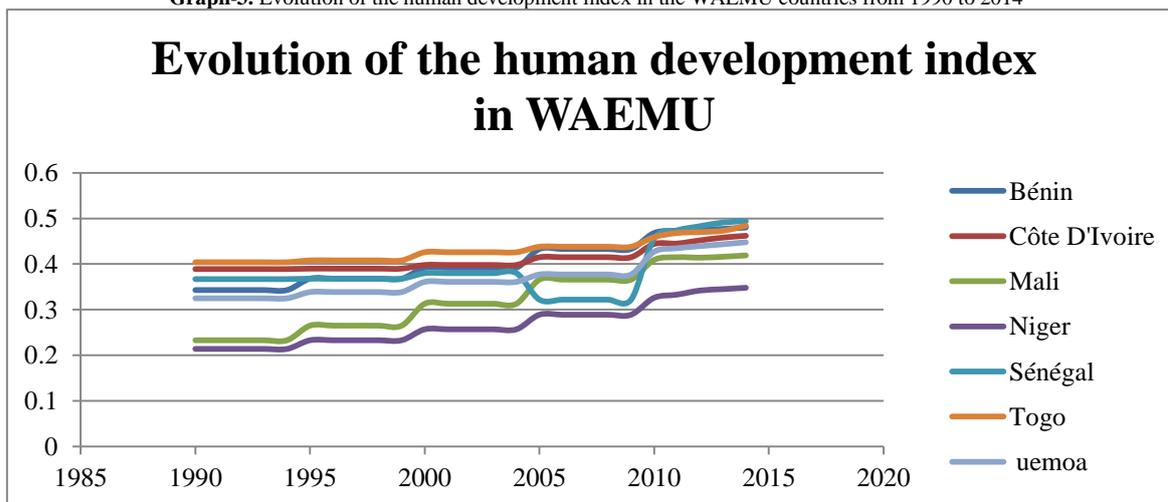
Note: in blue: credit to the economy ; in orange: claims on States and in grey: domestic credit

Concerning the sectoral distribution of credits to the economy, in the WAEMU zone, of the total credits granted, 37% went to the "trade, restaurant and hotels" subsector against 4% to the agricultural sector and 2% to extractive industries. The weakness in financing key sectors of the economy such as agriculture, public works and transport is real. In the WAEMU zone, bank credit is essentially short-term. In Côte d'Ivoire, short-term credit represented 76.8% of the total at the end of December 2015, medium-term credit 21.6% and long-term credit 1.6%. Even if the volume of loans distributed has increased, bank credit is relatively expensive in the WAEMU zone. The average real interest rate on bank loans in 2015 stood at 10.7% in the Union against 5.81% in Morocco. Bank lending rates remain high relative to resource costs. Indeed, the cost of all resources for banks is very low, standing at around 4% between 2009 and 2014. The banks' high lending rates are doubtful due to poor risk assessment.

3.2. Banking Development and Macroeconomic Variables

Although the banking sector is experiencing considerable growth, it does not seem to have a substantial impact on people's living conditions. Indeed, the human development index in the WAEMU increased by 37.79% from 1990 to 2014 but its level of development remains low. Graph 1 shows the evolution of the human development index in the WAEMU zone. As Figure 4 shows, the WAEMU countries have a different human development index. According to the HDI calculated by UNDP (2015), Senegal has the highest level of human development in the area and ranks 162nd in the world.

Graph-3. Evolution of the human development index in the WAEMU countries from 1990 to 2014



Source: Author based on UNDP data (2015)

Niger has the lowest level of development and ranks 187th out of 188 countries in the world. The low level of human development in the area is due to the level of poverty and a low level of education. From 2012 to 2015, economic growth in member countries accelerated slightly in 2015, reaching 7% on average. WAEMU thus posted sustained average growth, twice that of sub-Saharan Africa as a whole⁵. This remarkable growth is the result of dynamic growth in Côte d'Ivoire and Senegal. However, this acceleration in growth was contrasted by a slowdown

⁵ Global report for the franc area 2015, Banque de France

in growth in Benin, Mali, Niger and Togo. The slowdown in growth in these countries is largely explained by less favourable agricultural seasons than elsewhere in the region caused by drought. Particularly in the case of Niger, the decline in growth is attributable to the slowdown in extractive industry activities linked to the downward movements in commodity prices on the world market.

4. Strategy of Empirical Research and Data Description

In this section, we present the model specification and research methodology.

4.1. Model Specification

In econometric form, the regression model is as follows:

$$HDI_{it} = \alpha_{it} + \beta_1 CRED_{it} + \beta_2 (M2/GDP)_{it} + \beta_3 TXCGDP_{it} + \beta_4 INF_{it} + \beta_5 OUV_{it} + \beta_6 DP_{it} + \varepsilon_{it} \quad (1)$$

Where HDI is the human development index, it represents the level of well-being of a given country, $CRED$ represents the loans granted to the private sector by banks in relation to GDP. It measures the activity of financial intermediaries in developing countries. It was used by Levine and Zervos (1998) and Beck *et al.* (2000). The variable $M2/GDP$ measures the size of the overall financial system relative to the size of the economy. It is also an indicator of financial depth and a measure of the size of the formal financial intermediation sector in the broad sense relative to the size of the economy. This indicator has been used frequently in the financial literature by number of authors King and Levine (1993a); Beck *et al.* (2000); Levine *et al.* (2000). Among the control variables, $TXCGDP$ measures the growth rate of GDP per capita. This indicator measures the performance of the economy and INF represents the general price level in a country. It is measured by the consumer price index. The relationship between inflation and economic growth has been studied by several authors such as Mundell (1965), De Gregorio (1996), Ghosh and Phillips (1998), Khan and Senhadji (2001). OUV measures the degree of openness of a country while DP represents public expenditure. The variables and their different impacts are summarized in the table below.

Table-1. Summary of study variables and expected sign

Endogenous variable: HDI (Human Development Index)		
Exogenous variables	Description of Variables	Expected signs
CRED	Credit to the private sector	+
M2/GDP	Financial depth	+
TXCGDP	Growth Rates	+
INF	General price level	-
OUV	Degrees of opening	+
DP	Public expenditure	+

Source : Author

4.2. The Panel Estimation

Our study is carried out using panel data, with regard to their double dimensions, in particular an individual dimension and a temporal dimension. Panel data, because of this characteristic, are therefore particularly suitable when one wishes to estimate models and test the theories underlying them (Nerlove and Balestra, 1995). Therefore, the model (1) can be specified again as follows:

$$HDI_{it} = \alpha_{it} + \beta_1 CRED_{it} + \beta_2 (M2/GDP)_{it} + \beta_3 TXCGDP_{it} + \beta_4 INF_{it} + \beta_5 OUV_{it} + \beta_6 DP_{it} + \varepsilon_{it} \quad (2)$$

With $i = 1, \dots, \dots, 6, t = 1, \dots, \dots, 25$; X_{1it} , the value of the j -ième variable for the i -ième unit at the period $t, j = 1, \dots, \dots, 6$. K is the number of explanatory variables of the model and α_{it}, β_i , coefficients of exogenous variables for the individual i . At last, ε_{it} is the term of errors for the individual i at the time t .

This model assumes that each individual has a specific behaviour, itself differentiated from one period to another. Devoid of any economic interest, the model becomes interesting once identifying restrictions are imposed on it, which correspond to the different hypotheses to be tested. The economic literature most often adopts three hypotheses that we present in the context of our study.

4.1.1. First the Homogeneous Model

This type of model assumes the presence of uniform behaviour between individuals. Model estimation is the simple application of ordinary least squares (OLS) to all end-to-end data without regard to their particular nature or that of the hazard ε_{it} . In this model, all coefficients are identical. In this case we can write:

$$H1: \begin{cases} \alpha_{it} = \alpha \\ \beta_{kit} = \beta_k \end{cases} \text{ and } H2: \mu_{it} = iN(0, \sigma^2)$$

It follows that our model is given by :

$$HDI_{it} = \alpha + \beta_1 CRED_{it} + \beta_2 (M2/GDP)_{it} + \beta_3 TXCGDP_{it} + \beta_4 INF_{it} + \beta_5 OUV_{it} + \beta_6 DP_{it} + \mu_{it} \quad (3)$$

If we postulate the existence of differences in behaviour between individuals, then this model is no longer appropriate.

4.1.2. Second, the Individual Effect Model

which assumes that individual estimates differ only by the constant. In this case, we distinguish the fixed effect model where the individual effect is constant over time and the random effect model where the constant term is a random variable.

For the fixed effects model, he takes into account the heterogeneity of the behaviour of the individuals in the sample by considering that the equations governing the relationships between the explained variable and the explanatory variables differ from one individual to another by a constant. Therefore, the method of parameter estimation depends on the structure of the error terms. If the errors are homoscedastic, not autocorrelated in the time dimension and in the individual dimension, the OLS method is used on the indicator variables (LSDV = Least Square Dummy Variable) or on Within estimators. On the other hand, if the errors are heteroscedastic and/or autocorrelated in the time dimension but independent in the individual dimension, the Least Squares Generalized method is used on the indicator variables (LSDV) or Within estimators. In the case where the systematic effects are represented by the ordinates originally α_i for each individual the assumptions can be written as follows :

$$H1: \begin{cases} \alpha_{it} = \alpha_i \\ \beta_{kit} = \beta_k \end{cases} \quad \text{and} \quad H2: \mu_{it} = iiN(0, \sigma^2)$$

The equation is given by :

$$HDI_{it} = \alpha_i + \beta_1 CRED_{it} + \beta_2 (M2/GDP)_{it} + \beta_3 TXCGDP + \beta_4 INF_{it} + \beta_5 OUV_{it} + \beta_6 DP_{it} + \mu_{it} \quad (4)$$

In the absence of structural specificity of the endogenous variable which differs according to the individuals, it is possible to retain another hypothesis: that of the random effect. The random effect model assumes that the relationship between the variable to be explained and the explanatory variables is no longer fixed but random. The individual (constant) effect is no longer a fixed parameter but random. This model can be written as follows:

$$H1: \begin{cases} \alpha_{it} = \alpha \\ \beta_{kit} = \beta_k \end{cases} \quad \text{and} \quad H2: \mu_{it} = \alpha_i + \varepsilon_{it}$$

The equation is again given by :

$$HDI_{it} = \alpha + \beta_1 CRED_{it} + \beta_2 (M2/GDP)_{it} + \beta_3 TXCGDP_{it} + \beta_4 INF_{it} + \beta_5 OUV_{it} + \beta_6 DP_{it} + \mu_{it} \quad (5)$$

With : $\mu_{it} = \alpha_i + \varepsilon_{it}$

The Hausman test is a specification test that determines whether the coefficients of the two estimates (fixed and random) are statistically different. The statistic of this test is a Chi-two to k degree of freedom. If the probability of the test is less than 5%, then Within estimators are unbiased. Otherwise, GCM estimators or the random effect model will be used.

4.2. Stationarity and Cointegration Test

The robustness of the results depends on compliance with the stochastic characteristics of the series. To do this, the stationarity tests and, where appropriate, the cointegration test should be applied. Variables are stationary if the characteristics (expectation and variance) do not change over time. It is difficult, if not impossible, to clearly identify the stochastic characteristics of a series if it is not stationary. In panel, the most widely used test to analyze the stationarity of variables is that of [Im et al. \(2003\)](#) and [Levin et al. \(2002\)](#). The cointegration test identifies the true relationship between two variables by looking for the existence of a cointegrating vector and eliminating its effect, if any. Cointegration tests can detect the presence of a long-term relationship between variables. However, it is very interesting to know the short and medium term evolution of this relationship. If the series are cointegrated, then their relationship should be estimated through an error-correction model. For the cointegration test, we adopt the tests proposed by [Westerlund and Edgerton \(2007\)](#) to test the long-term relationship between the human development index and banking variables. Indeed, [Westerlund and Edgerton \(2007\)](#) developed four cointegration tests that are based on the structural dynamics of relationships and not on residues. The null non-cointegration hypothesis is tested by checking whether the error correction term in the error correction model constructed for this purpose is significantly equal to zero. The first two tests (Gt and Ga) test the existence alternative of at least one individual for whom the variables are cointegrated. The last two tests (Pt and Pa) test the null hypothesis of no cointegration against the alternative hypothesis that the panel as a whole is cointegrated.

4.3. Data and Descriptive Statistics

In this sub-section, we first present the source of the data and second, the different statistical characteristics of our study variables. Our study will be based on a panel of six (6) WAEMU countries over the period (1990-2014) and the choice of this period is related to the availability of data. Burkina Faso and Guinea Bissau are excluded from the study due to lack of data. Data for the study come mainly from the World Bank (WDI), the Central Bank of West African States ([BCEAO, 2015](#)), the [Banque de France \(2014\)](#) and the United Nations Development Programme ([UNDP, 2015](#)). [Table 2](#) below provides a statistical description of the variables used in our study.

Table-2. Description of variables

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
IDH	150	0.3767133	0.0725564	0.212	0.491
CSPPIB	150	16.91369	7.365962	3.302083	37.42317
M2/PIB	150	115.2739	90.5428	17.92606	449.378
OUV	150	0.259237	0.126594	0.0085689	0.664386
INF	150	81.72693	20.44045	38.11	114.02
TXCPIB	150	3.47434	4.537992	-15.09583	16.22897
DPPIB	150	0.1975139	0.774068	0.0837835	0.4333288

Source: Author based on UNDP (2015) and WDI (2015) data

Analysis of the table indicates an average level of human development in WAEMU of 0.38 with a maximum of 0.491. This level remains low in WAEMU. The average credit rate granted to the private sector is 16.91% with a maximum of 37.42% and the average size of the financial system is 115.27 with a maximum of 449,378. The average opening rate is 25.92% with a maximum of 66.4%. The average growth rate is 3.47% with a maximum of 16.23% and the average level of public expenditure is 19.75% with a maximum of 43.33%.

5. Results of Empirical Research

The purpose of this section will be to present the results of the various econometric tests and the results of the estimation of our model, then their statistical and economic interpretations.

5.1. Results of Stationarity Test and Cointegration

The results of the tests developed by Levin *et al.* (2002) and those of Im *et al.* (2003) are shown in Table 3 in the Appendix. The analysis of this table shows that only the variable TXCGDP is stationary in level according to the results of the IPS test, so the unit root hypothesis is verified. The results from the LLC test show that the INF and TXCGDP variables are level stationary. However, the other variables provide results in favour of the unit root hypothesis. In the first difference, the unit root hypothesis is rejected by the two tests for all the analysis variables. Thus, we can say that all panel series are first order integrated as shown by the statistics of Levin *et al.* (2002) and Im *et al.* (2003). For the cointegration test, as noted above, we adopt the test proposed by Westerlund and Edgerton (2007) and the results are reported in Table 4. The results indicate that the non-cointegration hypothesis can be rejected at the 1% threshold for all variables of the panel, taken as a whole, with regard to the Pt and Pa statistics. This means variables allow a dynamic specification of error correction type. Moreover, the hypothesis of the existence of a long-term relationship between the series is validated. Therefore, the error correction model can be adopted for the entire panel.

5.2. Tests for Specifying Individual Effects

First we test the homogeneous or heterogeneous specification of the data generating process. It will test the equality of the coefficients of the model studied in the individual dimension. This amounts to determining, from the specification tests, whether one is entitled to assume that the theoretical model studied is perfectly identical for all individuals. The rejection of the null hypothesis of absence of individual effects (Prob > F = 0.0002) in this study leads to perform the Hausman test to discriminate between the fixed effect model and the random effect model. Table 6 indicates that the results obtained lead to the acceptance of the null hypothesis and therefore to the estimation of the random effects model. Now we can estimate our panel error correction model in two steps. The first step consists in estimating the short-term relationship while the second step is dedicated to the long-term dynamics.

5.3. Analysis and Interpretation of Results

Here we analyse and interpret the results of the short-term and long-term relationship estimates. Regarding short-term dynamics, the results of our ECM estimation of the short-term relationship between banking development and human development are summarised in Table 3. The analysis in Table 3 shows that in the short term, for the model with CRED only one explanatory variable (TXCGDP) is significant and for the model with M2/GDP, the explanatory variables M2/GDP and TXCGDP are significant. The variable M2/GDP of model 2 presents a statistical significance at the 5% threshold with a positive coefficient. Our results also indicate that in the short term in both models the growth rate is positively correlated with the level of human development. Table 4 presents the results of the long-term dynamics between banking development and human development. All variables in both models are significant with the exception of the variable DP for model 1. These are the variables CRED, OUV, INF and TXCGDP and for model 1, the variables M2/GDP, OUV, INF and TXCGDP.

Table-3. Results of the short-term relationship between banking development and human development

Variable explained: Human Development Index (HDI)		
Variables explicatives	Modèle (1)	Modèle (2)
DCRED	0.00004 (0.668)	
D (M2/GDP)		0.00001** (0.022)
DOUV	0.07149 (0.325)	0.04006 (0.567)
DINF	0.0001 (0.122)	0.00007(0.244)
DTXCGDP	0.00049*** (0.000)	0.00046*** (0.000)
DDP	-0.00325 (0.531)	-0.00282 (0.561)
CSTE	0.149 (0.031)	0.299 (0.004)

Note : Values in brackets are p-values. (*) (**) (***) represent the respective significance levels of 10%, 5% and 1%.

In the long run, banking development, measured by the credit granted to the private sector and the size of the financial system as a whole relative to the size of the economy, are significant at the 10% and 5% thresholds respectively and both have a positive coefficient. Our results indicate that an increase in credit to the private sector leads to an increase in the level of human development. Similarly, an increase in the size of the financial sector leads to an increase in the level of human development. These coefficients are in accordance with the expected signs. However, the degree of openness has a negative and significant effect at 10% for model 1 and 5% for model 2. The sign of the opening rate is contrary to our expectations. The results show that an increase in the openness rate is not favourable to human development in the two models studied. Similarly, the sign of the inflation rate is counter-intuitive. Indeed, the general price level has a positive and significant impact at the 1% threshold in both models. The results suggest that higher inflation leads to higher levels of human development in both models. This result is contrary to those of [Boyd et al. \(2001\)](#), for whom inflation has a negative effect on real activity. But this result could be the result of a trade-off between inflation and unemployment within the WAEMU zone. Indeed, with the restrictive monetary policy conducted in the zone, a relaxation could have beneficial effects for employment and thus improve the well-being of the populations.

Table-4. Results of the long-term relationship between banking development and human development

Variable explained : Human Development Index (HDI)		
Variables explicatives	Modèle (1)	Modèle (2)
CRED	0.0553*(0.065)	
M ₂ /GDP		0.0006**(0.022)
OUV	-1.6491*(0.063)	-4.3220**(0.004)
INF	0.0043*** (0.000)	0.0041*** (0.000)
TXCGDP	0.0248*** (0.000)	0.0290*** (0.000)
DP	-0.2099(0.3190)	-0.1494(0.540)
CSTE	0.149(0.031)	0.299(0.004)

Source: Author

Note: The values in brackets are p-values. (*) (**) (***), represent the respective significance levels of 10%, 5% and 1%.

The variable TXCGDP is positively correlated to the level of human development with a statistical threshold of 1%. Moreover, one of the components of the HDI is income. The sign of the coefficient of the variable TXCGDP is consistent with theoretical predictions.

6. Concluding Remark

In this study, our objective was to analyze the effect of banking development on human development in six WAEMU countries, over a period from 1990 to 2014. Based on the panel error correction model (ECM), the empirical results showed a positive relationship between banking development and human development. Credit to the private sector and the size of the economic system have a positive and significant impact on human development, but this impact remains small. Similarly, the growth rate of GDP per capita and the level of inflation have a positive impact on human development. However, openness has a negative impact on human development in WAEMU countries.

In total, these results provides a number of policy implications. Firstly, the financial system must be made more sound, more efficient and more favourable to financing activity. This requires better access by private sector companies to bank credit financing and an increase in the size of the banking system. Second, the capacity of financial institutions to control and manage risk should be strengthened. The creation of a credit bureau, the definition and protection of property rights are favourable to banking activity. Anything that helps to reduce the cost of resources and risks enables banks to finance activities more, grant more credit to populations, thus promoting a reduction in poverty and an improvement in the level of human development. The State may encourage banks to set up in rural areas in order to enable the rural masses to benefit from banking services. This study could be extended by studying the impact of financial development on poverty reduction from a spatial perspective.

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Appendix

Table-5. Panel unit root test results

Variable	IPS		LLC	
	Coef	P-value	Coef	P-value
HDI	4.9613	1.0000	2.5224	0.9942
CRED	2.6386	0.9958	0.8905	0.8134
M2/GDP	4.556	1.0000	3.5329	0.9998
OUV	-0.4891	0.3124	-0.8127	0.2082
INF	0.9191	0.8210	-3.2871	0.0005
TXCGDP	-5.9253	0.000	-2.4278	0.0076
DP	1.5846	0.9435	3.4044	0.9997
dHDI	-6.4859	0.0000	-7.1496	0.0000
dCRED	-4.4340	0.0000	-2.4953	0.0063
dM2/GDP	-7.5559	0.000	-4.6255	0.0000
dOUV	-6.4563	0.0000	-3.7607	0.0001
dINF	-5.4215	0.0000	-6.1454	0.0000
dTXCGDP	-8.4770	0.0000	-5.2106	0.0000
dDP	-7.6616	0.0000	-2.3885	0.0085

Source : Author

Table-6. Hausman Test Results

The Hausman test accepts the null hypothesis that country-specific effects can be correlated with model variables or alternatively, that these effects are orthogonal to these explanatory variables. In other words, the Hausman test allows us to choose between the fixed effect model and the random effect model.

Modèle-1. Model using private sector credit (CRED) as an indicator of financial development

Test d'Hausman	Prob> chi2 =0.000
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Source: Author

Modèle-2. Model using variable M2/GDP as an indicator of financial development

Test d'Hausman	Prob> chi2 =0.000
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Source: Author

The results obtained from these two models lead us to reject the null hypothesis and therefore to estimate the fixed effects model. Human development does not depend on the individual specification of each country. We estimate our panel error correction model.