Stock markets, volatility and economic growth: evidence from Cameroon, Ivory Coast and Nigeria

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Abstract

This study examines in one hand the relationship between stock market return volatility and economic growth, and, in the other one, how stock market development can influence economic growth. The methods used in this paper are Generalized Autoregressive Conditional Heteroscedasticity (GARCH) framework to apprehend return volatility and VAR framework to capture any link between stock market and economic growth. Time series quarterly data used are from 2000 to 2015 for both Nigeria and Ivory Coast and from 2008 to 2015 for Cameroon. The study reveals that: 1) DSX results are not significant causing economic growth, neither the converse, showing how desperately Cameroon market needs to be boosted if the country wishes to reach an acceptable economic situation in 2035. The study also reveals, 2) none significant causality link going from stock market development to GDP in Ivory Coast and Nigeria; it also found that, 3) main macroeconomic variables influencing (or influenced by) stock market are Inflation and Money supply. The research finally reveals that, 4) NSE is more volatile than BRVM or DSX.

Keywords: stock markets; volatility; economic growth; Cameroon; Ivory Coast; Nigeria.
JEL classification: C01, F43.

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Los mercados de valores, la volatilidad y el crecimiento económico: evidencia de Camerún, Costa de Marfil y Nigeria

Resumen

El objetivo de este estudio es examinar, por un lado, la relación entre la volatilidad de los rendimientos del mercado de valores y el crecimiento económico y, por otra parte, la influencia del desarrollo de dicho mercado sobre la estructura económica de los países en desarrollo. La metodología GARCH fue utilizada para analizar la volatilidad de los rendimientos, tambien la metodología VAR con el objetivo de identificar cualquier posible vínculo entre el mercado de valores y las tendencias económicas. Los datos son trimestrales y se extienden desde 2000 hasta 2015 para Nigeria y Costa de Marfil y para Camerún de 2008 A 2015. Los resultados muestran: 1) en Camerún la existencia de una bicausalidad no significativa entre el nivel de la economía y el mercado de valores, lo que demuestra a que punto el mercado camerunes necesita desesperadamente ser potenciado si el país quiere beneficiarse de una situación económica aceptable para el año 2035; 2) la inexistencia de una relación significativa entre el mercado de valores y el PIB en Costa de Marfil y Nigeria; 3) con estos resultados las variables macroeconómicas que influyen más en el mercado de valores son: la inflación y la oferta monetaria; 4) en términos de volatilidad, el NSE es más que la BRVM o la DSX.

Palabras clave: mercados de valores; volatilidad; desarrollo económico; Camerún; Costa de Marfil; Nigeria.
Clasificación JEL: C01, F43.

1. Introduction
1.1. Statement of the problem

'World stock markets are booming and stock markets in developing countries account for a disproportionately large share of this boom. Investors are venturing into the world's newest markets and some are seeing handsome

returns. But are developing countries themselves reaping any benefits from their stock markets?' (Levine 1996). This interrogation still remains today especially with the rise of new stock markets. The common tendency is to consider developed markets as developed economies or countries, emerging markets as emerging economies and 'less developed markets' as 'less developed economies or countries'. Regarding this, the 24 developed markets found into the MSCI index classification (2015) are almost all from developed countries.

The ''third world'' expression, proposed by Alfred Sauvy, is today commonly known as ''developing countries''. From this new category, two countries which do not belong to any classifications from above, but projecting to reach an economic emergence attract this study's attention: Cameroon, projecting to be an emerging country in 2035 and Ivory Coast in 2020. One other developing country, sharing the same economic zone (but not monetary) with Ivory Coast and bordering Cameroon, but more close to reach emerging countries level is Nigeria. Studying Nigeria and Ivory Coast cases can help to infer Cameroon situation which is as the formers, a developing country. Nigeria and Ivory Coast are part of S&P EMDB[1] and MSCI frontier markets classification. Ivory Coast stock market capitalization of listed equities reaches its all-time high at end of December 2013 XOF 5 633.47 billion (USD11.86 billion) before going to XOF 6 319.72 billion (USD 11.70 billion) in December 2014, a decrease of 1.34% (Information from BRVM Trading Equity Statistics)[2].

The ASEA data on an overall view suggest the possibility of the existence of a relationship between BRVM stock exchange capitalization and Ivory Coast GDP evolution. Data move in the same direction (an increase) from 2011 to 2013, and then the fall of market capitalization in 2014 is also accompanied by a fall in indicator's level of GDP's percentage on market capitalization.

Even if Ivory Coast and Cameroon are not in the same economic or monetary zone, these small countries' zones have the same convergence

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[1] Standard & Poor's Emerging Markets Data Base S & P (EMDB) has since earned recognition as the world's premier source for reliable and comprehensive information and statistics on stock markets in developing countries.
[2] From African Securities Exchanges Association (ASEA), 2014 Annual report & Statistics.

criteria.[3] By the way, during 2011, Ivory Coast and Cameroon budget deficit over GDP is respectively -0.2% and -0.6%; annual inflation rate: 1.8% and 1.1%; public debt ratio: 64.8% and 11.7%. In spite of the gap, this information shows that these small countries' economies are very close.

Talking about a small economy stock exchange, Stangroom[4] says that many people wonder why a poor country like Malawi should have a stock exchange in the first place. But, according to him, the reason for having it there, is the same as in London or Frankfurt: enabling the private sector to raise capital. Cameroon market (with a market capitalization of USD 0.3 billion in 2014) can be considered as a small economy stock exchange. Even if it's not part of neither MSCI nor S&P Emerging market indexes, this study thinks being able to show as J. Minier (2009) has shown, that youth stock markets can help generate increase in economic growth. However, it's commonly assumed growth to be a sustainable increase of the output. But, long-term production needs long run investment, and that is stock market.

Most of recent studies around financial market and economic development mainly emanate from developed market (Alshogeathri, 2011; Karunanayake & Al, 2012; Ake Boubakari & Al, 2010). Studies on emerging markets especially in Nigeria and Ivory Coast are limited. For and emerging economy which want to reach his emergence on a specific period of time, evaluating relationship between financial market development is a crucial issue. According to Onakoya (2013) a common problem plaguing the low and slow growth of developing economies is the lack of depth of the financial sector. Although, financial markets play an important role in the process of economic growth and development by facilitating savings and channelling funds from savers to investors, the problem of high instability of the financial sector has adversely affected the proper functioning of the market. There is therefore a need for an in-depth evaluation of the link between stock market development, stock market return volatility and economic growth on those developing markets: Nigeria Stock Exchange, Douala Stock Exchange and ''Bourse Régionale des Valeurs Mobiliéres''.

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[3] Budget deficit over GDP>=0%; Annual inflation rate<=3%; Public debt ratio <=70%. Source: BEAC website.
[4] Rob STANGROOM, CEO of Malawi Stockbrokers Ltd.

1.2. Research questions

This study sought to answer this question: is the economic trend (represented by macroeconomic variables) of a country aspiring to be an emerging one, can be influenced by the development and the health of his stock market or conversely?
More precisely:
i) Is there a causal relationship going from stock development indicators to economic variables?
ii) Can macroeconomic variables influence stock market development?

1.3. Objectives of the study

The general objective of this study is to analyse the bidirectional relationship between market development indicators and macroeconomic variables of the selected developing countries. The specific objectives of this study are:
i) Determine the causalities going from stock development indicators to economic variables in targeted countries.
ii) Study the influence of selected countries macroeconomic variables on stock market development of each countries market.

2. Background of the study

In general, the theoretical analyses do not make any distinction between the stock markets and the banks. The fact that the financial system as a whole has an impact on economic growth implies that direct finance (stock markets) and indirect finance (banks) take part jointly in the increase on GDP. Nevertheless, it's crucial to find the specific influence of stock markets.

2.1. Financial market and economic growth

Theoretical arguments suggest that financial development plays an important role in encouraging economic growth. The theoretical literature can be traced back to Bagehot (1873) and Schumpeter (1911). According to Bagehot (1873), Money is economic power, ''the briefest and truest way of describing Lombard Street[5] is to say that it is by far the greatest combination

of economic power and economic weakness that the world has ever seen''. In 1911, Schumpeter argues that services provided by financial market (mobilising savings, evaluating projects, monitoring managers, managing risk and facilitating transactions) are essential for economic development. Works in this fields have been later developed by Hicks (1969), McKinnon (1974), and King and Levine (1993), demonstrating the importance of financial intermediation in facilitating economic activity. For these authors, a developed financial system can amongst other things lead to the growth by reducing transaction, information and monitoring costs. Nevertheless, some influential economists believe that financial development is not so important for promoting the economic growth.

Robinson (1952) states that financial development simply follows economic growth: "enterprise leads, finance follows." The relationship between financial and economic development is ''over-stressed'' (Lucas, 1988), thus the role of finance is overemphasized. However, Demetriades and Hussein (1996), Greenwood and Smith (1997) pointed out a bidirectional relationship between economic growth and financial development. Tsuru (2000) also explained the finance-growth link by arguing that financial development has a positive impact on capital productivity and the efficiency of financial systems in converting financial resources into real investment can promote economic growth. However, its effect on the saving rate is ambiguous and could affect negatively the economic growth rate. 'In net terms, the impact on welfare is likely to be positive, since increased efficiency of investment in the long term can offset any reduction in the propensity to save' Tsuru (2000). More recent, Creane *et al*. (2003) pretends that a modern and efficient financial system mobilizes savings, promotes investments by identifying and funding good business opportunities, monitors the performance of managers, enables the trading, hedging, and diversifying risk, and facilitates the exchange of goods and services. These functions finally result in a more efficient allocation of resources Seetanah *et al*. (2008).

Since Goldsmith (1969), McKinnon (1974), Shaw (1973) studied relationship between financial development and economic growth and found strong and positive correlations between them, works in this field increased

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[5] Bagehot uses it to describe Money Market.

and lead almost to the same results. It's in this way that Ross Levine *et al*. (2000) show that financial intermediary development is positively associated with economic growth; specially, the large, positive link between financial intermediary development and economic growth is not due to potential biases induced by omitted variables, simultaneity or reverse causation. On its side, Christopoulos, D.K. (2004) combined cross-sectional and time series data to examine the relationship between financial development and growth in ten developing countries. He uses panel unit root tests, and panel co integration analysis to conclude that there is fairly strong evidence in favour of the hypothesis that long run causality runs from financial development to growth, that the relationship is significant according to him, and he found no evidence of bidirectional causality. Empirical analysis based on a sample of 10 countries, 6 from the OECD region and 4 from the MENA region during 1990-2006, reports that a panel data cointegration analysis confirms a long-term relationship between financial development and economic growth for the OECD and the MENA[6] countries. The GMM system approach shows that financial development and real GDP per capita are positively and strongly linked. The error correction model approach shows that causality is bi-directional for the OECD countries and unidirectional for the MENA countries, *i.e.* economic growth stimulates financial development, Rachdi, Houssem (2011).

Researches in India (Nayia, Mahajan *et al*. (2014)) confirms the presence of long run equilibrium relationship between financial development and economic growth. Findings of Tariq Javed *et al.* (2014)'s study suggest that GDP growth is having highly significant and positive relationship with domestic credit, imports and exports. However GDP growth is having negative relationship with trade openness and liquid liabilities. Results also suggest that there is a need of relaxation of monetary policy to distribute productive credit in business community. This expansion of funds will improve productivity and positive impact on GDP growth. The analysis is performed on 42 years which is considered to be as significant period for observing long-term financial impact.

2.2. Stock market development and economic growth

Although the fact that some economists like Robinson (1952), Lucas (1988) do not consider financial system as important tool for economic growth,

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[6] Middle East and North Africa region.

furthermore John Robinson stated ''where enterprise leads, finance follows'', economists like Bagehot (1873) Schumpeter (1911), Demirguc-Kunt and Maksimovic (1998) are fully convinced on the importance of financial sector in economic growth. Thus, as the financial system becomes strong, the stock market becomes more active and important segment in financial sector.

Fama (1990)'s work on stock market pretends that the relationship between current stock returns and future production growth reflects information about the future cash flows that are stored in stock prices. Focusing on liquidity, Bencivenga, *et al*. (1991) and Levine (1991) argue that stock market liquidity plays an important role in economic growth. Without a liquid stock market, many profitable long-term investments would not be accepted because savers would be hesitant to tie up their investments for a long periods of time. In contrast, a liquid equity market allows savers to sell their shares easily, thereby permitting firms to raise equity capital on favourable terms. By facilitating longer-term, more profitable investments, a liquid market improves the allocation of capital and develops forecasts for long-term economic growth. The importance of stock markets is also find in its possibility to enable savings mobilization for financing "immense works" (Bagehot 1873, Hicks 1969, Greenwood and Smith, 1997). Stock markets also have the potential for generating quality jobs both directly and indirectly (N'Zué, 1997) and provide an alternative channel for savings mobilization and a better resource allocation (N'Zué 2006). An efficient stock market contributes to attract more investment by financing productive projects that lead to economic growth, mobilize domestic savings, allocate capital proficiency, reduce risk by diversifying, and facilitate exchange of goods and services (Caporale *et al*, 2004). Furthermore, Prabirjit, Sarkar (2009) argued that stock market development has no effect on fixed capital formation due to the high transaction and information costs in least developed countries.

2.3. *Stock market volatility and economic growth*

One of the most attractive and long-lasting debate in economics is about to know whether or not there is a link between stock market volatility and economic growth.

The volatility of stock returns represents the variability of stock price changes during a specific period of time. Many studies emphasis on the relationship between stock market volatility and macroeconomic performance

such as real output, inflation, investment and many others. Recent finds give mixed results: On one hand is the opinion that stock market volatility is significantly and positively correlated to economic growth (Levine & Zervos, 1998), according to Campbell *et al.* (2001), stock market volatility has significant power for real GDP growth forecast. On the other hand, there is still doubt on its contribution to economic growth. Some analysts even argue that stock market volatility has a negative impact on the economy (Adjasi & Biekpe, 2006). It's also important to note that growing inflation, fluctuations in exchange rates, broad money supply, and interest rate can increase stock returns volatility, leading to rise in risk, and then bringing investors to switch their investment to less risky portfolios like bonds (Karolyi, 2001).

It's commonly assumed that the presence of volatility in stock prices may reflect efficient functioning of stock markets, but Arestis (2001)'s results do not support this hypothesis. Utilizing time series methods and data from five developed economies, he examines the relationship between stock market development and economic growth and stock market volatility. He finds that, although both banks and stock markets may be able to promote economic growth, their influences are more powerful. According to Onakoya (2013), a rise in stock prices also makes it cheaper for firms to raise funds and invest more. He assumed that these factors can swell domestic demand and accelerate the increase in real GDP growth. Therefore, if stocks prices truthfully reflect the basic fundamentals, then the stock prices should be used as principal indicators of future economic activity. Similarly, since the value of corporate equity at the aggregate level depends on the state of the economy, it is plausible that a change in the level of uncertainty about future economic growth could produce a change in the stock market. However, his result suggests that there exists a bi-causal relationship between volatility of Nigeria's stock market and that of its real Gross Domestic Product. Recently, Kirui *et al.* (2014) analyses the effect of changes in macroeconomic variables on stock returns volatility. He revealed that the impact of news is asymmetric and that there is leverage effects.

3. Research methodology
3.1. Research design & theoretical model

This study examines the relationship between securities returns, their volatility and key macroeconomic variables for selected countries. This work

raises the problem of sustainability of economic growth, it seeks to analyse the influence which could stock market have on growth, this through a vector autoregressive (VAR) framework. The study also intends to check if the principal problem found on the stock markets: that of volatility of returns could be influence by evolution of the levels of considered macroeconomic variables, this through a Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model.

The models used in this research, are based on the principles of some earlier studies (King and Levine, 1993; Levine and Zervos, 1998; N'zue, 2006; Seetanah, 2008 and Evans Kirui *et al.*, 2014). The model is given as,

$$GDP = f(INF, IR, M2, UMP, INDEX, MCAP) \tag{i}$$
$$\text{and,}$$
$$\delta RT = f(\delta GDP, \delta M2, \delta IR, \delta INF, \delta UMP) \tag{ii}$$

The first model (*i*) is a VAR specification with 6 simultaneous equations. This is to analyse causal influences of stock market development on economic growth and conversely. Model (*ii*) is going to be estimate thru a GARCH framework, this to make an in-depth study of the specific effect of economic trend fluctuations on stock market variations.

3.3. Model specification and the estimation procedure
3.3.1. VAR model description

First of all, it's about studying the bidirectional bond which could exist between the selected macroeconomic variables and the stock market trend. Table 1, specified model is as:

$$Y_t = \alpha + \beta.Y_{t-1} + \varepsilon_t \tag{1}$$

Y_t is a matrix of following terms (exogenous): $Y_t = (GDP_t, INF_t, IR_t, M2_t, UMP_t, INDEX_t, MCAP_t)$

Y_{t-1} is the matrix of exogenous variables (Y_t lagged variables).
ε is the matrix of error term and α, β are matrix of unknown parameters to be estimated.

Table 1
Description variable

Variable	Description
GDP	growth rate of gross domestic product
INF	inflation rate
IR	interest rate
M2	money and quasi money growth rate
UMP	total unemployment rate (% of total labour force)
INDEX	closing market index value
MCAP	market capitalization of listed domestic companies (% of GDP)

Source: autor.

The vector autoregression (VAR) is an econometric model used to capture the linear interdependencies among multiple time series. Each variable has an equation explaining its evolution based on its own lags and the lags of the other model variables. All variables in the model are treated symmetrically.

Interpretation of estimated model: Properties of the VAR model are usually summarized using structural analysis (Granger causality), impulse responses, and forecast error variance decompositions.

3.3.2. GARCH model description

In a second stage, the effects of change in macroeconomic variables and stock returns volatility is investigated using generalized autoregressive conditional heteroscedasticity (GARCH) model developed by BOLLERSLEV (1986). The study choose the following equation (GARCH (1,1)):

• Mean equation

$$RT_t = C1 + C2. RT_{t-1} + e_t \tag{2}$$

• Variance equation

$$H_t = C3 + C4. H_{t-1} + C5. (e_{t-1})^2 + C6.GDP_t + C7.INF_t + C8.IR_t + C9.M2_t + C10.UMP_t \tag{3}$$

RT_t stands for stock return at period t. $C1\ldots10$ are the constants and e is the residual.

Residual derived from (2) is used in making variance equation. Then H_t is the variance of the error term, quarterly volatility of stock return or GARCH term.

$(e_{t-1})^2$ is previous periods squared residual derived from (2). It's the ARCH term, also known as previous day's stock return information about volatility.

3.4. Data type and source

Data analysed in this study consists of economic and financial time series of two West African countries (Ivory Coast and Nigeria) and one Central African country (Cameroon). These include gross domestic product rate (GDP), inflation rate (INF), interest rate(IR),[7] money and quasi money growth($M2$), total unemployment rate –% of total labour force– (UMP), closing market index value and market capitalization of listed domestic companies –% of GDP– (MCAP).

The data set of the study consists of 60 quarterly observations covering 2000 to 2015 for Nigeria and Ivory Coast and 2008 to 2015 for Cameroon. They come from Word Development Indicator Website, BRVM, DSX and NSE databases. Some two last year economic data are from African Economic Outlook,[8] Central Bank of Central, West African States and government expectations.

It is necessary to interpolate annuals series to a quarterly basis for some economic variables. The method used for the interpolation is from Goldstein and Khan (1976).

Here is the formula:

$Q_1 = 0.0545X_{t-1} + 0.2346X_t - 0.0392X_{t+1}$ $Q2 = 0.0079X_{t-1} + 0.2655X_t - 0.0234X_{t+1}$
$Q_3 = -0.0234X_{t-1} + 0.2655X_t + 0.0078X_{t+1}$ $Q4 = -0.039X_{t-1} + 0.2343X_t + 0.0547X_{t+1}$
Where X_t is the annual observation of a flow variable and Q_t quarterly data.

3.5. Time series characteristic of the data

In order to determine the appropriate method for the estimation of parameters, this study carried out the unit root test of the variables, the heteroscedasticity as well as relevant econometric tests on the series. The ARCH test is made to reject or not any presumption of residual heteroscedasticity before fitting any GARCH model. The examination of the variables stationnarity is done using Augmented Dickey-Fuller test at level and on first difference.

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[8] AfDB, OECD, UNDP 2015

The dynamic Granger causality can be captured from the VAR model. To mitigate problems of non-stationary and cointegration of the series, Toda and Yamamoto (1995) based on augmented VAR modeling, introduced a modified Wald test statistic. This procedure is found to be superior to ordinary Granger-causality tests since it does not require pre-testing for the cointegrating properties of the system and thus avoids the potential bias associated with unit roots and cointegration tests as it can be applied regardless of whether a series is I(0), I(1) or I(2), non-cointegrated or cointegrated of an arbitrary order.

4. Results and discussion
4.1. Stationarity analysis

An important concern in time series analysis is to determine whether a series contains a unit root or not. Time series data are often assumed to be non-stationary and thus it is necessary to perform ADF test to ensure that all the variables are stationary in order to avoid the problem of spurious regression (Granger, 2001).

The results show that only for stock returns (SR), unemployment (UMP) and market capitalization (MCAP) null hypothesis of non-stationarity are rejected, implying that they are I(0), stationary at level. Evaluation of the results is guided by the critical values provided by Mackinnon (1996). The other macroeconomic variables; gross domestic product (GDP), inflation (INF), money supply ($M2$) and interest rate (IR) are found to be non-stationary at level. However, they become stationary after the first difference. This means that they are integrated of order one, I (1). It is the same for index which become stationary after his first difference. Similar results are found in Nigeria case.

In the Cameroonian case, all variables are stationary at level except MCAP and GDP, which are I (1). Knowing this, VAR model can be estimate in order to find short run interrelationships between variables.

4.2. VAR Results and interpretation

After found different integration orders for variables, this study determines appropriate lag length by utilizing Akaike information criterion (AIC) in

order to estimate the suitable VAR model. The results show that the suitable lag according to Akaike, criterions is p = 5 for Nigeria and Ivory Coast. Cameroonian results suggest an optimum lag of 1 according to Akaike information criterion.

4.2.1. Ivory coast VAR result

From VAR[9] estimation, the third model (*iii*) appears to be significant. The exogenous variables explain at 99% interest rate. It is the same for model (*iv*) and (*vii*) with R-square values of 95% and 93% respectively. Meaning that exogenous variables explain very well the Money supply and market capitalization. Model (*i*), (*v*) and (*vi*) have good R-squared value, but the study prefers not to accept them because of their poor adjusted R-squared values. Meaning that in Ivory Coast, exogenous variables are not able to explain in a convincing way gross domestic product, index and unemployment variations.

Within this panoply of information, some relationships captivate the attention. Into model (*ii*), Index and MCAP affect negatively the inflation rate. In fact, when BRVM composite index lost 1 point ceteris paribus, the inflation rate seems to increase from 0.1915%. Index, representing the market well-being, when its value decreases, investors increase their purchases, the demand for securities increases because their value dropped. These demand thus increased lead to the growing of prices which results in the rise of inflation rate. Another interesting relationship is observed into model (*vii*) where MCAP is highly sensitive to GDP movements. The model states that an increase of 1 point of Ivory Coast's GDP (as %) lead to one other increase of 1.41E + 08 CFA Francs of BRVM's market capitalization. Model (*iv*) and (*iii*) show that Index and MCAP have a positive impact on money supply growth rate in one hand and Interest rate in the second one.

4.2.3. Nigeria VAR result

For Nigeria case, the study finds six good models over seven. From estimation, only model (*vi*) appears not to be well estimate. The exogenous variables

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[9] E-mail authors for the results details.

explain at 88% interest rate and MCAP, at 91% the GDP, at 85% the infla-
tion rate, at 82% the money supply and at 80% the unemployment rate.
Model (*vi*) have an acceptable R-squared value, but the study prefers not
to accept it because of its poor adjusted R-squared values. Meaning that in
Nigeria, the exogenous variables are not able to explain in a convincing way
the Index movements. Some relationships among all are interesting. Into
model (*ii*), index and MCAP affect negatively the inflation rate as found in
Ivory Coast case. Another interesting relationship is observed into model
(*vii*) where MCAP is highly sensitive to GDP movements. The model states
that an increase of 1 point of Nigeria's GDP (as %) lead to a fall of 1.78E + 09
Naira of NSE's market capitalization. Model (*iv*) and (*iii*) show that index
have a positive impact on money supply growth rate in one hand and Interest
rate in the other one. MCAP gives the inverse relationships.

4.2.3. Cameroon VAR result

Results show that none of all Cameroonian models are significant. These
results are not unexpected considering the moroseness of the douala stock
exchange, his early life, the poor number of quoted companies (3 in April
2016) and the lack of an index on the market. Compared to results recorded
on markets of same countries' situation (developing countries) –Nigeria and
the Ivory Coast–, Cameroon's performances for the moment are rather poor.

In spite of insignificant explanation from DSX variable to Cameroonian
economy and vice-versa, the correlation table gives a higher positive corre-
lation between market capitalization and gross domestic product (79.25%).
MCAP also seems to have negative correlation (60.01%) with Cameroon
inflation rate. These results are not similar to Nigerian an Ivorian result.
Result can be resumed in the following table 2.

4.3. Causality test results and interpretations

The exact direction of causality between selected variables is examined
through Granger-Causality tests. Granger-Causality is adopted to examine
the direction of causality between economic and stock market variables. An
optimal lag length of 5 is used. The results are presented below (from this
table, D(Y) → D(X) implies Y Granger-Causes X).

Table 2

Models accepted *vs* rejected; source: author, from VAR results

Country	Model	R²	Adj. R²	Decision
Ivory Coast	D(GDP) i	0.664017	0.129499	rejected
	D(INF) ii	0.798178	0.477097	accepted
	D(IR) iii	0.999666	0.999134	accepted
	D(M2) iv	0.955025	0.883474	accepted
	D(UMP) v	0.726074	0.290283	rejected
	D(INDEX) vi	0.712373	0.254783	rejected
	D(MCAP) vii	0.936799	0.836251	accepted
Nigeria	D(GDP) i	0.910078	0.767020	accepted
	D(INF) ii	0.854945	0.624175	accepted
	D(IR) iii	0.888005	0.709831	accepted
	D(M2) iv	0.806238	0.497979	accepted
	D(UMP) v	0.824235	0.544608	accepted
	D(INDEX) vi	0.571144	-0.111126	rejected
	D(MCAP) vii	0.881193	0.692182	accepted
Cameroon	D(GDP) i	0.197433	0.030232	rejected
	D(INF) ii	0.472084	0.362102	rejected
	D(M2) iii	0.288271	0.139995	rejected
	D(UMP) iv	0.201985	0.035732	rejected
	D(MCAP) v	0.113282	-0.071451	rejected

4.3.1. Ivory Coast Granger causality results and interpretation

Toda & Yamamoto causality test results for Ivory Coast are resumed in the table below.
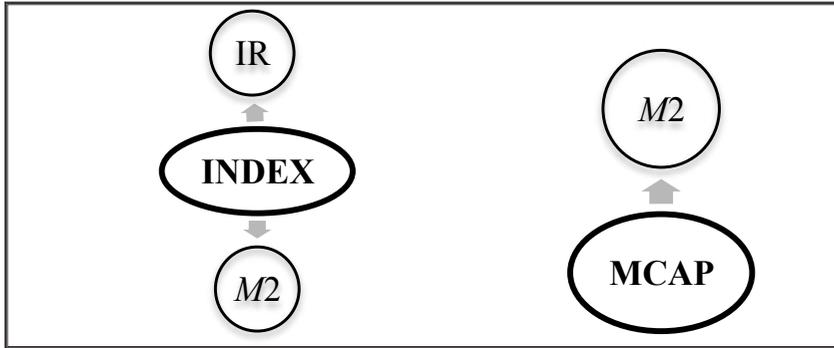
The results suggest Granger causality relationship running from BRVM stock market index to interest rate and money supply for Ivory Coast respectively at 5% and 10% level of significance. It is also found that the market capitalization 'Granger causes' money supply at 1% level of significance. Concerning economic variable influence on stock market development, results show that IR, INF, UMP and GDP are the only economic variables 'Granger causing' stock market development. It also important to note that none of all these variables causes GDP. More information can be found in the following figure 1 representation:

Table 3
VAR Ganger causality results for Ivory Coast[10]

Direction of causality	Number of observation	Chi-sq.	Prob.	Decision
D(INDEX) D(GDP)	58	3.301892	0.6536	no
D(MCAP) → D(GDP)	58	1.105531	0.9536	no
D(INDEX) → D(IR)	58	12.20865	0.0320**	yes
D(MCAP) → D(IR)	58	8.822308	0.1164	no
D(INDEX) → D(M2)	58	9.369084	0.0952***	yes
D(MCAP) → D(M2)	58	130.8685	0.0000*	yes
D(INDEX) → D(UMP)	58	5.889703	0.3171	no
D(MCAP) → D(UMP)	58	3.736421	0.5880	no
D(GDP) → D(INDEX)	58	6.98890	0.2215	no
D(INF) → D(INDEX)	58	4.70186	0.4533	no
D(IR) → D(INDEX)	58	14.5449	0.0125**	yes
D(M2) → D(INDEX)	58	2.37391	0.7954	no
D(UMP) → D(INDEX)	58	6.22241	0.2852	no
D(MCAP) → D(INDEX)	58	1.28736	0.9362	no
D(GDP) → D(MCAP)	58	28.7320	0.0000*	yes
D(INF) → D(MCAP)	58	48.1779	0.0000*	yes
D(IR) → D(MCAP)	58	8.34381	0.1383	no
D(M2) → D(MCAP)	58	79.9002	0.0000*	yes
D(UMP) → D(MCAP)	58	13.1086	0.0224**	yes
D(INDEX) → D(MCAP)	58	8.84710	0.1153	no
D(GDP) →D(M2)	58	11.3481	0.0449**	Yes
D(INF) → D(M2)	58	12.6617	0.0268**	Yes
D(IR) →D(M2)	58	18.0667	0.0029*	yes
D(GDP) →D(IR)	58	10.7337	0.0569***	yes
D(INF) → D(IR)	58	13.1075	0.0224**	yes

Source: author, from Eviews Granger Causality test results. * = 1% significance; ** = 5% significance; *** = 10% significance.

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[10] Only interesting relationships are taken into consideration. All significant relationships are into the table.

Sources: from author, using VAR estimation and Granger causality test results.

Figure 1

Stock market development influence on macroeconomic variables

The results suggest no direct causality between chosen BRVM's indicators and gross domestic product. On the first sight, this result seems disappointing. But, this is without including the link these variables have with $M2$ and IR, and the formers are significant while building efficient monetary policies by the central bank. However, there is no more need to prove that one of the objectives of the monetary policy is to stimulate economic growth. This non-Granger causality between stock development indicators and GDP also can be explained regarding this: from 1976 to 2002, N'Zué (2006) investigates the relationship between the development of the Ivorian stock market and the country's economic performance. His causality test conducted him to suggest a unidirectional causality from the stock market development variable to economic growth. At that time, the BRVM was BVA,[11] ''Bourse des Valeurs d'Abidjan'' and was not a regional stock (it was covering only Ivory Coast). Bringing other countries in the market undoubtedly have reduced (or annulled) the direct impact of the stock market on the Ivorian GDP. Another explanation can be the stressing of political disorder in the country since 2000 until 2011, covering the major period of this study (2000-2015).
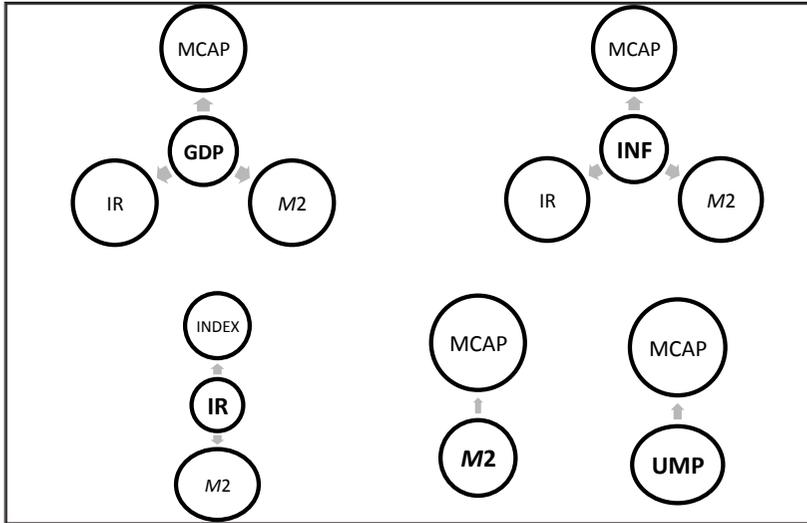
Sources: From author, using VAR estimation and Granger Causality test results.

Figure 2
Ivory Coast macroeconomic influence on BRVM stock market[12]

D (INDEX) –model (vi) from table 2– doesn't have an acceptable adjusted R^2 value (25.47%). It implies that this study prefers not to consider IR to IN-DEX causality.

Before analysing the Ivorian macroeconomic influence on the BRVM stock market, an interesting phenomenal comes here. The correlation table gives a negative correlation between BRVM market capitalization and its index (-0.1586). This seems irrational. But, looking carefully to above figures, this relation can be found:

$$\text{INDEX} \mapsto \text{IR } M2 \leftrightarrows \text{MCAP}$$

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[11] The Ivorian stock market was created in 1973 and named ''Bourse des Valeurs d'Abidjan''. It was transformed into a regional stock market (BRVM) in 1997.

[12] Red colour = negative relationship.
Green colour = positive relationship.
Variables in write ring are the causing one.

First, it is important to note that D (INDEX) represented by model (*vi*) is not a significant one. It is also important to understand that index is derived from market capitalization, then it exists a lag or delay between the period market capitalization changes and the other period index is computed (vice versa). Knowing this, Granger causality and VAR results enable to see that an increase in BRVM Composite index (lag 1)[13] lead to another increase in Ivory Coast interest rate –lag 2– (which is assumed to be the ''price of money''). Increasing IR ceteris paribus, will drop *M*2 money supply value (lag 3); which will finally lead to a fall in lag 4 market capitalization value. Meaning an indirect negative link running from index to MCAP.

Using these information, following relationships can be drawn:

INF ↦ IR ⇆ INDEX
INF ↦ IR ⇆ INDEX ↦ *M*2 ⇆ MCAP

GDP ↦ M2 ⇆ MCAP
GDP ↦ IR ⇆ INDEX ↦ M2 ⇆ MCAP
GDP ↦ IR ↦ M2 ⇆ MCAP

These results show that even if stock market indicators cannot cause GPD, the former can significantly cause MCAP. Even if a negative link exists here between *M*2 and MCAP whereas GDP and *M*2 link is positive, the explanation can be the following: GDP is not the only variable causing *M*2, there is also INF, and its influence on money supply can be greater than GDP's effect. Meaning that the direct impact of GDP on MCAP is positive and the indirect one is negative. These results are not far from pioneer ones of Levine and Zervos (1996). They found a strong correlation between economic growth and stock market development.

This high predictability of the BRVM stock market by economic indicators can also confirm the general thought that, developing countries' stock markets do not respect the Fama[14] efficiency assumption. Making these markets predictable.

*4.3.2. Nigeria results and interpretation (block exogeneity wald test)*

Nigeria results reveal that there are not enough arguments to support the fact that, it is the economy that catalyses development in the stock market. Above table suggest Granger causality relationship between Nigeria All

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[13] See Ivory Coast VAR results in the annex.
[14] Market efficiency theory: fama developed this theory in the year 1970. It suggests that a market is rational and current market prices reflect fully available information on security and expected return at that price.

Share index and its interest rate at 1% level of significance. Meaning that in order to respond to this study first question: ''can stock development indicators influence macroeconomic variables?'' The appropriate answer according to Nigeria's results is yes. But that influence is poor. Only interest rate is directly affected by NSE index.

It is also found that the market capitalization is only 'Granger caused' by money supply at 5% level of significance. That is, in order to know whether macroeconomic variables can influence or not stock development, the answer is: there is a poor influence on Nigeria stock market by his economic activities. That influence is mainly produced by Nigeria's M2, and correlation table shows this link is negative (a poor one: -23.02%). It also important to note that none of all these variables except INF, causes GDP. More information can be found in the following representations:
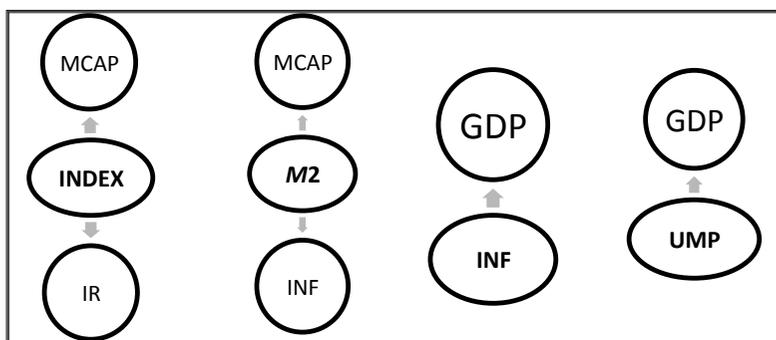
Sources: from author, using VAR estimation and correlation table.

Figure 3
Link between Nigeria macroeconomic and NSE stock market[15]

These results are not far from Onakoya (2013)'s finding. Its results reveals that stock market performance of the listed companies in Nigeria can hardly reflect their real economic competence. In fact, the Nigerian stock market is somewhat separated from the real economy, and the stock indexes do not reflect the actual situation of the economy. Seetanah *et al.* (2008)'s

[15] Red colour = negative relationship;
   green colour = positive relationship,
   variables in write ring are the causing one.

paper focused on a panel set of 27 developing countries[16] over a period of 15 years (1991-2007). His results show that stock market development is an important ingredient of growth, but with a relative lower magnitude as compared to the other determinants of growth, particularly with banking development. This could explain why this study results are poor, even in Ivory Coast and Cameroon case.

4.3.3. Cameroon results and discussion (block exogeneity wald test)

Granger causality test results for Cameroon pretend there is no significant Granger causality between all Cameroonian economic variables and its market capitalisation (and conversely) from 2008 Q1 to 2015 Q4. One reason explaining this can be the short period of study and multiple data sources, but this doesn't justified all non-causing relationships. As told overhead, Cameroonian Stock market is very young. It's inaugurated since 2003 and first quoted a company on 2008.

Another explanation can be on the level of the DSX structure. 62.9% of the company shares are held by banks which, also are brokerage companies on the former stock market. From the time when these same banks share the same market (financial market), it is then possible to suspect an unfair rivalry. 23.8% of these DSX shares belong to the State, and the public sector is not recognized for its competitiveness in the country. The possible causes are not exhaustive. Cameroon has an economy made up from approximately 90% of SME; these small and medium enterprises actually do not have access to the market, bringing stock capitalization powerless to explain GDP growth. This point of view is supported by Avom[17] when he says DSX reflect Cameroon economic structure. In addition, raw material's export is one of the principal income sources of the country, but it is easy to remark that stock market capitalization of the country does not count a

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[16] Algeria, Angola, Brazil, Cameroon, China, Ghana, Egypt, Ethiopia, India, Indonesia, Israel, Kenya, Mauritius, Malaysia, Malawi, Morocco, Mexico, Nigeria, Pakistan, South Africa, South Korea, Taiwan, Thailand, Tunisia, Uganda.

[17] Dean of FSEG, University of Dschang in Cameroon Tribune, ''Pourquoi la bourse n'attire pas'', April 26, 2016, pp. 17.

significant part of this sector. As last explanation, it is remarkable to note that the DSX shares a poor regional market (CEMAC) with its neighbour of Gabon (BVMAC).[18]

4.3. GARCH Results and interpretations

Another way to catch the influence of economic variables on stock market development is to study returns volatility, and find which selected macroeconomic variable can influence his fluctuations. Before estimating the model, the residuals were examined for heteroscedasticity where the ARCH-LM test provided weak evidence of ARCH effects in the Nigeria residual series. The null hypothesis of no ARCH effect is accepted and concludes that there is absence of ARCH effects in Ivory Coast.[19] Presence of ARCH effects paves the way for the estimation of GARCH model in Nigeria. In order to have more information before estimating any GARCH model, it's also important to take a look on the residuals fluctuation.

From figures 4 and 5, it appears that Nigeria SR residual fluctuations are more persistent than Ivory Coast ones. Nigeria figure shows short periods of low volatility tends to be followed by others periods of low volatility. That is from 00 to 02 which is followed by 02 to 04. Figures also showes that periods of higher volatility (04 to 06) are followed by other periods of higher volatility (07 to 09). Then GARCH model can be introduced in Nigeria case in order to analyse theses small fluctuations.
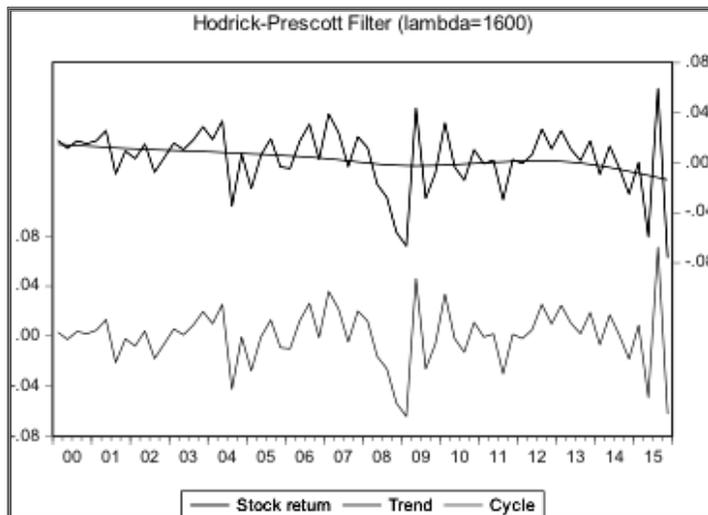
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[18] Bourse des Valeurs Mobilières d'Afrique Centrale.
[19] Volatility is not measure in Cameroon market due to no index availability.
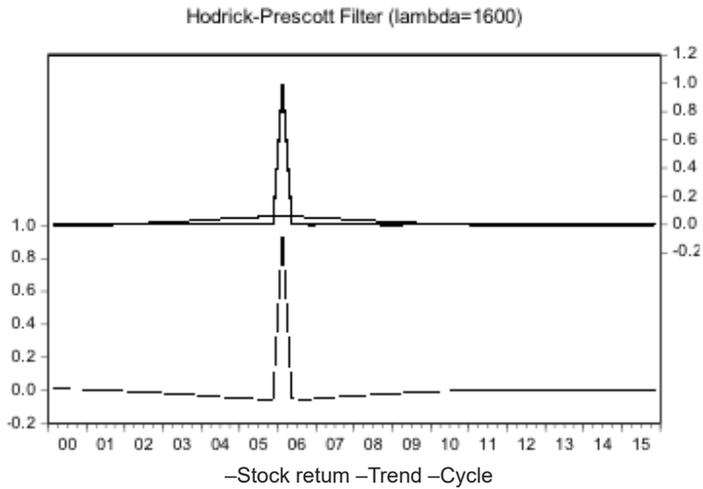
Source: author from Eviews 7.0.

Figure 4
Residuals of stock return (SR) in Ivory Coast case

Source: author from Eviews 7.0.

Figure 5
Residual of stock return (SR) in Nigeria case

The results of the GARCH give an adjusted R2 of 0.4326, meaning that selected variables explain 43.26% of NSE all share index return volatility. Mean equation results show that SR lag 1 have a higher negative influence (-74.92%) on present value of SR and variance equation gives a 5% significance of GARCH term. Nigerian investors expect decrease after good returns. Onakoya (2013) explain this by suggesting that small investors are more interested in short-term gains and ignore long-term investment opportunities. According to him, this makes Nigeria's stocks more volatile than those in mature markets like developed nations, and less correlated to longer-term company performance and economic growth. Another explanation is Omorokunwa *et al*. (2014) one. His paper examines the relationship between stock price volatility and few macroeconomic variables such as inflation, exchange rate, GDP and interest rate from 1980 to 2011 (annual time series). He finds that stock prices in Nigeria are volatile and that past information in the market have effect on stock price volatility in Nigeria as found in this study. It also important to note that none of all selected macroeconomic variables volatility is significant to explain stock return volatility.

These results are interesting and show that (Cameroon and) Ivory Coast stock market(s), because of his (their) youth experience and weak market has (have) no volatility problems. These results seem to be good, but may lead to troubles in the market if Fama's Efficiency hypothesis is not respected. Due to different order of integration, the study chooses to differentiate the variables before analysing them and then found some short run relationships between variables. Because of the abundance of the outcomes, just some interesting results are interpreted. This gives some answers to the main questions stated in the first chapter and lead to the end of this research.

5. Research closing
5.1. Summary

The whole results shown that Cameroon results are not similar to Nigeria and Ivory Coast ones. In fact, Nigeria results give the best VAR model estimation while Ivory Coast have the best significant Granger causality relationships. Unfortunately, just four models out of nineteen have a significant

Fisher value, Cameroonian models is considered as an advisory one. These results show no significant link between current DSX level and Cameroon economic trend. It precisely reveals no significant Granger causality between all Cameroonian economy variables and its market capitalisation, many reason have been exposed among them: short period of study, DSX structure. Ivory Coast Granger Causality unable to note that none of all selected variables cause GDP, but there is a significant causality going from BRVM composite index to $M2$ and IR, then from MCAP to $M2$. Concerning influence of macroeconomic on stock market, these results reveals that GPD significantly cause MCAP in Ivory Coast. These kind of results have been explained by: the direct impact of the Stock market on the Ivorian GDP, political disorder in the country since 2000 until 2011, covering the major period of this study (2000- 2015). Non-Granger causality between stock development indicators and GDP is also found in Nigeria while NSE All share Index causes IR, and $M2$ causes MCAP. These results haven't been found far from Onakoya (2013)'s finding. Its results reveals that stock market performance of the listed companies in Nigeria can hardly reflect their real economic performances.

One of the most unexpected finding of this study is the negative correlation between BRVM market capitalization and its Index. The study tried to explain this phenomenal using lags between the period market capitalization changes (due to stock prices) and the other period index is computed. Then, an increase in BRVM composite index (lag 1) may lead to another in crease in Ivory Coast interest rate during the next period –lag 2–. Increasing IR *ceteris paribus*, will drop $M2$ money supply value –lag 3–; which will finally lead to a fall in lag 4 market capitalization value. Explaining the indirect negative link going from index to MCAP. Another way used in the study to catch the influence of economic variables on stock market development is returns volatility analyse. The study find no ARCH effect in Ivory Coast and therefore, doesn't estimate GARCH model for BRVM and DSX (lack of market index). On the other hand, Nigeria market which is the biggest one is found to be more volatile. NSE returns volatility seems more sensitive to its past return value than Nigeria economic activities. This result can help explaining why Ivory Coast stock market, because of his youth experience and weak market has no significant volatility problems and then also Cameroon by inference.

5.2. Conclusion

An African developing country like Cameroon, aspiring to reach economic emergence, need to capitalise on great scale project. It then needs long run resources, and stock market is the best place to find it. This study shows that DSX results are not significant causing economic growth, neither the converse. Is this mean it should be closed? Absolutely no. On the contrary, this study reveals that Cameroon market desperately need to be boosted if the country wishes to reach an acceptable economic situation. Developing countries can better gain from their stock markets and thus improve their development like China made it in less than few decades.

5.3. Policy implications

Given the above findings, the policy implications for governments and institutions are numerous:
- The first one concern developing countries with poor stock markets like Cameroon. They need to boost their stock market if they want a sustainable economic growth. One way of doing this can be reinforcing their SME, (As suggested by Pr Avom)[20].
- The two stock markets of CEMAC (Gabon and Cameroon) should merge in order to improve their activities all over the region.
- Governments should attempt to develop their financial sector and one of the first steps is to have less state involvement in the system as suggested by Seetanah *et al*. (2008). This includes cutting back on public ownership of financial institutions and minimizing monetary financing of budget deficits. The deregulation and liberalization process should continue in a careful way and more competition within the financial sector should be encouraged.
- Moreover, governments should promote stock market culture by, for instance propagating knowledge to the public of the benefits of investing in stock markets (N'Zué, 2006). They also need to put in place measures that will curtail instability and political crisis in the countries.

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[20] Dean of FSEG, University of Dschang in Cameroon Tribune, ''Pourquoi la bourse n'attire pas'', April 26, 2016, pp. 17.

- Central Banks should define their policies knowing that they can have an influence on stock market development. This is because empirical evidence from study has shown that interest rate and money supply affect stock market movements.

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