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Impact of Financial Market Development on Economic Growth in Sub-Saharan African Countries: A Study Over The Period From 2015 to 2020

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Abstract: The objective of this article is to empirically study the impact of the development of stock markets on economic growth in Africa and particularly in SSA. The results obtained from the static panel model through use of the generalized least squares (GLS) method for the first model and the random effect model for the second. The results obtained using data from 10 SSA countries and over a 16-year horizon from 2008 to 2024, suggest long-term indifference of stock market development on economic growth. Economic growth being measured by the growth rate of real Gross Domestic Product per capita and the development of the stock market approximated by the size of the stock market, the turnover rate in volume and the liquidity of the stock market. The comparison of the two models allowed us to set up the Granger causality test which predictably gave us nothing concerning the direction of causality. We concluded that the SSA stock markets outside South Africa, considered homogeneous, were not yet sufficiently developed to have a positive impact on economic growth.

Keywords: Sub-Saharan Africa, Stock market development, Economic growth, Panel data, causality.

JEL Codes: E 43, G17

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1. INTRODUCTION

The financial market plays a decisive role in promoting greater economic efficiency. It directs funds to those who need them. A well-functioning financial market is a key factor of production. We distinguish: The spot financial market (securities exchange) with an equities compartment and a bonds compartment and the futures financial market (over-the-counter market, futures market, etc.). In 1602 the Dutch East India Company was the first company to finance its investment through the public sale of shares, exchanged with a price determined by the comparison of supply and demand. At the beginning of the 18th century, we saw stock exchanges multiply (London: 1773; Paris: 1724; New York: 1792 etc.). Today states (via bond issues) use this instrument as a source of financing for their major projects as well as large companies use it for their investments. If Euronext and the London Stocks Exchange in Europe, the NYSE (New York Stocks Exchange) in the USA Tokyo in Japan are undoubtedly the largest financial centers in the world, since the 1980s new financial centers have emerged thanks to the liberalization policies established by the developing countries and have taken the names of "emerging markets". The growth of emerging stock markets has been meteoric in recent years.

From 1989-1998 the number of developing countries with actively trading stock markets increased from 31 to 78. Stock indices increased by more than 300% from 8709 to 26354, and market capitalization in emerging markets increased by 256% to US$1.91 trillion Magnus and Wydick (1998). These markets are concentrated mainly in Asia, the Middle East, Central America and Africa. In the latter in particular, progress has been dazzling in recent years. From four financial markets in 1976, the number increased to eleven by the end of 1996 in South-Saharan Africa Kenny and Moss (1998). Currently the African continent has at least thirty financial indices which are present in the capital markets highly dominated by the equity market and an embryonic public debt market for several years. Over the last 5 years, African stock markets have grown by around 210%, one of the most notable increases globally.

The relationship between financial development and economic growth has attracted widespread attention over the past four decades, and many studies focused in this area have illuminated the performance of the financial sector. Therefore, financial development is an important tool for economic growth (Bagehot1, 1873; Schumpeter, 1911; Calderon, 2003; Levine, 2005; Demirgüç-Kunt and Levine, 2008). There are many different views in previous work on how financial development is linked to economic growth (Goldsmith,

1969; McKinnon, 1973; Shaw, 1973; King and Levine, 1993; De Gregoria and Guidotti, 1995).). He started with Schumpeter (1911), who argued that financial development plays a role for economic growth.

King and Levine (1993) supported Schumpeter's work by showing that financial development is strongly linked to economic growth and has a positive and significant effect on the latter. At the same time, other works (Robinson, 1952; Gurley and Shaw, 1967; Lucas, 1988; Chandavarkar, 1992) have demonstrated the weakness of this relationship and noted that financial development is not a major factor in supporting sustainable growth. The nature of the causal relationship between financial development and economic growth is divided into three categories. The first is the "Supply leading" vision, which means that financial development is a major factor in promoting economic growth, hence financial development causes economic growth. Second, the "Demand following", which indicates that economic growth is the key factor to develop the financial system, hence, economic growth leads to financial development. A third nature of relationship leads to a bidirectional relationship between financial development and economic growth.

These different points of view on the link and direction of causality between financial development and economic growth, prompt us to conduct a study to verify the direction of this relationship in West Africa, because knowledge of the direction causality remains vital and has an important implication for the economic policy of the Country. In addition, for more than a decade, we have better understood the economic dynamics in this part of Africa, which experienced a period of turbulence around the 1990s and recession which faded in 2002. Since then, apart from the yo-yo shocks of the premium financial crisis in 2008, the fall in commodity prices in 2015 and the current coronavirus crisis, the growth rate has always hovered around 5%. Likewise for the financial system, it has experienced quite remarkable growth since the beginning of the 2000s. However, with a very young and shallow profile (Pinshi, 2017a), the Congolese financial system remains more limited by and in relation to other African countries and around the world (Ilunga and Pinshi, 2018). This first section is followed by a literature review of empirical and theoretical studies on the link and direction of causality between financial development and economic growth.

The financial system plays a crucial role in the economy by mobilizing savings to finance investment which is the basis of growth (Pagano, 1993; Levine, 2005). The evolution of a country's economic activities depends on the

health of its financial system. Numerous financial crises have also shown that a simple malfunction of the latter is enough for us to arrive at an economic recession. This is the case of the "subprime" crisis which has weakened real sector activities throughout the world. This is also the case for the banking crisis which hit the majority of Sub-Saharan African (SSA) countries in the 1980s. The latter has led to a drastic decline in growth rates in the region. In the CEMAC zone for example, the average annual growth rate fell sharply from 5.6% over the period 1980-1985 to -1.3% between 1986 and 1989, then -0.9% over the period 1990. 1993 (BEAC, 2002). Faced with this disastrous situation, financial reforms were adopted in the early 1990s with a view to rehabilitating the banking sector, diversifying sources of financing and modernizing payment systems and means.

Following these reforms, the level of financial development improved in SSA, but economic growth did not really follow. The share in GDP of credit allocated to the private sector by financial intermediaries increased from 13% in 1990 to 18% in 2015. The same is true for stock market capitalization whose share in GDP increased from 5.4 % to 50% (GFD, 2015). The economic growth rate has remained low with a downward trend in recent years. Over the period 2010-2016, the real GDP growth rate fell from 5.4% to 1.24% in the region (WDI, 2018).

There are times when the growth rate is negative in certain sub-regions and countries. Case of CEMAC and Nigeria with a real/capita GDP growth rate of -3.7% and -40.1% respectively in 2016 (WDI, 2018). This observation leads us to focus our work on the following question: What is the Impact of the Development of financial markets on economic growth in sub-Saharan African countries? To answer this question, it would be useful to see how economic growth behaves in relation to changes in the financial system. A review of the literature allows us to better understand the contours of the subject in order to see if there is a way to treat it in another way. The critical analysis of this literature will lead to the adoption of a methodology necessary to carry out an econometric analysis.

The interpretation and discussion of the results will make it possible to make economic policy recommendations. In Africa south of the Sahara, securities exchanges can be classified into four geographical categories: West Africa, Central Africa, Southern Africa and Eastern Africa. West Africa has three stock exchanges (Nigeria, Ghana and Ivory Coast representing the 08 UEMOA countries), Central Africa two stock exchanges (La Douala Stocks Exchange

and the Central African Securities Exchange).), in Eastern Africa there are seven financial centers and in Southern Africa four. Market capitalization of these stock exchanges south of the Sahara is 200 billion dollars in 2002 and 808 billion dollars in 2006.

West Africa experienced the strongest growth in capitalization between 2002 and 2006 with 525%, or 1.4 times the continental average. This strong growth is largely due to the dynamism of the Nigerian stock market, the fourth most active and largest stock exchange on the continent in 2006. It should be noted that these amounts are also high thanks to the performance of the South African stock market. South. Because without it, the capitalization in 2002 would be 18.5 billion dollars and 92 billion dollars in 2006.

2. REVIEW OF LITERATURE

The financial system owes its existence to the imbalance that exists between the investment in physical assets of non-financial agents and their savings. Overfunded agents seek employment for the excess of their income over expenses. Likewise, agents in need of financing want to spend a little more over a period than they earn. It is this complementarity which justifies the existence of capital markets where lenders and borrowers can directly or indirectly meet. There are 02 typologies in the financial system: a bank-oriented system and another market-oriented: The bank-oriented system or financial intermediation is the traditional form of the financial system. It is characterized by the presence of financial intermediaries. The market-oriented system is the one in which the meeting between agents with financing capacity and agents with financing needs takes place directly on the financial market or stock market. This relationship between non-financial agents and financial institutions is based on public information.

The optimal method of financing is still a controversy. The contrasting economic development experience of countries which primarily developed financial markets (England, United States) and those which relied primarily on the system of universal banks (Germany, Japan) is an illustration of this. There is now extensive empirical literature that proves the robustness of the link between economic growth and the stock market. Its fervent defenders are (Levine (1997), Goldsmith (1969), Mc Kinnon (1973), Merton Miller (1988) this through the financing of productive investments. Other authors such as Joan Robinson (1952) and very recently Lensink et al (1998) think that it is rather economic growth which drives the development of the financial system.

We therefore have a first current which maintains that the development of the stock market precedes and influences economic development and the second supports the opposite thesis. Between these two currents, there are two other currents, the first of which supports a bilateral relationship between the two phenomena and the second stipulates that finance has no influence on growth.

2.1. The stock market and economic growth

The stock market is the meeting place between the supplier and the applicant of financial products (or securities), the best known of which are stocks and bonds. However, there are other products which, although not well known to the general public, are also traded, including: options, warrants, subscription warrants, etc. Stock markets are divided into two categories. The spot market and the futures market.

The functions of stock markets in growth

The main function of financial markets is to facilitate efficient allocation of resources in time and space, in an uncertain environment Merton and Bodie (1995). According to Levine (1996) these functions can be extended to the financial system and fulfills a function called primary by Levine (1997). This primary function is subdivided into five basic functions by Levine (1997):

- Mobilization of savings;
- Acquisition of information on firms and allocation of resources;
- Exercise of control over companies;
- Liquidity;
- Facilitation of risk management.

We will see how these five functions affect economic growth through the two channels of capital accumulation and technological innovation. The financial system affects the accumulation of capital by affecting the savings rate and the reallocation of these savings. Technological innovation concerns the invention of new production processes (Romer 1990).

2.2. Stock market development measure

Several indicators allow us to measure the development of the stock market. The theory does not give us a single measure of the development of the stock market. The measures suggested to measure the development of the stock market relate to:

- The size of the market;

- Market liquidity;
- The depth of the market;
- Market concentration.

Bencivenga, Smith and Starr (1996) agree and find that stock market liquidity is important for economic growth. Indeed, enhanced liquidity therefore facilitates investment in long-term projects with higher profitability and stimulates economic growth. Bencivenga et al. (1996) and Levine (1991) believe that a liquid market reduces the risk and the price of investment (possibility of quickly selling capital). This liquidity is explained by the hoarding of economic agents but also by the fact that they could be led to keep less savings in the form of real estate or durable consumption and money for the benefit of other goods such as shares and other titles. Also, stock markets can promote the acquisition of information about firms. The ability to take advantage of information will stimulate investors to research and monitor firms. Better information about firms will improve the allocation of resources and boost economic growth Grossman and Stiglitz (1980). A general consensus emerges from empirical studies indicating that the development of stock markets improves investment efficiency.

The number of listed companies has also seen a clear increase in recent years. Indeed, apart from two countries, South Africa and Namibia, which have seen the number of listed companies reduced, all the others have experienced either stability or an increase over the last two decades. This increase is significant on an overall level when we do not take into account the South African stock market. Indeed, taking the latter into account, we went from 1036 companies in 1992 to 961 in 2008 and from 353 companies in 1992 to 536 in 2008 without it, an increase of 51.84%. This actually hides the lack of enthusiasm among companies to list. Table 3.1 shows the SSA stock markets, their years of establishment, their main indices and the number of listed companies.

Table 1: Presentation of SSA stock markets

Countries	*date of creation*	*Date of start of transactions*	*Main indices*	*Frequency Weekly quotation*	*Number of companies listed*		
					1992	*2002*	*2008*
central Africa	2003				-	-	
Botswana*	1989		BSE domestic index	1	11	19	19
Cameroon	2001			1	-	-	04

Countries	*date of creation*	*Date of start of transactions*	*Main indices*	*Frequency Weekly quotation*	*Number of companies listed*		
					1992	*2002*	*2008*
Ivory Coast*	1976		BRVM 10 index	5	27	38	38
Ghana*	1989		GSE all share index	3	15	24	35
Kenya*	1954		NSE 20 share index	5	57	50	53
Malawi	1995		MSE domestic share index	1	-	8	14
Mauritania*	1989		SEMDEX	1	22	40	41
Mozambique	1999				-	-	
Namibia*	1992		NSX local companies	5	3	5	7
Nigeria*	1960		NSE all share index	5	153	195	213
South Africa	1887		JSE all share index	5	683	472	425
Swaziland*	1990		SSX all share index	5	3	5	7
Tanzania	1996		LA all share index	3	-	5	7
Uganda	1997		LA domestic share index	2	-	3	6
Zambia*	1993		LUSE all share index	5	-	11	15
Zimbabwe*	1896		ZSE industrial index	5	62	77	81

*these are the scholarships that were selected for our study
Sources: Author

From an average of 35.5 companies per stock market in 1992 this increased to 41.13 companies per stock market, this excluding South Africa. Compared to other regions of the world, these figures are very low and skewed with the presence of South Africa. SSA is at the bottom of the ranking just ahead of South Asia. The following graph 1 gives us an overview.

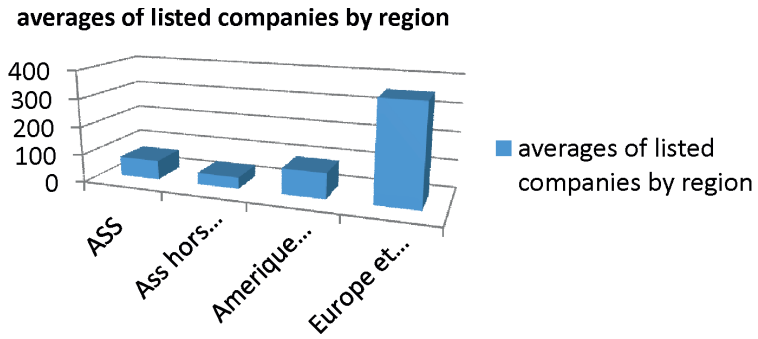

Figure 1: Distribution by Geographical Area of Listed Companies

Sources: Author

3. METHODOLOGICAL APPROACH

The data collected for this study are from secondary sources. They were extracted from the World Bank database in the WDI 2024 "World Development Indicators (2024)". This study covers 10 countries whose specificities may be common or different. It covers a period from 2008 to 2024. The periodicity is annual. The different problems we encountered during data collection are: firstly, there was the problem of incomplete data. We calculated moving averages on four terms to fill in the missing data for certain variables. The countries in our sample were chosen on the basis of their seniority (date of creation). Thus we retained the ten oldest stock exchanges in SSA and we excluded South Africa given its characteristics which are similar to those of developed countries and its size which represents two thirds in terms of capitalization of the entire continent. The following table represents the countries selected for our study.

Table 3: Country Selected for the Study with their Year of Creation

Country	date of creation
Kenya	1954
Mauritania	1989
Namibia	1992
Botswana	1989
Ivory Coast	1976
Ghana	1989
Nigeria	1960
Swaziland	1990
Zambia	1993
Zimbabwe	1896

Source: author

Empirically, to assess the direction of the relationship between financial development and growth, we can use a linear model as the theory formalizes it but which we adapt by the introduction of control variables and financial variables. Romer's endogenous growth model revised by Pagano (1993) considers capital and technical progress as arguments for the production function. Capital is considered here as a composite element whose elements are physical capital, financial capital and human capital. Econometric modeling of the relationship between the development of financial activity and economic growth was the work of authors such as King and Levine in their work dating from 1993a and Levine, 1997. The form used by these authors is as follows:

$$Y=\beta o + \beta_1 B(i) + \beta_2 X + \mu \quad 1$$

In this equation, Y represents the variable which materializes economic growth in logarithmic terms of course or the growth rate of GDP per capita. B (i) is used for financial variables. X is the matrix of control variables associated with economic growth. These include per capita income, education, savings rate, foreign direct investment, investment level, openness rate, trade, taxation and even monetary policy (Levine, 1997). This form of the production function is particular in the sense that it highlights the direct relationship between financial development and the growth of economic activity. Only according to Arestis and Demetriades (1997), this formulation does not provide us with sufficient information about the direction of finance-growth causality. Patrick (1966) established a one-to-one relationship between financial variables and real variables. The theoretical basis of this analysis is that in a first phase, the development of the financial sphere contributes in a large proportion to the development of the real sphere. This phase is that of "supply leading". In a second phase, the economic growth generated fuels financial innovations and contributes to the development of the financial system; this phase is called that of "demand following". Also Arestis and Demetriades (1997) suggest a formulation of the model in the form of a bivariate VAR. This form has the advantage of taking into account the interdependence of the two spheres and of analyzing the direction of causality between financial development and economic growth.

However, our study focuses more on the reciprocal impact between the two phenomena (the direction of the relationship) based on dynamic panel data. She also goes around questioning the sign of the relationship; for this reason, we prefer Levine's (1997) formulation for both models. For this analysis, the

structure of the Levine (1997) model adapted with the variables of Biekpe and Adjasi (2006) and Levine (1991) is retained. In which the growth rate of real GDP per capita is a function of certain control variables. The stock market growth variables retained will be the one used by Biekpe and Adjasi (2006), Sodjahin (2003), Mohtadi and Agarwal (2000). This model that we want to estimate to evaluate the impact of stock market growth on the economic growth of some SSA countries from 1990 to 2010 is as follows:

$$Y_{it} = f\,(MKT_{it}, lIQ_{it}, RTO_{it}, X_{it}) \quad 2$$

Where X represents the matrix of control variables, Y the real growth rate per capita, MKT the level of market capitalization as a percentage of GDP, stock market liquidity as a percentage of GDP and RTO the turnover ratio. Which gives us the following model:

$$Y_{it} = f\,(MKT_{it,}\, LIQ_{it}, RTO_{it}, TI_{it}, SAV_{it}, FDI_{it}) \quad 3$$

The control variables retained are: the interest rate (TI), savings (SAV) and foreign direct investment (FDI). So the model becomes:

$$Y_{it} = a_o + a_1 MKT_{it} + a_2 LIQ_{it} + a_3 RTO_{it} + a_4 TI_{it} + a_5 SAV_{it} + a_6 FDI_{it} + \mu_{it} \quad 4$$

In matrix form this gives us:

$$Y_{it} = G_{it}\, B + \mu_{it} \quad 5$$

With μit = αi + eit + βt or βt, αi, eit are the uncorrelated random disturbances. Git the matrix of explanatory variables and B the matrix of coefficients. With αi designates the constant term over time depending only on individual i, βt designates the term depending only on the variable t and eit is the crossed random term. To better measure the impact of each of the stock market variables, we will divide model (4) into 3 equations. By writing Y thus we will have the following model:

$$Y_{it} = f\,(MKT_{it}, X_{it}) \quad 6$$

$$Y_{it} = f\,(lIQ_{it}, X_{it}) \quad 7$$

$$Y_{it} = f\,(RTO_{it}, X_{it}) \quad 8$$

We therefore obtain the following regression system:

$$Y_{it} = \alpha_1 + ß_1 MKT_{it} + X_{it} + u_{it} \quad 9$$

$$Y_{it} = \alpha_2 + ß_2 LIQ_{it} + X_{it} + + u'_{it} \quad 10$$

$$Y_{it} = \alpha_3 + ß_3 RTO_{it} + X_{it} + u''_{it} \quad 11$$

The estimation of the two models will be done using the panel data analysis technique. Panel data offers an essential advantage because it takes into account at least two dimensions, individual and temporal. They contain data on several individuals observed over several dates. The usefulness of panel data is that they make it possible to control three types of factors: those which vary between individuals, but do not vary over time, those which could cause omission bias if we do not not taken into account, and those which are unobservable or not available and cannot be included in the regression. Thus, by fixing an observed individual which can be for example a country if we consider a panel of countries, we obtain the chronological series or longitudinal section concerning it. If the period examined is fixed, we obtain a cross-section or instantaneous section for all individuals. In order to better understand the above, consider an econometric equation of type $Y= a + b X + c Z+ \varepsilon$, where Y is the endogenous variable, the term error or hazard. This relationship takes the form $Yit = a + b Xit + c Zit + \varepsilon it$ for observation it, that is to say individual i at period t.

The particular modeling concerns only the specification of the hazards. The basic form is simply written: $\varepsilon it = ui + vt + wit$, where ui designates a constant term over time, depending only on the individual i, vt a term depending only on the period t and wit a crossed random term. The following which summarizes the estimation techniques depends on the assumptions made regarding the components ui, vt and wit and their relationship. First of all, a simple method can be used by directly applying O.L.S. on stacked data (Pooled Least Squares), without worrying about their nature or that of the hazard. This way of proceeding allows the estimation of the common effect model, also called "pooled estimator". The individuals in the model are then all treated in the same way, i.e. it is assumed that the panel of countries is homogeneous. We thus accept the uniformity of behavior and the homogeneity of observations.

Then, fixed effects models or covariance models which assume that ui, and vt are non-random constant effects, which therefore simply modify the value of the ordinate (or constant) of the equation according to the values of i and t. The basic hypothesis of these models is that the heterogeneity of behaviors is modeled by a generic individual effect. It is therefore a model with individual dummy variables. Consequently, this model highlights intra-individual variability (within estimator). If we assume that the crossed random disturbances satisfy the classical assumptions of O.L.S. i.e. centered, homoskedastic, independent and normal, the estimates are optimal. Finally, it may be important to estimate a random effects model, also called a compound error model, which assumes

random ui and vt. In other words, the individual effect is no longer a fixed parameter to be estimated but an unobservable random variable. In this model, the null hypothesis is the no correlation between the error terms and the explanatory variables. This results in interindividual variability (between estimators).

Table 4: Table of Abbreviations of Variables used

Variables	Data	Coded	Measures
Endogenous or target variable	Economic growth	Y	Growth rate of real GDP per capita
	Stock market development	MKT	Market capitalization/GDP
		LIQ	Value of transactions/GDP
		RTO	Value of transactions/capitalization
Control variables	Real interest rate	TI	Nominal rate minus inflation rate
	Savings level	SAV	Percentage of domestic savings per GDP
	Foreign direct investment	FDI	Value of foreign direct investment

Source: author

The heteroscedasticity test

This test will be done through the Breusch-Pagan test to see if our model is homoscedastic or not. If it is homoscedastic we will use the OLS method to estimate our model, but otherwise we use the MCG method. In this case, we will assume under the null hypothesis that our model is homoscedastic (constant and finite variance) and under the alternative hypothesis that the model is heteroscedastic (the variance is no longer a constant). For a significance threshold set a priori at 5%, if the probability of the test is lower than this threshold, we conclude that the null hypothesis is rejected and the alternative hypothesis is accepted.

Wooldridge's autocorrelation test

This test makes it possible to detect the presence of autocorrelation. Thus for a fixed significance threshold of 5%, if the probability of the test found is lower than this previously chosen threshold, we accept the alternative hypothesis and we conclude that the model is self-correlated. Thus, if the model is both autocorrelated and heteroskedastic then we will estimate our model using the MCGF method.

The Hausman specification test

The choice between fixed effects model and random effects model depends on the following considerations: the nature of the individual effect, the number of statistical units, the nature of the sample, and the type of induction that we want to make. However, the test for discriminating between fixed and random effects is the Hausman specification test. The Hausman test makes it possible to determine whether the coefficients of the two estimators (fixed and random) are statistically different. This test is based on the hypothesis of no correlation between the error terms and the explanatory variables (assumption of the random effects model). This assumption indicates that the two estimators are unbiased and therefore the estimated coefficients should differ. The test is based on the comparison of the variance-covariance matrix of the fixed and random estimators: $H = (\beta_f - \beta_a) var\,(\beta_f - \beta_a)^{-1} (\beta_f - \beta_a)$

The result follows a law with k-1 degree of freedom. If the p-value is greater than the significance level set a priori, the null hypothesis is accepted and in this case, we will use the random effects model. It is important to note that this test will only be used in the case where it is previously found through the autocorrelation and heteroscedasticity test that the fixed effects model is non-autocorrelated and homoskedastic. Otherwise, we use the MCGF method.

The Granger causality test

This test makes it possible to determine the causal relationship, in the sense of Granger (1969), between stock market development (B) and economic growth (Y) and to look for a dynamic of interaction between them under the hypothesis of homogeneity between the countries. The Granger causality test examines whether past values of one variable can help explain the current value of another variable conditional on past values of the second variable. Explained in a synthetic way, testing Granger causality simply means determining whether the financial variable B "Granger causes" the variable Y (GDP) by first observing to what extent the past values of Y arrive at explain the current value of Y and subsequently see the improvement in the estimation thanks to taking into account the lagged values of the variable B.

Intuitively, the Granger test determines whether the past values of B contain additional information about the current value of Y information that is not contained in the past values of Y (See Hernandez and Torero (2010)). If this is so, we say that B "Granger causes" Y. In other words, Y can be considered "Granger caused" if the variable B is decisive in the estimation of Y or, again, d

'equivalently, if the coefficients of the lagged values of variable B are significantly different from zero. However, it is important to specify that "bilateral causality", also called "reciprocal causality", can exist during these tests. Indeed, we can find ourselves in a situation where Y is "Granger-caused" by B and B is also "Granger-caused" by Y. More rigorously, in order to test Granger causality between two stationary series Bt and Yt (in the case of a bivariate regression), we can base ourselves on the following two starting equations:

$$Yit = \alpha_0 + \sum_{i=1}^{n} \alpha i \, Y_{t-i} + \sum_{j=1}^{m} \beta j \, B_{t-j} + \eta_t \qquad 12$$

$$\mathbf{Bit = \alpha_0 + \sum_{i=1}^{n} \gamma i \, B_{t-i} + \sum_{j=1}^{q} \lambda j \, Y_{t-j} + \mu_t,} \qquad 13$$

Where the variables εt and μt correspond to the error terms and the real numbers αi and λj; βj and γi are respectively the coefficients of the lagged values of the series Yt and Xt. The Granger test consists of posing the following two hypotheses:

- "Ho: Bt does not cause Yt"

- "Ho: YT does not cause Bt"

The null hypothesis that Bt does not cause Yt is rejected if the coefficients βj (j = 1, 2, 3,…, m) are significantly non-zero. In other words, Bt does not cause Yt when:

Ho: β1 = β2 = β3; = …… = βm= 0 is accepted.

Similarly, the null hypothesis that Yt does not cause Bt is rejected if the coefficients λj with j = 1, 2, 3,…, q are significantly different from zero. In other words, Yt does not cause Bt when:

Ho: λ1= λ2 = λ 3 = …… = λq= 0 is accepted.

Now, we can test these two hypotheses using a simple Fisher significance test of the parameters βj and λj or the probabilities. If the probability is lower than the thresholds of 1%, 5% or 10% or if F calculate is greater than F read, the Ho hypothesis is rejected. It is important to specify that this test is carried out according to the hypothesis that the εt and μt asymptotically follow a distribution of the F. This can be the case if the εt and the μt are white noise; this therefore amounts to saying that the series considered must be stationary series. If this is not the case, it is necessary to transform the series considered into stationary series suitable for being subjected to the causality test. In our study on the SSA stock markets and economic growth, it seems relevant to us to use Granger causality tests while respecting, however, the

Limitations of the model during the results interpretation phase. We will therefore have three systems of two equations to test the causal relationship between each stock market variable and GDP.

$$Yit = \alpha_0 + \sum_{i=0}^{n} \alpha i \, Y_{t-i} + \sum_{i=0}^{n} \beta j \, MKT_{t-j} + \varepsilon_t \quad 14$$

$$MKTit = \alpha_0 + \sum_{i=0}^{n} \gamma i \, MKT_{t-i} + \sum_{i=0}^{n} \lambda j \, Y_{t-j} + \mu_t, \quad 15$$

$$Yit = \alpha_0 + \sum_{i=0}^{n} \alpha i \, Y_{t-i} + \sum_{i=0}^{n} \beta j \, LIQ_{t-j} + \varepsilon_t \quad 16$$

$$LIQit = \alpha_0 + \sum_{i=0}^{n} \gamma i \, LIQ_{t-i} + \sum_{i=0}^{n} \lambda j \, Y_{t-j} + \mu_t, \quad 17$$

$$Yit = \alpha_0 + \sum_{i=0}^{n} \alpha i \, Y_{t-i} + \sum_{i=0}^{n} \beta j \, RTO_{t-j} + \varepsilon_t \quad 18$$

$$RTOit = \alpha_0 + \sum_{i=0}^{n} \gamma i \, RTO_{t-i} + \sum_{i=0}^{n} \lambda j \, Y_{t-j} + \mu_t, \quad 19$$

Despite the many advantages they offer, Granger causality tests are not without limitations. The inadequacies of Granger tests are linked to the fact that they can practically only be used in the case of two variables even if, theoretically, we can consider the case of several variables. Furthermore, it can happen that two variables, for example B and Y, are both determined by a third variable Z but that the latter acts with a delay. Thus a researcher will conclude, for example, that B exerts Granger causality on Y even though the causal link is not as obvious. It should also be noted that it would not, for example, be possible to determine the direction of the causal link emerging from a test (See Jacobs, Leamer and Ward (1979)). This problem would be mainly due to the fact that the null hypothesis tested constitutes a necessary but not sufficient condition, and that these tests are extremely sensitive to specification errors.

4. RESULTS AND ANALYSIS

Regarding the autocorrelation test, we used the Wooldridge procedure in the presence of panel data. The fact that Prob > F=0.4054 > 0.05 leads us to accept the null hypothesis. There is therefore no first-order autocorrelation (AR1). The second Fisher statistic giving the estimate of the fixed effects model, tests the joint significance of the fixed effects introduced. As Prob > F =0.0000 is less than 0.05, we accept the Ho hypothesis. Therefore, the fixed effects are not all zero. We must therefore reject the model estimated by OLS (common effects). We thus have a heterogeneous panel model. It therefore turns out that there are individual effects between the 10 countries of Sub-Saharan Africa specific to each country and which explain its growth rate of real/capita GDP. Thus,

the fixed effects model of the three equations gives R^2 within which explains respectively at 45.07%, 44.12% and 44.13% the part of the intra-individual variability of the dependent variable explained by that of the explanatory variables. The R^2 between respectively explain 25.10%, 25.36% and 24.25% of the contribution of fixed effects to the model. The problem that arises at this level is whether these country-specific effects are deterministic or random. To address this concern, it is appropriate to estimate the random effects model and carry out the Hausman specification test. But to develop the Hausman test, the fixed effects model must be homoscedastic and there must be no autocorrelation.

This involves checking whether the fixed effects model is homoscedastic. This verification is done through the Breusch-Pagan test which consists of regressing the square of the residuals (variable R2) of the fixed effects regression on the independent variables of the original regression.

According to the results in this table, we can conclude that there is heteroscedaticity in the fixed effects model given that Prob > F = 0.0000 at 5%. For this, it is no longer necessary to carry out the Hausman test because the model suffers from both a problem of heteroscedasticity and autocorrelation of order one (AR1). The appropriate method is Feasible Generalized Least Squares (FGLS) for all three equations which corrects for autocorrelation and heteroskedasticity to ensure the reliability of the results. The Fisher test shows that the estimated model is generally well specified. The estimation results obtained using the Stata software are recorded in Table 5 below. Column (1) gives the results of the simple model while column (2) concerns the robustness analysis.

Table 5: Regression results

Variable explained: Economic growth rate	*(1)*	*(2)*
GDP per capita (ln)	-1,605 (-0 42)	1,13 (0,29)
Financial development	16,113** (2,60)	27,99* (1,84)
Financial development squared	-7,331*** (-2,73)	/
DF*DF level		-16,64** (-2,16)
Investment (ln)	8,663* (1,74)	15,432*** (3,01)
Population growth	0,42 (0,29)	-1,648 (-1,07)
Inflation (ln CPI)	-10,14*** (-3,69)	-10,30*** (-3,54)

Variable explained: Economic growth rate	*(1)*	*(2)*
turnover rate (ln)	1,338 (0,61)	0,347 (0,17)
stock market liquidity (ln)	-6,889** (-2,50)	-5,701** (-2,52)
Constant	26,255 (0,77)	10,486 (0,30)
Number of observations	160	160
Number of countries	10	10
AR test (1)	0,020	0,041
AR test (2)	0,183	0,169
Hansen test	0,317	0,345

Note: The values in parentheses are the Student's T values; ***, ** and * respectively denote significance at the 1%, 5% and 10% level.
Source: author

It appears from this table that:

– The variable coefficient DF is positive and significant while that of the variable *DF* is negative and significant, which suggests that there is a non-linear relationship (with the bell shape) between the development of financial markets and economic growth. This result is similar to that obtained by several authors.

– The coefficient of the DF variable is positive and significant, while that of the cross variable (DF* niv) is negative and significant. This confirms that the development of financial markets promotes growth more in countries with an underdeveloped financial system.

– There is a threshold for financial market development (1.099) beyond which an improvement in the level of financial development can lead to a reduction in economic growth. Only the six financially developed countries in the region have already exceeded this threshold.

– Economic growth is more sensitive to the development of financial markets than to other macroeconomic factors. Investment positively influences growth, while inflation and public spending negatively impact it.

4.1. Direction of causality between economic growth and the development of stock markets

Under the hypothesis of stationarity of the series, the results of this test are given in the following tables:

Table 6: Results of the Causality test under the Hypothesis of a Homogeneous Panel

SSA Countries	Variables	Results	Direction of causality
	RTO and Y	RTO does not cause Y	----------
		Y does not cause RTO	----------
	MKT and Y	MKT cause Y	From the stock market to economic growth
		Y does not cause MKT	----------
	LIQ and Y	LIQ does not cause Cause Y	----------
		Y does not cause LIQ	----------

Source: author

These results show us that overall a unidirectional causality going from the SSA stock markets towards economic growth and this for a single indicator which is the market capitalization, liquidity and the turnover ratio do not play a significant role in economic growth. These results corroborate with those of Adjasi and African Biekpe (2005) on a panel of 14 African countries. These results allow us to validate our hypothesis 3 according to which causality exists. Unidirectional from the stock market to economic growth.

Assuming that countries react differently, the results of the country-by-country causality test are given in the following table:

Table 7: Results of the country-by-country causality test

SSA Countries	*Variables*	*results*	*Sense of Causality*
Botswana	RTO AND Y	RTO does not cause Y	----------
		Y does not cause RTO	----------
	MKT AND Y	MKT cause Y	----------
Ivory Coast	LIQ AND Y	Y does not cause MKT	----------
	RTO AND Y	LIQ does not cause Cause Y	Stock market towards economic growth
	MKT AND Y	Y does not cause LIQ	----------
Ghana	LIQ AND Y	RTO does not cause Y	----------
	RTO AND Y	Y does not cause RTO	----------
	MKT AND Y	MKT cause Y	----------
Kenya	LIQ AND Y	Y does not cause MKT	----------
	RTO AND Y	LIQ does not cause Cause Y	Stock market towards economic growth
	MKT AND Y	Y does not cause LIQ	----------

Mauritania	LIQ AND Y	RTO does not cause Y	----------
	RTO AND Y	Y does not cause RTO	Economic growth towards stock market
	MKT AND Y	MKT does not cause Y	----------
Namibia	LIQ AND Y	Y does not cause MKT	----------
	RTO AND Y	LIQ does not cause Cause Y	bidirectional
	MKT AND Y	Y does not cause LIQ	----------
Nigeria	LIQ AND Y	RTO does not cause Y	Economic growth towards stock market
	RTO AND Y	Y does not cause RTO	----------
	MKT AND Y	MKT cause Y	bidirectional
Swaziland	LIQ AND Y	Y does not cause MKT	Stock market towards economic growth
	RTO AND Y	LIQ does not cause Cause Y	----------
	MKT AND Y	Y does not cause LIQ	----------
Zambia	LIQ AND Y	RTO does not cause Y	----------
	RTO AND Y	Y does not cause RTO	----------
	MKT AND Y	MKT does not cause Y	----------
Zimbabwe	LIQ AND Y	Y causes MKT	----------
	RTO AND Y	LIQ does not cause Cause Y	Economic growth towards stock market
	MKT AND Y	Y does not cause LIQ	----------

Source: author

4.2. The summary can be found in the following table:

Table 8: Summary of results

Causality test results	*No causality*	*Unidirectional From growth to the stock market*	*Unidirectional From the stock market to economic growth*	*bidirectional*
Country	Botswana Ghana Zambia	Zimbabwe Mauritania	Ivory coast Kenya Swaziland	Nigeria Namibia

Source: author

Individually, 05 countries present no causality between the two phenomena (table 7) and two countries present unidirectional causality going from economic growth to the stock market and one country (Swaziland) where there is unidirectional causality going from the market stock market towards economic

growth in the other two, there is a bidirectional causality between the two phenomena. Although growing and performing well, the SSA stock exchanges are not yet very active, more specifically in terms of liquidity in general. And this the direction of causality depends on the stock market determinant used, there is no causality between the stock market and economic growth when using liquidity and the turnover ratio. There is a unidirectional causality from the stock market to economic growth when using capitalization. The direction of causality also depends on the country. In countries like Zimbabwe and Mauritania the direction of causality may be due to the high level of government interference in the financial system and economic life. Countries such as the Ivory Coast, Kenya Swaziland, Nigeria, Namibia are old stock exchanges which have seen a clear increase in the number of listed securities in recent years and therefore the youngest dates from 1992 (Namibia). For countries like Botswana, Ghana and Zambia, the number of listed companies (19, 35, and 15 respectively) does not reflect the real level of development of the latter.

5. CONCLUSION

The main objective of this research work was to assess the meaning of the existing relationship between stock market development and economic growth in SSA countries. The two secondary objectives of the study relate to the reciprocal impact of the development of the stock market and the growth rate of real GDP per capita. To achieve these objectives, we used various techniques and methods. Regarding the techniques, this work required the use of documentary, statistical and econometric techniques. The data collected could be processed through the use of historical, statistical, comparative and analytical methods using STATA software. Concerning the analysis of the effects of the development of the stock market on the growth rate of real GDP per capita through an empirical model, we arrived at the results according to which only the stock market capitalization has a positive and significant influence on the rate growth in real GDP per capita. Thus the two other indicators, stock market liquidity and the turnover ratio (LIQ and RTO) which negatively influence the growth rate of real GDP per capita. This allowed us:

To affirm our second hypothesis according to which the indicators of stock market development did not have an influence on economic growth in SSA.

To affirm the first hypothesis according to which the presence of the stock market had an influence on GDP/capita. This with a reservation relating to the quality of the indicator used.

Furthermore, we analyzed the opposite effect, namely the impact of the growth rate of GDP per capita on the level of financial development and we arrived at the results according to which the growth rate of real GDP per capita (Y) n does not positively influence the development of the stock market.

Estimation of two panel models using a sample of 10 SSA countries did not yield clear results on the reciprocal contribution of stock market development to economic growth. This may be due to the heterogeneity of the sample and the failure to take into account certain variables.

The results of the causality test allow us to say that there is a one-to-one relationship going from the development of the stock market to economic growth in general as stated in a large part of the theory or one-to-one by taking the case of some particular countries as stipulated by several authors in the literature review such as King and Levine (1993a). This result only allows us to affirm our hypothesis.

At the conclusion of our analysis, we are led to formulate the following observations linked to our results. This work has so far estimated the influence of the development of the stock market of period t on the growth rate of real GDP per capita of the same period and vice versa. However, it is possible that the reciprocal impact of these two phenomena is shifted by one period to be able to make our study dynamic (VAR) and carry out the Granger causality test in order to assess the direction of causality without having to regress independently and simultaneously two equations. Therefore, to continue this research work, two paths must be followed:

- Make our model dynamic (dynamic panel data: VAR);
- Take into account missing qualitative variables and quantitative variables.
- Carry out a panel study with countries grouped into homogeneous classes in order to highlight the determining effects of each country.

Since we cannot claim to have exhausted the question relating to the effects of stock market development on the economic growth of SSA, we recommend to future researchers that they can also address the following research themes: “Analysis of the effects of stock prices on investment by private companies”, “Study of the performance of stock exchanges in the decision-making process of listed companies in SSA”.

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