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Stock Market and Economic Growth: Evidence from Africa

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Abstract: We assessed the impact of stock market development on growth in Africa. It uses annual data from a panel of 9 countries in Africa over the period 1992–2017. Panel Vector Autoregressive econometrics technique is used in data analysis. Our main findings are that stock market development has a positive effect on economic growth. Investment, human capital, and openness also positively influence economic growth in Africa. The inflation and government expenditure affect economic growth negatively. The paper also finds that using the impulse response function, economic growth reacts to the stock market for 8 years and goes back to the initial level.

Keywords: Stock market, Economic growth, Panel vector autoregressive

JEL CLASSIFICATION: G00, O16, C23

1. INTRODUCTION

Over the past few decades, the world stock markets have surged, and emerging markets have accounted for a large amount of this boom. In Africa, new stock markets have been established in Ghana, Malawi, Swaziland, Uganda, and Zambia. Prior to 1989, there were just five stock markets in sub-Saharan Africa and three in North Africa. Today there are 19 stock exchanges. Stock market development has been central to the domestic financial liberalization programs of most African countries. It seems any program of financial liberalization in Africa is incomplete without the establishment and development of stock markets.

More than three decades ago, Stiglitz (1985) suggested that "Keynes in General Theory expressed concern that stock-market investors were only concerned with short-term gains, not long-term returns. Today, more and more, similar claims are made against the administrators of many of the largest in the world. The link between the financial stock market and economic growth is the field of research that has been widely explored. For instance, Luintel and Khan (1999) explored the causality test between financial development and economic growth; they found that the stock market affects economic growth. Levine and Zervos (1996), in their research on the relationship between the stock market and economic growth, presented empirical evidence on the main theoretical debates about the linkages between stock markets and long-term economic growth using data from 41 countries from 1976 to 1993. The results presented by them showed that stock market liquidity is positively and significantly correlated with current and future rates of economic growth, capital accumulation, and productivity improvements, even after controlling for economic, political, and other factors.

The main question is: Does the African stock market affect the economic growth of

African countries? On one hand, according to what has been found in the literature, we can answer for the positive correlation between the financial stock market and the economic growth measures by GDP and FDI see (Rajan and Zingales, 1998; Levine and Zervos, 1998; Beck and Levine, 2002; Nyasha and Odiambo, 2016; Kyophilavong *et al*. 2016; Demetriades and Hussein, 1996). On the other hand, several studies are investigating the relationship between the financial system and economic growth; However, to date, there is no unanimity on the role of financial development in economic growth. The views about the role of financial development in economic growth are conflicting. While some researchers believe that financial development strongly affects economic growth, some do not (see Friedman and Schwartz, 1963; Lucas, 1988).

We want to analyze this topic, stock market, because the number of stock exchanges in Africa has increased, even in those countries where the number of companies registered is quite small, unlike the existing empirical work, almost none of them use a model of a Panel-Vector Autoregressive (PVAR), our contribution in this field will be to use this methodology in African stock market. Most of the works use the time series or only panel data, see (Boubakari and Jin, 2010; Beck and Levine, 2002; Vazakidis and Adamopoulos, 2009; Carp, 2012; Fanta and Makina, 2017 and Ho, 2018). It is important to highlight that the time-series studies examining the causal relationship between financial development and economic growth mainly use banking sector development as a proxy for financial development and exclude the stock market, due to data limitations. Although many studies include the indicator of stock market development in them analyzes, the need for long-term data, time series, for the stock market is limited to studies in a few countries, only available to the developed ones.

This essay as said before uses a panel VAR model used in macroeconomics and finance which addresses a variety of empirical issues of interest to macroeconomists and

policymakers. The panel VAR is particularly good at addressing issues that are currently at the center of discussion in academia and the policy arena as they can, capture static and dynamic interdependencies, treat links across between units in an unrestricted fashion, easily incorporate time variations in the coefficients and the variance of the shocks, and to be responsible for the dynamic heterogeneities of the cross-section. The large dimension of panel VARs typically makes the curse of dimensionality an issue especially when searchers are interested in examining the input-output links of a region or area, where the time series of the panel is short, (Canova and Ciccarelli, 2013).

The findings of this essay will help to clarify the role of economic growth in stock market development and the role of finance in economic growth, which will have significant policy implications. Convincing evidence that the financial system influences long-term economic growth may lead to the implementation of policies that support the smooth functioning of the financial system.

The essay is organized as follows. Section 2 reviews the existing literature. The methodology, result and discussion are presented in Section 3. at last Section 4 concludes the essay.

2. LITERATURE REVIEW

On one general way, there is a debate about the relationship between the financial system and economic growth. We can see that the early economists focused specifically on banks. Bagehot (1873) and Schumpeter (1912) emphasized the critical importance of the banking system in growth and stressed how banks could actively stimulate innovation and future growth by identifying and financing productive investments. On the other hand, Lucas (1988) argues that economists "overestimate" the role of the financial system, and Robinson (1952) argues that banks are passive to economic growth. From the

empirical point of view, King and Levine (1993) show that the level of financial intermediation is a good indicator of long-term growth, capital accumulation, and productivity improvements.

2.1 Theoretical Background

According to Levine and Zervos (1996), the development of the stock market should encourage savings by providing households with additional instruments that can better meet their risk preferences and liquidity needs. Net equity markets make investment less risky and more attractive because they allow savers to acquire equity and sell it quickly and cheaply if they need to access their portfolios. At the same time, companies enjoy permanent access to capital raised through equity issues. However, by facilitating long-term investment and making it more profitable, stock market liquidity improves capital allocation and increases long-term economic growth prospects. Levine (1997) concludes that the costs of collecting information and transactions are the incentives for the emergence of markets and financial institutions. Financial systems can affect economic growth by providing functions such as facilitating trading, hedging, diversification, and accumulation of risk. These functions affect growth, thus influencing the rate of capital formation. Project holders use external financing as a source of investment, and banks are the cheapest and quickest mobilization of savings for the holders of these projects.

Considering the importance of the stock market in economic growth, an important question is raised how stock market development could lead to increased aggregate saving and investment, or raise the productivity of investment. Bonser-Neal and Dewenter (1999) examined how the stock market could influence savings by considering three factors that could affect savings: (1) how this affects the return on savings, (2) how this affects the risk of saving and (3) response of individuals to these changes in return and

risk. The theory suggests that the development of the stock market should increase the rate of return of savings for two reasons. First, the ability to add shares to a portfolio will increase the expected rate of return. Second, if capital controls on investment opportunities prevented individuals from maintaining their optimal portfolio, then liberalization and expansion of the stock market would allow individuals to channel financial resources to optimal use by buying shares. This more efficient reallocation of resources should therefore lead to a higher rate of return on savings in the economy. As stock market transaction costs are reduced, investments in the illiquid, high-return projects increase, and stock market liquidity induces faster steady-state growth. In the absence of stock markets, risk-averse agents would be discouraged to invest, (Levine, 1991).

According to Pagano (1993) endogenous growth model, the growth rate depends positively on the percentage of savings diverted to the investment. Pagano (1993) argues that a better selection of funders and the monitoring of recipients leads to more efficient resource allocations; financial services can encourage the mobilization of idle resources, and improvements in the sharing of risks and reductions in costs of origin can increase savings rates and promote the initiation of innovative and high-quality projects.

In an older perspective, Tobin and Brainard (1977) illustrate that the neoclassical theory of corporate investment is based on the assumption that management seeks to maximize the firm's current net worth, the value of the market in the ordinary shares in circulation. An investment project must be carried out if and only if it increases the value of the shares. According to Yoshikawa (1980) stock markets evaluate the project, its expected contributions to the company's future profits, and its risks. If the value of the project evaluated by the investors exceeds the cost, the company's shares will be valued for the benefit of existing shareholders. That is, the market will value the project more than the

money used to pay it. If new debts or equity securities are issued to raise money, the project leads to an increase in stock prices.

Indeed, there is much theoretical literature on the link between equity markets and long-term growth, suggesting that equity markets can promote long-term growth. Stock markets stimulate information acquisition, reduce the cost of mobilizing savings and facilitate investment (Williamson, 1986; Greenwood and Jovanovic, 1990; Greenwood and Smith, 1997).

2.2 Empirical Literature

The strong relationship between the stock market and economic growth has been widely discussed in the literature. Many studies show that there is a positive relationship between stock market development and economic growth (see, for example, Atje and Jovanovic 1993; Arestis et al., 2001; Adjasi and Biekpe, 2006; Levine and Zervos, 1996; Enisan and Olufisayo, 2009; Beck and Levine, 2002; Choong et al 2010; Cooray, 2010; Masoud e Hardaker, 2012; Minier, 2003; Ngarea et al., 2014; Asteriou and Spanos, 2019; Rahman et al, 2020).

With the increasing role of the stock market over the world, some researchers, beginning with Atje and Jovanovic (1993) and later Levine and Zervos (1996) have studied the relationship between the stock market and economic growth in 40 and 41 countries, respectively. The results of their pooled cross-country, time-series regressions show that stock market development has a positive impact on the long-run economic growth. Two years later, Levine and Zervos (1998) employ regression between countries for 47 countries. They find that the size of the stock market and liquidity have a positive influence on the current and future rates of economic growth. They examine the individual role of the stock market because banks provide services different from those

of the stock market. They examine whether the measure of liquidity, size, volatility, and equity market integration with global capital markets are significantly correlated with current and future rates of economic growth, capital accumulation, productivity improvements, and savings rates. Yu, *et al* (2012) argue that the positive finance-growth relationship established by Levine (1997) is the long-run relationship and it is possible for underdevelopment countries to experience slower economic growth despite financial and stock market development in the short-run mainly due to ill-enforced legal systems and political instability.

Darrat, (1999) found that financial deepening is a necessary causal factor of economic growth. Demirguc-Kunt and Levine, (2001) show that market development in stock markets (and banks) parallels the economic development of countries. McGowan, (2008) suggests that developed economies will also have developed capital markets, and Lin et al (2009) analyze that there is an optimal financial structure endogenously determined for the economy at each stage of development. Cecchetti and Kharroubi (2012) argue that financial booms are generally not conducive to growth and that there is an urgent need to re-evaluate the relationship between financial system development and real growth.

Harris (1997), using a cross-sectional study examined the relationship between the stock market and economic growth and found no evidence showing an effect of stock market activity in per capita output. Using Indian stock market indicators, Deb and Mukherjee, (2008) carried out a time series analysis and concluded that between real GDP growth and market capitalization is a bidirectional causality, but from the stock market activity and real GDP growth exists a unidirectional relationship. Minier (2003), based on data from Levine and Zervos (1998), shows that the development of the stock market is positively related to economic growth in countries with high stock market capitalization, such as Hong Kong, which conclude that stock market development has a strong positive

influence on economic growth in the more developed economies. The results are similar to Beck and Levine (2002) that used panel data. Arestis et al. (2001) consider that the positive influence of equity markets on economic growth is stronger than the positive influence of banks. Arestis et al. (2001) find that although both banks and stock markets may be able to promote economic growth, the effects of the former are more powerful and further argue the contribution of stock markets on economic growth may have been exaggerated by studies that utilize cross-country growth regressions.

For studies in Africa, Adjasi and Biekpe (2006) explore the relationship between stock market development and economic growth in 14 African countries. They find that stock market development and growth are positively related. Also, Enisan and Olufisayo (2009), find that stock market development employs a positive impact on economic growth in seven sub-Saharan countries, using the ARDL bounds testing approach. Enisan and Olufisayo (2009), using data from sub-Saharan African countries, found that stock market development significantly influences economic growth in countries such as Egypt and South Africa. Nowbutsing and Odit (2009), when analyzing the Mauritian equities market, implemented a time series analysis based on two important indicators of market size and liquidity and obtained a positive correlation between the variables in both the short and long term. In more recent studies they also found that stock market development and economic growth are positively related, (Masoud and Hardaker, 2012 and Ngare *et al.*, 2014).

There is another set of studies that counted negative or nonexistent relationships between financial development and economic growth. Singh (1997), Narayan and Narayan (2013) in 65 developing countries, in the developed and developing countries, Mhadhbi (2014) in the case of developed countries - between financial development and economic growth. Using the data of 87 developed and developing countries, Law and Singh, (2014)

concluded that more finance is not necessarily good for economic growth. Consistent with this, Arcand et al. (2015) and Rousseau and Wachtel (2011) found an escape effect of financial development on economic growth. According to Arcand et al. (2015), finance will have a negative effect on output growth when credit to the private sector reaches a threshold. Deidda and Fattouh (2002), using the regression model, found that financial development has a more significant effect on economic growth in high-income countries compared to low-income countries. A more recent study by Demetriades and Rousseau (2016) on the non-monotonous relationship between financial development and economic growth has concluded that financial depth is no longer a significant determinant of long-term growth.

Although most of the recent theoretical and empirical literature agrees on the view that the stock market positively affects growth, some studies are showing that stock market development does not enhance economic growth, (see De Gregorio and Guidotti, 1995). The results of these studies suggest that, at the early stage of equity market development, underdeveloped financial systems may affect the quality of the association between stock market development and economic growth. Singh (1997), in examining the role of stock markets in the economic growth of developing economies during the 1980s and 1990s, argues that the development of the stock market is unlikely to help achieve faster long-term economic growth in most developing countries. However, Harris (1997), looking at the empirical relationship between equity markets and economic growth in 49 countries covering the period 1980-1991, finds no clear evidence that stock market development is associated with growth in output per capita throughout the sample. Naceur et al. (2008) using annual data from 11 MENA countries covering the period 1979–2005 find that stock market liberalization does not affect economic growth.

3. METHODOLOGY, RESULTS, AND DISCUSSION

3.1 Data

We analyze the link between stock market development and economic growth in a panel of nine African countries and 234 observations (table 1)[1]. We use a balanced panel (annual data) from 1992 to 2017. The choice of data period is shaped by data availability concerns. Moving to a panel from pure cross-sectional data allows us to exploit the time-series dimension of the data and deal rigorously with simultaneity. The theories we are evaluating focus on the long-run relationships between stock markets and economic growth. We use the following variables, real GDP per capita (Y), human capital (HC) wherein the size of a country's human capital stock is vital for its growth (see Lucas, 1988, Barro, 1991). Investment (I), the motivation is that all growth models emphasize the role of physical capital in economic growth (see Barro, 1991; Mankiw el al.1992; Moral-Benito, 2012; León-González and Vinayagathasan, 2015; Iyke, 2017). For the Stock market, we use a turnover ratio that measures market liquidity, which equals the value of the trades of shares on domestic exchanges divided by the total value of listed shares. It indicates the trading volume of the stock market relative to its size. Some models predict countries with illiquid markets will create disincentives to long-run investments because it is comparatively difficult to sell one stake in the firm. In contrast, more liquid stock markets reduce disincentives to long-run investment, since liquid markets provide a ready exit-option for investors, (Beck and Levine, 2002; Levine, 1991; Bencivenga et al., 1996). Following Levine and Zervos (1998) we use also the value traded ratio which equals the value of the trades of domestic shares on domestic

[1] In fact, there are more countries with stock exchanges in Africa, however the lack of data and some credibility forced us to exclude some of them.

exchanges divided by GDP. The value traded and turnover ratio are preferred to market capitalization, which is also used in the empirical literature. Levine (2002) argues that market capitalization is not a good predictor of economic growth. Rousseau and Wachtel (2011) also state that value traded is a better measure of the stock market than capitalization.

Table 1. List of countries

African Countries	
Botswana	Kenya
Tunisia	Namibia
Egypt	Nigeria
Ghana	Mauritius
South Africa	

It also used variables such as inflation (INF), most growth models have underscored the role of inflation in economic growth. For instance, De Gregorio (1992), Fischer (1993), Sbordone and Kuttner (1994), and Smyth (1994), argue that inflation has a negative impact on economic growth. The endogenous growth model of Hung (2003) illustrates the important role played by inflation in determining the effects of financing development on economic growth. Government expenditure (GXP), it is well known that countries whose governments pile up huge debts are unable to progress. The growth experiences of the heavily indebted poor countries come to mind. Therefore, most empirical studies have recommended the inclusion of this variable (see Aghion et al, 2009; Barro, 2003). Finally,

Following Beck and Levine (2002), we use Trade Openness- hereafter OPE- i.e. total shares of export and imports as a percentage of GDP. The description of the variables is in table 2 and the descriptive statistics of the variables used in the paper are in table 3.

Table 2. Description of variables

Variable	Notation	Description	Source
Real GDP per capita	$LNGDP_{pc}$	The logarithm of real gross domestic product divided by midyear population.	WDI
Human capital	*LNHC*	The logarithm of the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown	WDI
Investment (% GDP)	*LNI*	The logarithm of Gross fixed capital formation (% GDP)	WDI
Value traded (% GDP)	*LNVTR*	The logarithm of value traded: Total shares traded on the stock market exchange to GDP.	IFS
Turnover ratio	*LNTURN*	The logarithm of turnover ratio, the ratio of the value of total shares traded to average real market capitalization, the denominator is deflated using the following method: $T_t/P_{at}/\{(0.5)*[M_t/P_{et} + M_{t-1}/P_{et-1}]$ where T is total value traded, M is stock market capitalization, P_e is end-of-period CPI P_a is average annual CPI.	IFS
Inflation rate	*INF*	The consumer price index (CPI)	WDI
Government expenditure	*LNGXP*	The logarithm of Government expenditure (% GDP)	WDI
Trade Openness	*LNOPE*	The logarithm of total trade as a ratio of GDP	WDI

Note: IFS, International Financial Statistics; WDI, World Development Indicators;

3.2 Methodological Approach

The VAR models are now well established in applied macroeconomics. In VAR models all variables are treated as endogenous and interdependent, both in a dynamic and in a

static sense, (Canova and Ciccarelli, 2013). According to them, Economists model economic issues in multilateral interdependency settings in two main ways, in a first way is to develop dynamic stochastic general equilibrium (DSGE) models. However, although well-specified DSGE models provide precise solutions to policy questions and simplify the welfare implications of economic policy, their restrictive assumptions make them largely unsuitable for analyzing economic issues in a developing country context. Moreover, Canova and Ciccarelli (2013) state that certain of the restrictions of the DSGE are often not consistent with the distributional characteristics of the dataset, with the consequence, that policy recommendations from such models might be misleading.

Table 3. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. dev.	Obs.
GDP_{PC}	3014.77	2560.89	10490.50	223.33	2293.91	234
HC	64.90	67.22	102.75	22.86	20.53	234
Investment	23.43	21.47	44.50	11.76	5.95	234
VTR	7.59	1.10	123.15	0.03	18.24	234
Turn	17.83	7.59	1081.12	1.06	71.43	234
Inflation	10.22	7.70	72.84	-0.69	9,85	234
GXP	15.46	15.20	30.07	0.91	6.18	234
OPE	75.27	73.70	132.20	20.72	28.09	234

Note: VTR is value traded, OPE-Trade Openness, HC is human capital, GXP is government expenditure and GDPpc is the real GDP per capita.

The second way is to develop panel vector autoregressive (PVAR) models that escape most of the restrictive assumptions made in the DSGE models. According to Issahaku et al (2016), the advantage of PVAR derives from the advantages of VAR base models. First, all variables in the model can be treated as endogenous, and there is still additional

flexibility to accurately include exogenous variables. He adds that PVARs solve an endogeneity, one of the most serious problems in the analysis of econometric time series and panel data. Second, PVARs make it easier to analyze the impact of innovations, creating space for interactions between variables and, therefore, producing dynamic solutions that are often not achievable via OLS and other standard models (Li et al., 2012; Issahaku et al, 2016). PVARs can accommodate multiple cointegration vectors, as opposed to Johansen (1988), different the maximum likelihood cointegration procedure and the Johansen and Juselius (1990) test for cointegration, (Ericsson and Irandoust, 2004). In the same context, Grossmann *et al*. (2014) state that PVARs permit the inclusion of fixed effects that capture country-specific time-invariant effects as well as global time-invariant effects, and they can effectively handle short time dimensions due to extra degrees of freedom gained from the inclusion of cross-sections; moreover, by using impulse response functions, PVARs can show delayed effects on each variable in the system.

The PVAR model is a mixture of the conventional VAR approach – in which all variables are considered endogenous a priori – and the panel data approach in which unobserved individual heterogeneous effects are accommodated, (Issahaku *et al*, 2016). The baseline PVAR model is represented below:

$$Y_{it}=\mu_i+\sum_{k=1}^{p} A_j Y_{it-k}+\varepsilon_{it} \qquad i=1,\ldots,N; \quad t=1,\ldots,T \tag{1}$$

Where, Y_{it} is a *k x 1* vector defining the state of the *k* endogenous variables in the country *i* during period *t*. In this study, Y_{it} is given as:

$$Y_{it}=\begin{bmatrix} LNGDP_{pc_{it}} \\ LNHC_{it} \\ LNI_{it} \\ LNVTR_{it} \\ LNTURN_{it} \\ INF_{it} \\ LNGXP_{it} \\ LNOPE_{it} \end{bmatrix}$$

All variables are defined in Table 2, μ_i is a *k x 1* country-specific intercept term, A_j is *k x k* matrices of coefficients ε_{it} are a residual term and *p* denotes the number of lags. The model equations system involving these variables is specified below. The *LNGDPpc* can be specified as a function of the lags of endogenous variables while controlling for country-specific fixed and time-specific effects as follows:

$$LNGDP_{pc_{it}}=\mu_{1i}+\sum_{j=1}^{p} LNGDP_{pc_{it-j}}+\sum_{j=1}^{p}\beta_{3j}\,LNVTR_{it-j}+$$
$$\sum_{j=1}^{p}\beta_{4j}\,LNTURN_{it-j}+\sum_{j=1}^{p}\beta_{1j}\,LNHC_{it-j}+\sum_{j=1}^{p}\beta_{2j}\,LNI_{it-j}++\sum_{j=1}^{p}\beta_{5j}INF_{it-j}+\sum_{j=1}^{p}\beta_{6j}LNGXP_{it-j}+\sum_{j=1}^{p}\beta_{7j}LNOPE_{it-j} \quad (2)$$

i is the country subscript while *t* is a time subscript; $LNGDP_{pc_{it}}$ is the logarithm of the GDP per capita for country *i* at time *t*; $LNHC_{it}$ is the logarithm of human capital; LNI_{it} is the logarithm of investment as proxied by the gross fixed capital formation ; $LNVTR_{it}$ is the logarithm of value traded; $LNTURN_{it}$ is the logarithm of turnover ratio; INF_{it} is the inflation rate, proxied by the consumer price index; $LNGXP_{it}$ is the logarithm of government expenditure as a percentage of GDP; $LNOPE_{it}$ is the logarithm of economic openness, proxied by the share of trade in GDP. Where human capital, investment, inflation, government expenditure, and economic openness are the control variables. Similarly, value traded and turnover ratio can be specified as the main dependent variable as follows.

$$LNVTR_{it}=\mu_{1i}+\sum_{j=1}^{p} LNGDP_{pc_{it-j}}+\sum_{j=1}^{p}\beta_{3j}\,LNVTR_{it-j}+$$
$$\sum_{j=1}^{p}\beta_{4j}\,LNTURN_{it-j}+\sum_{j=1}^{p}\beta_{1j}\,LNHC_{it-j}+\sum_{j=1}^{p}\beta_{2j}\,LNI_{it-j}+\sum_{j=1}^{p}\beta_{5j}INF_{it-j}+\sum_{j=1}^{p}\beta_{6j}LNGXP_{it-j}+\sum_{j=1}^{p}\beta_{7j}LNOPE_{it-j} \quad (3)$$

$$LNTURN_{it}=\mu_{1i}+\sum_{j=1}^{p} LNGDP_{pc_{it-j}}+\sum_{j=1}^{p}\beta_{3j}\,LNVTR_{it-j}+$$
$$\sum_{j=1}^{p}\beta_{4j}\,LNTURN_{it-j}+\sum_{j=1}^{p}\beta_{1j}\,LNHC_{it-j}+\sum_{j=1}^{p}\beta_{2j}\,LNI_{it-j}+\sum_{j=1}^{p}\beta_{5j}INF_{it-j}+\sum_{j=1}^{p}\beta_{6j}LNGXP_{it-j}+\sum_{j=1}^{p}\beta_{7j}LNOPE_{it-j} \quad (4)$$

Where all variables are as defined under Eq. (2) above.

Table 4. Correlation Matrix

Variables	VTR	Turnover	OPE	Inflation	HC	GXP	Investment	GDPpc
VTR	1							
Turnover	0.083	1						
OPE	-0.212	0.037	1					
Inflation	-0.140	-0.072	-0.255	1				
HC	0.436	0.065	0.312	-0.532	1			
GXP	0.141	0.110	0.478	-0.380	0.424	1		
Investment	-0.198	-0.034	0.264	0.251	-0.225	-0.106	1	
GDPpc	0.288	0.099	0.470	-0.423	0.728	0.395	0.058	1

Note: VTR is value traded, OPE-Openness, HC is human capital, GXP is government expenditure and GDPpc is the real GDP per capita.

In time series and panel data analyses, it is essential to explore the order of variable integration. The stationarity status (the order of integration) of the variables helps to choose the suitable model for estimating the coefficients. There are advantages to using panel unit root tests over individual time series-based unit root tests (Issahaku et al, 2016). First, panel data-based unit root tests have more statistical power than their univariate counter- parts. In a panel setting, the traditional Augmented Dicky–Fuller (ADF) has low

power identifying stationarity, particularly in short panels. Second, panel unit root tests are less restrictive and allow for fixed effects at the country level as well as time variations in the parameters across panels, (Issahaku *et al.* 2016).

The panel data, by blending the inter-individual differences and intra-individual dynamics have several advantages, more detailed inference of the model parameters. Panel data usually contains more degrees of freedom and more sample variability than cross-section data that can be viewed as a panel with T = 1 or time series data that is a panel with N = 1, improving efficiency econometric estimates. Has also a greater ability to capture the complexity of human behavior than a single cross-section or time series data. Simplifies calculation and statistical inference. The stationarity properties of the data are examined with a panel unit root test. Researchers such as Hadri (2000), Breitung (2000), Levin, Lin and Chu (2002), and Im and Shin (2003) have developed a unit root test that is similar to unit root tests carried out on single series.

The results from table 5 show that, apart from the logarithm of real GDP per capita ($LNGDP_{pc}$), logarithm of investment (LNI) and logarithm of government expenditure (LNGXP) all variables are integrated of order I(0). The $LNGDP_{pc}$, LNI, and LNGXP are integrated of order I(1).

Table 5. Panel unit root test

	$LNGDP_{pc}$	LNHC	LNI	LNVTR	LNTURN	INF	LNGXP	LNOPE
level								
LLC	-1.55	-5.0***	-0.43	-4.31***	-4.67***	-2.71***	-0.01	-2.12***
IPS	1.50	-1.28	-0.30	-6.11***	-5.34***	-3.27***	0.28	-3.02***
ADF	9.54	35.16***	17.89	74.87***	62.96***	42.87***	17.32	39.58***
PP	4.40	43.20***	18.22	70.68***	63.28***	58.09***	18.30	23.88
First diff.								
LLC	- 4.63***		-10.42***				-12.38***	
IPS	-5.34***		-10.26***				-11.49***	
ADF	62.96***		121.66***				136.97***	
PP	63.28***		184.81***				149.14***	

Note: LLC, Levine–Lin–Chu statistics; IPS, Im, Pesaran and Shin statistics; ADF, Augmented Dickey-Fuller Fisher Chi-square statistics, PP, Phillips Perron statistics. All variables are described in Table 2. *** shows significance at the 1% level, and ** shows significance at the 5% level.

It should be noted that Sims et al (1990), show that the common practice of trying to transform models into the form of stationary by difference or cointegration operators when it seems likely that the data is integrated is in many cases unnecessary. Even in a classic approach, according to them, the question is not whether the data are integrated, but whether the estimated coefficients or as test statistics of interest have a distribution that is not standard if the regressors are integrated. It will often be the case that the statistics of interest have distributions unaffected by non-stationarity, in which case the hypotheses can be tested without first turning into a stationary regressor.

After testing the unit root, Pedroni (1999, 2004), Kao (1999) and Fisher /Johansen panel cointegration are performed to test the existence of long-run and relationship between the stock market and economic growth. They extend the Engle-Granger (1987) cointegration

test. However, the Kao test follows the same basic methodology as the Pedroni test, although identifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors, the result is not presented in the paper. The Kao and Fisher/Johansen Panel Cointegration test results are not presented here but the variables are not cointegrated. Given that most variables are stationary, panel cointegration testing is not necessary. Panel VAR models do not suffer from inconsistent estimates due to nonstationary variables (Phillips and Moon, 2000). Formally, the VAR model is stable if all eigenvalues of the coefficient matrix in absolute terms are less than 1 (Lütkepohl, 2005). In our case, panel VAR satisfies the stability condition, as all eigenvalues lie inside the unit circle (figure 1).

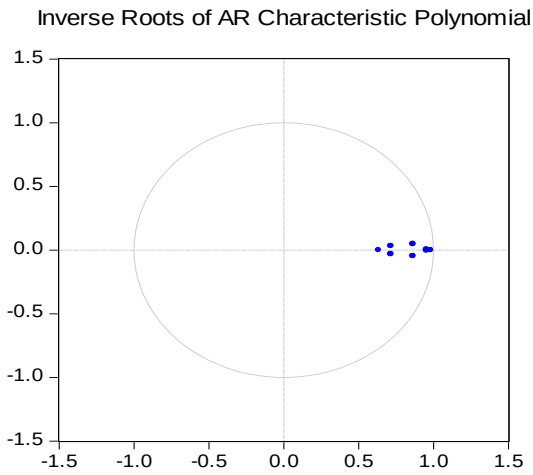

Figure 1: VAR Stability

3.3 Results and Discussion

Using modified Akaike information criteria we estimate the equation with one lag. As a VAR model, we would have 8 equations, however, the objective in the article is just the three equations in table 6. The results in model 1 under table 6 show that the value traded has a positive and significant effect on real GDP per capita, for another financial variable which is turnover ratio, the results show that have a positive impact on GDP per capita but the variable is not significant, from the results it appears that higher levels of stock

market turnover rate and value traded to GDP are characterized by a higher level of real GDP per capita growth, which signifies that stock market development improves economic growth. This is consistent with the literature (see Levine and Zervos, 1998; N'Zué, 2006; Ngare et al., 2014; Ho, 2018; Pradhan et al, 2020). The non-financial variables result show that human capital and trade openness has a positive and significant effect on GDP per capita (see Beck and Levine 2004; Demetriades and Rousseau, 2016). However, the investment, inflation, and government expenditure are not significant. The negative impact of government expenditure may be due to higher expenditure on imports in African countries.

Table 6. Panel VAR Estimation

	Dependent Variable		
	$LNGDP_{pc}$ (1)	**LNVTR (2)**	**LNTURN (3)**
$LNGDPpc_{t-1}$	0.9518	0.0560	0.4011
	(0.0167) ***	(0.1032)	(0.1556) ***
$LNVTR_{t-1}$	0.0137	0.6386	-0.0579
	(0.008) *	(0.0419) ***	(0.0632)
$LNTURN_{t-1}$	0.0160	0.1432	0.3922
	(0.0109)	(0.0449) ***	(0.0678) ***
$LNHC_{t-1}$	0.0169	-0.1452	-0.6920
	(0.0542) ***	(0.2909)	(0.4388)
LNI_{t-1}	0.0206	0.0766	0.3864
	(0.0440)	(0.1761)	(0.2656)
INF_{t-1}	-0.0004	0.0437	-0.1732
	(0.0011)	(0.0570)	(0.0860) **
$LNGXP_{t-1}$	-0.0314	-0.0307	0.3054
	(0.0206)	(0.1163)	(0.1754) *
$LNOPE_{t-1}$	0.1018	0.5174	0.9545
	(0.0324) ***	(0.1932) ***	(0.2914) ***
***R*-Squared**	0.9823	0.9395	0.6348

Adj. *R*-Squared	0.9816	0.9348	0.6066
***F*-statistic**	1495.16***	200.9029***	22.4916***

Note 1: GDP per capita is the dependent variable for model 1, Value traded is the dependent variable for model 2, while turnover is the dependent variable for model 3. ***, **, * represents significance at 1%, 5% and 10%, respectively. Figures in parentheses are standard errors.

The positive impact of human capital estimated is consistent with previous studies, (Barro, 1991; Bodman and Le, 2013; Ho, 2018; Teixeira and Queirós, 2016). Exist literature different views about the role of inflation, Ireland (1994) affirms that the impact of inflation on growth is small, furthermore, he augments that effects of inflation may disappear completely in the long run. But Hung (2003) states the important role of inflation in determining the effects of financial development on economic growth. This result implies that if the inflation is in the range of expected values, it does not affect the real growth rates significantly.

The results from model 2 are provided with value traded as a dependent variable. The real GDP per capita tends to increase the value traded, this result supports the bi-directional association between financial development and economic growth in some emerging economies (see Pradhan et al, 2020). The turnover ratio has a positive and significant impact on total shares traded on the stock market exchange. While trade openness has a positive significant effect on value traded, human capital and government expenditure have a negative effect on value traded. The investment, which is the gross fixed capital formation and inflation also have a positive no significant impact on total shares. That is, the greater the investment and inflation, the more traded shares are expected. At last, for model 3, the dependent variable is the turnover ratio. The real GDP per capita has a positive and significant impact on the turnover ratio, which means that the greater growth rate more turnover ratio. Human capital and inflation have a negative impact on turnover, where inflation has a significant impact. If there is an increase in expected inflation, also

will be a demand for real goods, which, in turn, will increase bank development while decreasing the turnover ratio. The results also show that investment, government expenditure where the latter are statistically significant have a positive impact.

The findings of this essay provide evidence, that some of the results are satisfactory and others not so. For instance, the fact that value traded effects are a positive and significant way shows us that the stock exchange has helped some African countries in their economic development, although its magnitude is small (0.0137), which may be because in some countries the number of companies registered on the stock exchange is very small. However, with greater incentive and adequate regulation that allows the stock exchange to be more robust, it can greatly help the development of African countries. Looking at the results of equations 2 and 3, we can see that economic growth positively affects the stock exchange.

According to Canova (2007), the estimated coefficients VAR should not necessarily be presented since most of them are not significant. It is better to present the results in a more summarized form as impulse response function or variance decomposition which has more economic meanings. Therefore, next, we establish the result of the impulse responses from Cholesky, which identify the responsiveness of the dependent variables (endogenous variables) in the VAR when a shock is put to the error term. Figure 2 show the result of the impulse response, we can see that the growth tends to increase after value traded and turnover shock in next 8 year and go back to the initial level. The shock of variables such as inflation, trade openness, investment, and human capital tend to burst the growth, nevertheless, government expenditure shock leads a negative values growth. The figure also shows that shock of GDP per capita, government expenditure, and trade openness and leads to negative values for values traded, indicating that this shock can

affects negatively the stock market. But the turnover, inflation, investment, and human capital shock increase the value traded.

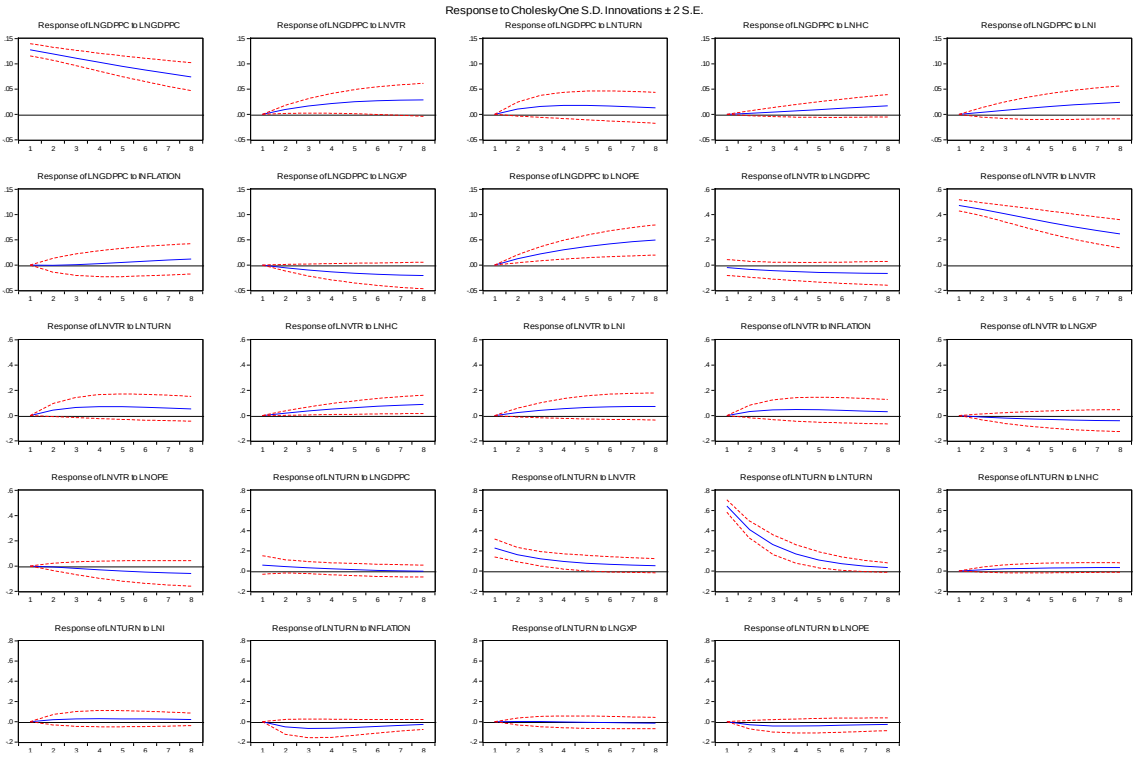

Figure 2: Impulse response function of real GDP per capita, value traded and turnover

When it comes to turnover, the shock of inflation and trade leads to negative values, in a majority of other cases, the shock leads to a slight increase in turnover and after some periods go back to initial values.

4. CONCLUSION

We set out to assess the impact of stock market development on growth in some African countries. However, a formal assessment of the link between the country's stock market and its growth has been limited to cross-sectional and panel data studies. Each African country has a unique experience. Hence, combining countries in panel settings may cover the true stock market–growth nexus. Furthermore, the general studies regarding the stock

market–growth link have yielded mixed results, leaving the relationship open for further examination. This paper revisited the relationship for African countries using panel data techniques.

Using the panel vector autoregressive and a dataset covering the period 1992-2017, for 9 countries and 234 observations we found that both stock market proxy, turnover ratio, and value traded have a positive impact on growth, represented by real GDP per capita. Although value traded is significant and turnover ratio is not. Our results suggested that one of the proxies for stock market development did not influence the sign of the impact of stock market development on growth. We also found that human capital and trade openness exerted a positive and significant impact on growth, investment also has a non-significant positive impact. In contrast, the inflation rate exerted a negative impact on growth. These findings are consistent with the existing literature. Based on our findings, we believe that the policymakers in Africa should continue to pursue policies that promote stock market development to sustain growth. For the government expenditures, the results show that has a negative impact on growth, African countries are big importers so consumer expenditure has negative effects on the economy.

Our findings also show, that with exception of human capital and trade openness all the variable has a positive impact on value traded, leading an increase on total shares traded on the stock market exchange, but only turnover ratio and trade openness are significant. Another key finding of this paper is that considering as dependent variable the turnover ratio, where the effect of inflation, value traded, government expenditure, and trade openness are significant. At last, it establishes impulse responses from Cholesky and the findings demonstrate that growth responds positively to stock market shock.

These results show that the stock exchange has been an important factor for the economic development of African countries. Therefore, these countries should invest more in the sustainability and credibility of their financial system, which may give greater prominence to stock exchanges and provide greater robustness in the economy.

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