

ANALYSIS OF THE THRESHOLD LEVEL EFFECT BETWEEN THE STOCK EXCHANGE AND ECONOMIC GROWTH: AN APPLICATION TO THE IVORIAN ECONOMY.

ANALYSE DE L'EFFET DU NIVEAU SEUIL ENTRE LA BOURSE ET LA CROISSANCE ECONOMIQUE : UNE APPLICATION A L'ECONOMIE IVOIRIENNE.

GNOLEBA Martin Zahore

Université Alassane OUATTARA de BOUAKE

Laboratoire d'Analyse et de Modélisation des Politiques Economiques
CÔTE D'IVOIRE

Date de soumission : 15/03/2024

Date d'acceptation : 08/05/2024

Pour citer cet article :

GNOLEBA. M.Z. (2024) « ANALYSIS OF THE THRESHOLD LEVEL EFFECT BETWEEN THE STOCK EXCHANGE AND ECONOMIC GROWTH: AN APPLICATION TO THE IVORIAN ECONOMY », Revue Française d'Economie et de Gestion « Volume 5 : Numéro 5 », pp : 454 –.472.

Author(s) agree that this article remain permanently open access under the terms of the Creative Commons Attribution License 4.0 International License



Abstract

We focused on the connection between stock exchange and economic growth applied to the Ivorian economy, by referring to classical theory of efficiency of financial markets. As methodological guideline, a threshold model (TAR model) was estimated through an econometric approach on time series. Our results disclose U-shaped relationship presence between economic growth and stock exchange. In addition, trigger point for size of the stock exchange stands at 7.91% of GDP. The BRVM's stock market is weakly developed because of the fact that narrowness, small number of marketable securities, small transaction volume and liquidity of the stock exchanges and the small size of the national economies, thus contributing to the exacerbation of the handicaps of African stock markets. But these stock markets can become dynamic under certain conditions.

Keywords: Threshold level effect; stock exchange; economic growth; Ivorian economy; TAR model.

JEL classification : C13 ; O16 ; O40.

Résumé

L'objectif de la présente étude est d'analyser le lien entre le marché boursier et la croissance économique en Côte d'Ivoire, en nous référant à la théorie classique de l'efficacité des marchés financiers et boursiers. Comme orientation méthodologique, un modèle de seuil (modèle TAR) a été estimé à l'aide d'une approche économétrique sur séries chronologiques ou temporelles. Nos résultats révèlent l'existence d'une relation en U entre la croissance économique et le marché boursier. En outre, le seuil critique de la taille du marché boursier s'établit à 7,91% du PIB. En conséquence, le marché boursier de la BRVM est faiblement développé et ce à cause des faits liés à la petite taille, au nombre limité de titres négociables, au faible volume de transactions et à la liquidité médiocre des bourses ainsi que l'étroitesse des économies nationales, qui concourent ainsi à l'exacerbation des handicaps des marchés boursiers africains. Mais ces marchés boursiers peuvent devenir dynamiques sous certaines conditions.

Mots-clés : effet du niveau seuil ; bourse ; croissance économique ; économie ivoirienne ; modèle TAR.

Introduction

In the early 1910s, (Schumpeter, 1911) first discussed the role of financial markets in economic growth. According to him, credit markets finance companies, which in turn use them to acquire new technologies, which in turn promotes economic growth. Stock markets were not seen for many years as an important part of economic growth, while banking financial institutions were seen as more useful in accelerating economic growth. There is a growing body of literature (theoretical and empirical) on the contribution of stock markets to economic growth. Taken in isolation, economic growth is achieved when the overall level of output increases in proportion to the overall demand of the economy. According to supply-side theory, economic growth results from firms responding to increased demand for goods and services by hiring more workers. In order to cover the additional cost of the new workforce, companies are focusing on loans. Thus, the stock markets are becoming one of the sources of financing for companies wishing to ensure their sustainability. Stock markets allow companies to borrow money in the form of long-term debt. This is called an obligation. In addition, these bonds can be bought and sold on other stock exchanges. The use of bonds and tradable shares to raise capital by companies shows the existence of the direct relationship between the stock market and economic growth. Among the research, some argue that there is a dual relationship, and others argue that stock markets have no effect on economic growth. Here are some arguments in favour of the positive contribution of stock markets to economic growth: (Gurley & Shaw, 1955), (Levine & Zervos, 1998), (Raj, Rev Dr J Felix & Roy, 2014), (Chakraborty, 2008). Although, a number of scholars have argued that stock markets and economic growth simultaneously inter-cause each other, which implies that there is a double-causality between the two variables see, (Luintel & Khan, 1999) and (GC, 2006). On the other hand, according to some researchers, stock markets have no impact on economic growth, see (Harris, 1997). Discussions are still ongoing on this issue, as different studies have found different results. These mixed arguments and debates form the basis of this research, which aims to determine, if not examine, the nature of link betwixt the stock exchange and economic growth in the case of Ivorian economy. Moreover, majority of empirical studies on this relationship are transnational studies with a limited number of country-specific time-series studies. In the case of Côte d'Ivoire, there are few studies on this relationship. This analysis therefore seeks to determine whether the stock market has played a key role in the continued growth of Côte d'Ivoire. So, what are the characteristics of the BRVM's stock market? In addition, at what point does the BRVM stock market influence Côte d'Ivoire's economic growth? Overall, can we say that the BRVM stock

market contributes significantly to the economic growth of Côte d'Ivoire? To carry out our study, we develop an econometric model inspired by the theoretical models of (Tong, 1990) and taken up by (Ben Salem & Perraudin, 2000). It is a threshold model that introduces exogenous factors into the specification, in particular the TAR model, to better capture the optimal level at which the stock market is pro-growth or not in the Ivorian case. This manuscript is subdivided as follows. Point 1 provides an overview of the characteristics and development of literature review concerning stock exchange and economic expansion. Part 2 discusses econometric methodology and description of the data. Finally, the empirical results are presented in Section 3.

1. Literature review

1.1. Review of the theoretical literature

The relationship between financial development and economic growth has received increased attention from researchers and economists, due to the results showing controversial outlooks. Several studies on this topic have tried to prove the existence of a relationship between financial development and economic growth and secondly, the nature and direction of causality. Some analyses have focused on whether financial sector development stimulates economic growth or whether the relationship goes in the opposite direction, King and (Levine, 1993a, b).

The role of stock markets is increasingly significant in the economic spotlight. The recent subprime mortgage crisis is a testament to the role played by the financial market and its interaction with the real economy. According to (Singh, 1997), the stock market is often seen as an intermediary that generates positive externalities by increasing domestic savings and their quality. In an analysis of forty countries, (Atje & Jovanovic, 1993) proved that there is a correlation between economic growth and the stock market value traded divided by GDP, Identifying the fundamental channels through which economic growth can be influenced: liquidity, risk diversification, corporate governance and information acquisition.

The stock exchange has an ambivalent effect on the economic growth. (Shahbaz *et al.*, 2008), apply another ARDL technique and they confirm the positive long-term correlation between the stock market and economic growth in Pakistan, while (Enisan & Olufisayo, 2008) demonstrated, using data from sub-Saharan African countries, that stock market development significantly influences growth in Egypt and South Africa. (Maurice, Nowbusting & Odit, 2009), implemented a time series analysis based on two important indicators of the stock market: size and liquidity, and obtained a positive correlation between short- and long-term variables.

1.2. Empirical literature review

Many empirical studies have examined the link between stock market development and economic growth. These studies show that the relationship between the stock market and economic growth can be classified into four different categories of studies, namely: transnational studies, panel method, microeconomic studies, and single-country research. Among the cross-national studies, (Rousseau & Wachtel, 2000) and (Beck & Levine, 2004) found a positive relationship between stock markets and economic growth in developed countries over the long term. (Atje & Jovanovic, 1993) and (Harris, 1997) have also found that countries with well-functioning stock markets are associated with economic growth. However, a cross-study conducted in seven African countries by (Enisan & Olufisayo, 2009), shows that only a few countries have experienced growth with the development of their stock markets. In the case of developed countries, in a panel data study by (Wachtel, 2003), (Rioja & Valev, 2004) and (Beck & Levine, 2004), the results showed that there was a positive relationship between stock market variables and economic growth. (Calderon & Liu, 2003), found a dual direction of causality, while (Christopoulos & Tsionas, 2004), established a one-way direction, ranging from stock markets to economic growth. Examples of microeconomic-level studies to examine the causal effects of stock markets on economic growth include (Rajan & Zingales, 1998), (Levine, 1997), and (Beck & Levine, 2004). (Taghipour, 2009) recently attempted to study the influence of the Tehran Stock Exchange (TSE) on the country's economic growth. To achieve this, he used 16-year time series using error-corrected models (ECMs), to study the transmission channels through which financial development affects Tehran's economic growth. The results of his analysis suggest that the stock market via banks affects economic growth primarily through the channel of capital accumulation. On the other hand, it appears that the stock market only causes growth through the channel of productivity. Criticism can be levelled at (Taghipour's, 2009) analysis. This is because it does not control for other factors that affect economic growth and whose effect needs to be assessed. To address this difficulty, researchers have improved on the work of (Taghipour, 2009), adopting the VAR model and controlling for other factors that affect growth in Iran and emphasizing the different control variables by which the development of banks and stock markets can affect growth. (Taghipour's, 2009) analysis is also criticized for attempting to minimize the problems of bias of omitted variables by controlling for other factors that can be considered to influence economic growth. Control variables include the openness of the economy to international trade, government spending, capital stock, and the financial sector. (Lenuța, 2012) aims to analyze the dynamism of the stock

market in Central and Eastern Europe in the light of macroeconomic imbalances, with a focus on the volatility of foreign capital inflows. Its results make it possible to compare macroeconomic performance and identify appropriate measures through which the domestic capital market can become more attractive to investors. (Khyareh & Oskou, 2015) seek to determine the short- and long-term dynamics of correlation between stock exchange enlargement and economic recovery relative to Iran. They relied on error-corrected vector models (VECMs). Their results suggest that the variables are co-integrated and the VECM reveals the existence of a long-term relationship. In addition, Granger's causality test showed a two-way causation allying the stock exchange and economic progress concerning Iranian economy. The role of stock markets in economic development has been analyzed differently. (IGUE, C.B & ESSEHOU, Y. 2023), in their study on structural transformation and employment in sub-Saharan Africa: an analysis by threshold approach, use an endogenous threshold effect model from Hansen (1999) to determine the level of economic development from which the diversification or sophistication of exports significantly influences the share of employment in the different sectors of activity in SSA. The results of their estimates indicate that a level of economic development of US\$1276.04 and US\$1510.92 is required to see a positive effect of export diversification on the share of employment in the industrial and service sectors, while the effect is negative on the share of employment in the agricultural sector for a level of US\$1510.92 of economic development. For their part, (MANSOURI, A. & NDIAYE, O.H. 2024), through their reflection on the influence of the French and American stock markets on the Moroccan stock market, have tried to show that classical VAR models can be used with Gini regression (VAR-Gini) in order to study the causal relationship that may exist between MASI, the CAC40 and the SP500. they conclude that in the presence of outliers, Gini regression allows for more robust estimators using VAR models. The study of causality, according to these authors, has proven that the evolution of the MASI stock market index is closely dependent on the SP500 and CAC40 stock market indices. (ONGUENE ATEBA, J. G., & BENGALY, A. 2024), in their article on the financing of economic emergence dynamics in Africa: the case of Cameroon's economic emergence model, use an econometric model that they estimate using the ordinary least squares technique with the aim of assessing the impact and effectiveness of the financing of projects included in the 2010 Growth and Employment Strategy Paper (GESP) and those of the 2020 National Development Strategy (SND30) for the expected horizon in a retrospective and prospective manner. Their results show that the financing policy for Cameroon's economic emergence contained in the 2010 DSCE and the 2020 NDS30 has a

negative influence on economic growth. and consequently, the economic emergence of Cameroon. The economic model of the Big Push theory, the foundation of the economic emergence model, is the cause, because it consumes a lot of funding and demands in terms of governance, which Cameroon does not offer as a guarantee.

2. Methodology

Evaluate the influence of stock exchange on economic progress and corroborate the theoretical and empirical conclusions highlighted in the literature review, will done using a three-step methodology. First, we will present the sources of the data. Secondly, we will develop our econometric model based on the theoretical model of (Tong, 1990) and taken up by (Ben Salem & Perraudin, 2000). This is because it is a threshold model that introduces exogenous factors. Finally, we conclude this chapter by presenting the estimation techniques as well as the different hypothesis tests.

2.1. Data Sources

The manuscript relies on data obtained from secondary databases, which are predominantly quantitative. These data were extracted from the World Bank's World Development Indicators (WDI) 2021 database and cover the period from 1993 to 2020, with a quarterly time frame.

2.2. Description of the data

This study aims to analyze the effect of financial development on economic growth in Côte d'Ivoire. Thus, in accordance with the empirical work of (Levine, 1997), the Gross Domestic Product per capita (GDPH) serves as an endogenous variable, acting as a substitute for the economic growth rate. It is widely regarded as one of the most effective synthetic indicators, for measuring a country's economic growth.

As a variable of interest, we have opted for indicators of stock market development:

- Market capitalization (CB): according to the economic literature, this variable is used to measure the size of the stock exchange. It is equal to the total value of listed shares in relation to GDP. The measure in question found application in the work of Levine and Zervos (1996). They expected a positive effect.
- Stock market liquidity (LIQMCH): This variable is used to assess the level of liquidity (activity) of the stock market. Its use as an indicator of financial development is advocated by several authors, including Levine (1991), (Bencivenga *et al.*, 1996). This measure can have a positive effect on GDP depending on the regularity of transactions. It can also have a negative

impact on GDP due to the existence of exogenous shocks (financial crises) that generally lead to capital flight.

In accordance with the literature review, we will augment our model by including control variables alongside the variables of interest:

- Gross fixed capital formation (GFCF): this variable will be used as a proxy for the investment rate. In addition, it is defined by the volume of investment in relation to GDP. In economic theory, investment drives a country's economic growth, and it is expected to have a positive impact.
- The rate of openness of the economy (TOE): the opening of the economy to the outside world can generate economic growth (Berthélemy & Varoudakis, 1998). We expect a positive sign as a more outward-looking economy is more dynamic than an economy with self-sufficiency.
- The share of the urban population in the total population (POPURB): This variable is used in this study as a proxy for urbanization. Indeed, urbanization could improve economic growth. A positive sign is therefore expected.
- Government Spending (GOVD): In our study, this variable will be used as a proxy for government spending.

2.2.1. Individual evolution of variables

A general rule in time series analysis is to analyze the data before performing any calculations in order to determine the stationarity of the variables used.

- **Evolution of market capitalization**

over the period 1993 to 2020, the average capitalization stands at 17.45% of GDP. However, prior to 2003, the average level of capitalization was less than 10% of GDP. From 2003 to 2020, it is clear that the BRVM stock market has developed rapidly. However, our analysis shows that the capitalization is not hovering around 17.45%. Therefore, it can be implied that the BRVM's market capitalization series is a priori non-stationary.

- **Evolution of GDP per capita**

GDP per capita is a measure of economic growth. We note that there was a period of economic recession from 2002 to 2011 in Côte d'Ivoire. During this period, this country experienced the darkest instability in its history with a deterioration of the business environment and a massive exodus of the population from the north to the south. In the aftermath of the decade of instability, the Ivorian government has set itself the major objective of improving the social

conditions of the population. Its economic policies are largely based on a transparent, efficient and accountable fiscal policy, have created an enabling environment for domestic resource mobilization and improved the efficiency of public expenditure. From our investigation, it can be deduced a priori that the series of gross fixed capital formation is non-stationary because it does not fluctuate around its mean.

- **Evolution of the rate of openness of the economy**

A steady evolution of the rate of openness of the economy from 1993 to 2001 is observed. Beyond this period, we see a decrease in this rate. Indeed, this deterioration in participation in international trade can be explained by the numerous politico-military crises which shook the country, notably the armed rebellion that began on 19 September 2002 and ended in a post-election crisis in 2011. Nowadays, the State and ECOWAS have set themselves the task of creating a free trade area between the member countries of the said community.

- **Evolution of gross fixed capital formation**

There are three phases in the evolution of gross fixed capital formation. The first phase lasted from 1993 to 1999 and was characterized by a slower development of Gross Fixed Capital Formation. The second phase corresponds to the period 1999 to 2011; It highlights the socio-political crises that have shaken the country. Indeed, investment experienced an upward trend before stabilizing at a very low level. The last phase corresponds to the aftermath of the decade of instability (after 2011). The stability of this period has led to an improvement in the business climate, which has made the Ivorian economy dynamic.

2.2.2. Comparative evolution of variables

We note in our investigation that there is a non-linear relationship between the two series. Since 2011, both developments have been on a downward trend. And It is also important to note that, the logarithm series of GDP per capita and the urbanization series have a linear relationship. Since 1993, this trend has been on an upward trend.

2.3. Threshold Model Specification

The existence of non-linear relationships between economic and financial variables is quite recurrent in the economic literature. In addition, while it is important to note that economic growth is a goal sought by most developing countries, it is also important to note that the stock market is recommended to meet financing needs. However, for some economists, the impact of stock market development on growth is a function of the level of economic development (Deidda & Fattouh, 2002), (Rioja & Valev, 2004), (Gaytan & Ranciere, 2004), (Fung 2009). Others believe that there is a threshold effect between the stock market and economic growth.

Thus, based on this doctrinal controversy, our work is based on the evidence of a threshold effect between the stock market and economic growth. Drawing from the previously presented information, our investigation utilizes an autoregressive abrupt transition (ART) threshold model. This model specifically pinpoints critical threshold values that influence the connection between stock market development and economic growth. Commonly known as the TAR model, it is esteemed for its adaptability and, notably, the unbiased nature of its estimators, often referred to as Best Linear Unbiased Estimators (BLUE). Indeed, this technique, unlike the first two, will generate different dynamics depending on the phase of the variable cycle. The change in dynamics occurs according to the sign of the deviation between the transition variable and the threshold value. Threshold models were introduced by (Tong, 1990) and taken up by (Ben Salem & Perraudin, 2000) who also introduce exogenous factors. STAR specifications are easy to estimate and interpret.

The model is formulated as follows:

$$Y_t = \theta_1 X_t I(q_t \leq \gamma) + \theta_2 X_t I(q_t > \gamma) + \varepsilon_t \quad (1)$$

with $I(.)$ the indicator function. So, we can reformulate it by the following equation:

$$Y_t \begin{cases} \theta_{11} X_t + \varepsilon_t & q_t \leq \gamma \\ \theta_{21} X_t + \varepsilon_t & q_t > \gamma \end{cases} \quad (2)$$

with: Y_t : dependent variable; X_t : The Vector of Independent Variables; q_t : The Transition Variable; γ : The threshold value; ε_t : Estimate residuals; θ_{ij} : the estimated coefficient of i -ème regime. Thus, $q_t \in X_t$ that is, the transition variable can be one of the elements of the vector of independent variables and its distribution is assumed to be continuous. Considering the variables selected in accordance with the literature, the equation of our model becomes:

$$\text{LogPIBH}_t = \begin{cases} \alpha_{11} \text{CB}_t + \alpha_{12} \text{LIQMCH}_t + \alpha_{13} \text{POPURB}_t + \alpha_{14} \text{TOE}_t + \alpha_{15} \text{FBCF}_t + \alpha_{16} \text{DGOUV}_t + \varepsilon_t & q_t \leq \gamma \\ \alpha_{21} \text{CB}_t + \alpha_{22} \text{LIQMCH}_t + \alpha_{23} \text{POPURB}_t + \alpha_{24} \text{TOE}_t + \alpha_{25} \text{FBCF}_t + \alpha_{26} \text{DGOUV}_t + \varepsilon_t & q_t > \gamma \end{cases} \quad (3)$$

with: CB: Market capitalization; LIQMCH: Stock market liquidity; POPURB: The share of the rural population in the total population; TOE: the rate of openness of the economy; GFCF: gross fixed capital formation; GGOV: Government Spending; α_{ij} : the coefficient of i -ème regime; t : The Time Index. In the following, we will make our econometric estimates using the Eviews 12 software.

3. Results and interpretations

In the subsequent section, we delve into the results obtained from estimating the threshold model. Our focus lies in investigating the influence of stock market performance on growth, with market capitalization serving as the pivotal threshold variable. Our work uses the TAR model and is also in line with the study of the impact threshold between finance and economic growth, which has been very little discussed in theoretical and empirical work.

3.1. Descriptive statistics

The purpose of this test is to identify the potential presence of outliers. The outcomes of this test are documented in the table provided below.

Table 1: Descriptive statistics of variables

	LOGPIBH	CB	LIQMCH	POPURB	TOE	FBCF	DGOUV
Mean	7.0148	17.7302	14.1244	45.91165	7.4916	14.3267	12.4092
Median	6.9140	14.2044	0.1312	45.86150	8.4172	13.1019	12.6353
Maximum	7.7517	40.7704	250.6572	51.70600	11.5382	23.4847	15.4744
Minimum	6.4056	0.2349	0.0000	40.46100	1.9907	4.7037	8.7424
Std. Dev.	0.4094	11.2804	41.4400	3.294610	3.0892	4.5562	1.7200
Skewness	0.5013	0.1291	3.7978	0.051079	-0.6999	0.4822	-0.2961
Kurtosis	1.9788	1.8275	18.0542	1.797138	2.1169	1.9930	1.9474
Observations	109	109	109	109	109	109	109

Source: Author, based on WDI (2021)

Between 1993 and 2020, the data in the table indicate that the natural logarithm of the average GDP per capita during the observation period is approximately 7.01, with a maximum value of 7.75 and a minimum value of 6.40. However, during the same observation period, the market capitalization had a minimum value of 6.68% of GDP, a maximum value of 40.77% of GDP and an average of 17.73% of GDP. The variability of this series across a standard deviation of 11.28; shows that Côte d'Ivoire has seen a reduction in the size of the stock market. As for the liquidity of the financial market, its average during the period was 14.12 for a maximum value of 250.65. A remarkable observation of descriptive statistics is that time series perform well. The close proximity of the mean and median in this table suggests that the data does not exhibit an outlier issue. In other words, the central tendency of the data is not significantly affected by extreme values.

3.2. Variable correlation matrix

The correlation matrix shows whether or not there is a statistical relationship between the variables. It is used to measure the extent of multicollinearity between variables. The logic behind the assumption of the absence of multicollinearity is simply that if two or more independent variables are linearly dependent on each other, one of them should be included instead of both. For the purposes of this study, we will adopt the correlation matrix as a method to demonstrate multicollinearity if it exists.

Table 2: Matrix of Variable Correlation

Probability	LOGPIB						
	H	CB	LIQMCH	POPURB	TOE	FBCF	DGOUV
LOGPIBH	1.00000 -----						
CB	0.5594 (0.0000)	1.0000 -----					
LIQMCH	-0.381283 (0.0000)	-0.4943 (0.0000)	1.0000 -----				
POPURB	0.947979 (0.0000)	0.6718 (0.0000)	-0.4997 (0.0000)	1.0000 -----			
TOE	-0.974930 (0.0000)	-0.4473 (0.0000)	0.2990 (0.0016)	-0.8740 (0.0000)	1.0000 -----		
FBCF	0.755659 (0.0000)	0.2747 (0.0038)	-0.0617 (0.5238)	0.630329 (0.0000)	-0.8025 (0.0000)	1.0000 -----	
DGOUV	-0.742858 (0.0000)	-0.2237 (0.0194)	-0.050282 (0.6036)	-0.628539 (0.0000)	0.7641 (0.0000)	-0.7077 (0.0000)	1.0000 -----

Source: Author, based on WDI (2021)

The Matrix of Variable Correlations does verify the hypothesis of a negative correlation between the logarithm of real GDP per capita and all exogenous variables with the exception of gross fixed capital formation (GFCF), urbanization (POPURB) and market capitalization (CB). After careful analysis, it becomes evident that strong correlation coefficients exist among most of the variables. The correlation matrix further validates this significant relationship between the variables. As a result, we can confidently conclude that there are no multicollinearity concerns. Therefore, all variables can be safely incorporated into the model

3.3. Results of TAR Model Estimates

The existence of a possible non-linear relationship between economic and financial variables can be confirmed by a test of nonlinearity.

3.3.1. Non-linearity test

Table 3: Non-linearity test

Linearity Tests			
Null Hypothesis	F-statistic	d.f.	p-value
H04: $b_1=b_2=b_3=b_4=0$	41.79063	(11, 91)	0.0000
H03: $b_1=b_2=b_3=0$	41.79063	(11, 91)	0.0000
H02 : $b_1=b_2=0$	45.44922	(10, 92)	0.0000
H01 : $b_1=0$	45.35708	(6, 96)	0.0000

The test of nonlinearity, with market capitalization (CB) as a transition variable, states that there is a non-linear relationship between the development of the stock market and the level of economic activity. In addition, this test reveals the existence of two critical thresholds, the values of which will be determined in the estimation of our model.

3.3.2. Results of the TAR model estimation

Table 4: Results of the TAR model estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Threshold Variables (linear part)				
CB	-0.050601	0.025145	-2.012364	0.0471
LIQMCH	-0.001883	0.000948	-1.987550	0.0498
POPURB	0.076205	0.017685	4.309025	0.0000
TOE	-0.086038	0.005308	-16.20808	0.0000
FBCF	0.026949	0.007982	3.376090	0.0011
DGOUV	-0.005428	0.008097	-0.670298	0.5043
C	3.991058	0.873621	4.568411	0.0000
Threshold Variables (nonlinear part)				
CB	0.042805	0.023835	1.795851	0.0758
LIQMCH	0.008513	0.001481	5.748848	0.0000
POPURB	-0.042219	0.020089	-2.101622	0.0383
TOE	0.005784	0.007836	0.738143	0.4623
FBCF	-0.025433	0.008118	-3.132822	0.0023
DGOUV	0.015642	0.011584	1.350271	0.1802
C	2.216122	1.035866	2.139390	0.0350
Slopes				
SLOPE	0.194280	0.038095	5.099810	0.0000
Thresholds				
THRESHOLD	7.910636	2.662500	2.971131	0.0038
Adjusted R-squared	0.998253	Durbin-Watson stat		0.336411
F-statistic	4115.150	Prob(F-statistic)		0.000000

Source: Author, based on WDI (2021)

Let the equation :

$$\text{LogPIBH}_t = \begin{cases} 3,991 - 0,050CB_t - 0,001LIQMCH_t + 0,076POPURB_t - 0,086TOE_t + 0,026FBCF_t - 0,005DGOUV_t + \varepsilon_t & q_t \leq 7,91 \\ 2,216 + 0,042CB_t + 0,008LIQMCH_t - 0,042POPURB_t + 0,005TOE_t - 0,025FBCF_t + 0,015DGOUV_t + \varepsilon_t & q_t > 7,91 \end{cases}$$

If we consider *Ceteris paribus*, the results obtained indicate the existence of two critical thresholds, hence the existence of three regimes. In the first regime, the market capitalization (CB) of the BRVM significantly and negatively affects the logarithm of GDP per capita, where a 1% increase in market capitalization leads to a 0.0428% decrease in economic growth as long as it remains below 7.91% of GDP. The development of the BRVM's stock market has only a small impact on economic growth. This low elasticity can be explained by the limited role of the BRVM's stock market. Indeed, the BRVM is a market that is not very liquid and does not meet the financing needs of the economy. It is important to add that the most successful and consistent companies in the BRVM-10 ranking (Sonatel, Onatel, Ecobank Transnational Incorporated, etc.) are mostly non-Ivorian companies. As a result, a large majority of the market capitalization is used to increase investment and thus the economic growth of WAEMU companies other than those in Côte d'Ivoire. Finally, the majority of large companies or SMEs that contribute effectively to Côte d'Ivoire's economic growth are not listed on the BRVM and in the worst case are in the informal sector. Similarly, stock market liquidity negatively and significantly influences economic growth at the 5% threshold. In addition, a 1% increase in stock market liquidity leads to a 0.0018% decline in economic growth. The effect of urbanization on the logarithm of GDP per capita is significantly positive at a level of 1%. This represents an elasticity of exports with respect to economic growth of 0.0762. This would mean that a 1% increase in the urbanization rate would result in a simultaneous increase of 0.0762% in the logarithm of GDP per capita. This could be explained by the fact that the most dynamic companies in the Ivorian economy are located in urban areas due to access to transport infrastructure for the smooth running of their activities. It is also important to note that since the aftermath of the decade of socio-political instability in 2011, the Ivorian government has focused its development strategies on increasing public spending on education, health and infrastructure. In the first regime, the rate of openness of the economy has a significant and negative influence on the logarithm of GDP per capita, where a 1% increase in market capitalization leads to a 0.0860% decrease in economic growth at a significance threshold of 1%. When the market capitalization drops below 7.91%, only a select few companies actively

engage in stock exchange activities. As a result, these companies encounter difficulties in securing funding for their operations. Consequently, the economy relies heavily on exporting goods and services to meet overall demand. The gross formation of fixed capital has a positive and significant impact on the logarithm of GDP. In other words, a 1% increase in gross fixed capital formation leads to a 0.0269% increase in the logarithm of GDP. The effect of investment on the logarithm of GDP is significantly negative at the 1% level. This could be explained by the fact that increased investment is one of the drivers of economic growth as long as investment allows firms to increase their output. A strong observation of our results concerning the first regime is that government spending (DGOV), although negatively impacting growth, does not do so significantly.

In the second regime, the tax burden seems to have a stronger positive impulse on economic growth when it fluctuates or exceeds 7.91% of GDP. Indeed, the elasticity associated with market capitalization stands at 0.0428; where, a 1% increase in market capitalization (CB) induces a 0.0428% increase in economic growth. Similarly, stock market liquidity (LQMCH) has a positive and significant impact (at the 1% threshold) on growth with an elasticity of 0.0085. In contrast to the results of the first regime, we get opposite results. Gross fixed capital formation has a negative and significant influence on the logarithm of GDP, where a 1% increase in gross fixed capital formation leads to a decrease in economic activity of 0.0254%. Urbanization (POPURB) has a negative and significant influence on the logarithm of GDP at the 1% threshold, where a 1% increase in the share of the urban population in the total population leads to a 0.042219% decrease in economic growth. The opening up of the economy remains insignificant. In sum, the results of the model's estimation show us that if we consider that, all other things being equal, the development of the stock market negatively and significantly influences economic growth if the market capitalization remains below 7.91% of GDP. However, the stock market seems to have a positive impulse when the market capitalization exceeds the critical threshold of 7.91% with a low elasticity of (0.0428). However, the influence of the financial market on growth remains weak overall in both regimes. Econometrically, the model is generally well specified with an adjusted R-squared = 0.86. These results therefore confirm the non-linearity (U-shaped) relationship between the tax burden and economic growth. Investment, in contrast to the two variables mentioned above, has a positive and significant effect on growth. Moreover, our analysis reveals that the socio-political crises and the COVID-19 health crisis have no significant effect on long-term economic growth. This is due to the fact that the transparency of fiscal policy in Côte d'Ivoire

during these periods under review helped to mitigate the effects of shocks on economic growth. It should be noted that in the continuation of our investigations, we carried out diagnostic tests to see if the model used by us is well specified. Since the critical probability (0.43) is greater than 0.05, it can be concluded that the residuals of the ART model follow a normal distribution. Subsequently, we present in the table below, the results of the validation tests of the TAR model.

Table 5: Summary of Diagnostic Tests

Object	Test	Test Stats	P-value	Conclusion
Autocorrelation	Breusch Godfrey Serial LM Test	$nR^2 = 2,6149$	0,0657	No autocorrelation
Heteroscedasticity	Breusch-Pargan-Godfrey	$nR^2 = 2,0830$	0,1009	No heteroscedasticity
Normality	Jarque Bera	$JB = 1,6605$	0,4359	Normal Distribution

Source: Author, based on data from BCEAO (2021) and WDI (2021)

The p-value of the different tests is above the significance threshold of 5%. This states that all the tests carried out were important. Therefore, it seems reasonable to conclude that the residuals satisfy the assumptions of the classical normal linear regression model.

3.3.3. Cusum and Cusum of squares test

Finally, stability tests of the estimated model confirm that it is indeed stable. The two versions of that test, namely the CUSUM, based on the cumulative sum of the recursive residuals, and the CUSUM SQ, based on the cumulative sum of the square of the recursive residuals, are conclusive. The recursive residuals are very close to zero, it is well within the confidence interval. We can therefore conclude that there is no instability of the parameters over time. Similarly, the CUSUM SQ always remains between two dashed lines, and the residual variance is stable at the 5% level.

Conclusion

This investigation focuses on the connection between stock exchange and economic growth applied to the Ivorian economy. Our work required threshold model estimation, in particular a TAR model. In terms of results, the available estimates suggest that there exists a U-shaped relationship between economic growth and stock exchange indicators. Furthermore, it is crucial to highlight that the BRVM's stock exchange is inadequately developed, as it falls below the critical threshold of 7.91% relative to the size of the GDP. This is the underlying factor contributing to its limited impact on economic growth not only of Côte d'Ivoire but also of almost all the countries that operate on this stock market between 1993 and 2020. The

economies of Africa persistently grapple with substantial hurdles arising from their modest scale, restricted availability of tradable securities, low trading volumes, and liquidity limitations within their exchanges. (Atiopou, M. 2006). Besides, the BRVM stock market faces a significant challenge in terms of attracting savings due to its lack of competitiveness. This issue primarily stems from the investment decisions made by specific companies, which are often inappropriate. This approach has adverse effects on both the liquidity and the overall framework of the BRVM stock exchange. In addition, the repeated socio-political crises on the territory of Côte d'Ivoire, and then within the economic union to which it belongs, have caused investors to lose confidence who prefer to invest in businesses operating in tranquil regions, stable political systems significantly influence investment decisions. The predictability provided by political stability allows companies to plan for the long term, allocate resources efficiently, and develop sustainable strategies. These research findings have important implications for economic policies. In particular, the stock market plays a crucial role in bolstering the reputation of companies that join it. Ensuring that small and medium-sized enterprises (SMEs) and start-ups have access to the stock market is vital. Additionally, simplifying the formalization process for informal businesses within an ever-improving business environment is equally critical. This work also recommends to the Ivorian authorities and generally the political decision-makers of West African countries that are pursuing programs to improve their public management should pay particular attention to economic development indicators and the institutional factors that influence them. However, the manuscript focuses on a rather short period of analysis due to lack of data, thus limiting itself to the period as described in the introduction. In addition, our analysis was unable to determine the institutional quality performance threshold beyond which the effect of stock exchange changes regime. A study that will explore a dynamic threshold regression, would be very interesting.

References

- Al-Awad, M. & Harb, N. (2005). "Financial development and economic growth in the Middle East." *Applied Financial Economics*, 15(15), pp 1041-1051.
- Al-Yousif, Y. K. (2002). Financial development and economic growth: another look at the evidence from developing countries. *Review of Financial Economics*, 11(2), pp 131-150.
- Atje, R. & Jovanovic, B. (1993). Stock markets and development. *European Economic Review*, 37(2), pp 632-640.
- Beck, T. & Levine, R. (2004). Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance*, 28(3), pp 423-442.

- BRITEL, I. QUAMAR, T. & GODOWSKI, C. (2020). L'impact de la mise en place des normes comptables internationales IAS/IFRS sur les jugements des acteurs boursiers : Revue de littérature. *Revue Du contrôle, De La Comptabilité Et De l'audit*, 4(1). Retrieved from <https://www.revuecca.com/index.php/home/article/view/481>. Consulté le 17/3/2024
- Calderón, C. & Liu, L. (2003). The direction of causality between financial development and economic growth. *Journal of development Economics*, 72(1), pp321-334.
- Deidda, L. & B. Fattouh (2005). *Banks, Financial Markets and Growth*. Journal of Financial Intermediation. <https://api.semanticscholar.org/CorpusID:54025701>. Consulté le 17/3/2024
- Enisan, A. A & Olufisayo, A. O. (2009). Stock market development and economic growth: Evidence from seven sub-Sahara African countries. *Journal of Economics and Business*, 61(2), pp162-171.
- Gaytan, A. & Ranciere R. (2004). *Banks, Liquidity Crises and Economic Growth*. Econometric Society 2004 North American Summer Meetings 399, Econometric Society.
- Harris, R. D. (1997). Stock markets and development: A re-assessment. *European Economic Review*, 41(1), pp139-146.
- IGUE, C.B. & ESSEHOU, Y. (2023). Transformation structurelle et emploi en Afrique subsaharienne : une analyse par approche de seuil. *Revue Française d'Economie et de Gestion*. 4, 7 (juill. 2023).
- Khyareh, M. M. & Oskou, V. (2015). The Effect of Stock Market on Economic Growth: The Case of Iran. *International Journal of Academic Research in Economics and Management Sciences*, Vol. 4, No. 4, pp 52-63.
- Lenuța, Carp. (2012). Can Stock Market Development Boost Economic Growth? Empirical Evidence from Emerging Markets in Central and Eastern Europe. *Procedia Economics and Finance*, 3, pp 438-444, doi.org/10.1016/S2212-5671(12)00177-3.
- Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of economic literature*, 35(2), pp 688-726.
- MANSOURI, A. & NDIAYE, O.H. (2024). Influence des marchés boursiers français et américain sur le marché boursier marocain. *Revue Française d'Economie et de Gestion*. 5, 1 (janv. 2024).
- ONGUENE ATEBA, J. G. & BENGALY, A. (2024). Le financement des dynamiques d'émergence économique en Afrique : cas du modèle d'émergence économique du Cameroun. *Revue Francophone*, 2(1). Consulté le 17/3/24 à l'adresse <https://revuefrancophone.fr/index.php/home/article/view/14>

Rajan, R., & Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, Vol. 88 pp 559-586.

Rioja, F. & Valev N. (2004). *Finance and the Sources of Growth at Various Stages of Economic Development*. *Economic Inquiry*, Western Economic Association International, vol. 42(1), pp127-140, January.

Singh, A. (1997). Financial liberalization, stock markets and economic development. *The Economic Journal*, 107(442), pp 771-782.

Rousseau, P. L. & Wachtel. P. (2000). Equity markets and growth: cross-country evidence on timing and outcomes, 1980–1995. *Journal of Banking & Finance*, 24(12), pp 1933- 1957.

Taghipour, A. (2009). Banks, Stock Market and Economic Growth: the case of Iran. *Iranian Economic Review*, 14(23), pp 19-40.