



IJFBS
Finance & Banking Studies

Finance & Banking Studies

IJFBS, VOL 6 NO 3 ISSN: 2147-4486

Contents available at www.ssbfn.net/ojs

<https://doi.org/10.20525/ijfbs.v6i3.746>

Financial Development, Economic Growth and Energy Consumption Nexus in Cote d'Ivoire

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Abstract

This paper examines the relationship between financial development, economic growth and energy consumption in Cote d'Ivoire over the period 1971-2011. To do so, the study first built a synthetic indicator of financial development through the Principal Component Analysis technique (PCA) and used four energy sources such as electric power consumption, electricity production from renewable sources, electricity production from oil sources and electricity production from hydroelectric sources. Then, employing the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, we find that there is a long run relationship between financial development, economic growth and energy consumption sources. Furthermore, the results of the Vector Error Correction Models (VECM) reveal unidirectional causality running from financial development to energy consumption sources, bidirectional causality between economic growth and energy consumption and unidirectional causality from financial development to economic growth in the long run. The mixed results are due to the use of different proxies for energy consumption. Accordingly, this paper recommends that policy makers should solicit the support of financial sector in order to solve energy problems and further the diversification of the energy consumption sources since financial development has a positive effect on energy consumption in long run. Moreover, government should develop public-private partnership (PPP) to stimulate economic growth, as well as to improve the access to energy and maintain a sustainable development in Cote d'Ivoire.

Key Words: *Financial Development, Economic Growth, Energy Consumption, ARDL, Cote d'Ivoire.*

JEL classification: Q43; G21; G32; C32

Introduction

The relationship between economic growth and energy consumption is one of the most contrasted issues in economics. Although many recent studies have employed new econometric models and data analysis techniques, there is still no consensus on the energy-growth nexus. In fact, several studies analyzing the energy-growth nexus have revealed mixed results in Africa, even in Cote d'Ivoire. For instance, studies such as Lee (2005), Wolde-Rufael (2006), Dantama et al (2012) proved that energy consumption causes economic growth in some african countries (Benin, Congo, Tunisia..). However, Ambapour et al (2005) and Esso (2010) rejected that hypothesis stipulating on the contrary in the cases of Congo and Ghana. More radical studies supported the neutral hypothesis of no nexus between energy and growth : Huang et al (2008), Akinlo (2009) while the bidirectional causality between energy and economic growth has been defended by Belloumi (2009), Esso (2012) and Kouakou (2012) for the case of Cote d'Ivoire. In addition, this subject still arouses a particular interest for policy makers since they have to deal with socio-economic problems as well as the deficit of energy offer and sustainable environment involving a best energy management throughout the development of economic activities.

In Cote d'Ivoire, there are still concerns about the situation of energy sector, as people experience difficulties to access energy services throughout the country. As a result, the national electrification rate was 26% in 2012 with urban and rural electrification rates of 42% and 8%, respectively, and nearly 15 million people without access to electricity (IEA, 2014)¹. This low electricity consumption level combined with the frail contribution of the other sub-sectors of the ivorian energy mix (renewable energies, etc.) could not permanently enable the country to meet its target of providing 10% of the West african market in order to be the leader in energy exchanges in the sub region. Moreover, Cote d'Ivoire still faces many problems in the energy sector such as the low level of access to modern energy services and the fact that the primary energy supply is dominated by biomass energy at 61.20% against 26.70% for crude oil, 10.50% for natural gas and only 1.60% for hydroelectricity (SIE, 2010)². Similarly, according to the National Energy Seminar (SNE, 2012)³, in Côte d'Ivoire, the levies on invoices concerning rural electrification, although on average 4 billion CFA francs per year, fail to cover the needs estimated at 20 billion francs CFA per year to reach the electrification target of 200 localities per year. Besides, the energy sector has experienced a huge financial imbalance due to insufficient revenues and increased operating costs. This is highlighted in the final report of the national investment program for access to energy services in Cote d'Ivoire (PNIASE-CI, 2012)⁴ in which the operating deficit of the sector was 107.224 billion francs CFA in December 2011, with a cumulative deficit of 452.976 billion francs CFA over the period 1999- 2011.

In order to meet these challenges above mentioned, the Ivorian government has foreseen under the national investment program for access to energy services in Cote d'Ivoire (PNIASE-CI, 2012) various projects that require the support of financial sector in the implementation of these projects. These projects include the extension of the electricity network in peri-urban areas in the major cities of Cote d'Ivoire, the electrification of 200 localities per year to conventional energy, the construction of the underground hydroelectricity power station (275MW), electricity generation from biomass, biogas recovery, expansion of the natural gas network for industrial users (PND, 2012)⁵. All these projects require financing and are beneficial to the economic growth to raise Cote d'Ivoire to emergence by 2020. Therefore, with a view to diversifying the energy mix and solving these problems, one way would be to look for the link and the causal relationship between financial development, economic growth and energy consumption to achieve the Millenium Development Goals (MDGs) as well.

However, there are still no significant studies that have included financial development, taking into account the multidimensional functions of financial system in the relationship between growth and energy

¹ *International Energy Agency, Africa Energy Outlook 2014.*

² *Système d'Information Energetique, 2010.*

³ *Seminaire National sur l'Energie, 2012.*

⁴ *Programme National d'Investissement pour l'Acces aux Services Energetiques en Cote d'Ivoire, 2012.*

⁵ *Programme National de Development, 2012.*

consumption in Africa (Sadorsky, 2010 ; Chtioui, 2012 ; Shahbaz and Lean, 2012 ; Al-Mulali and Sab, 2012b) and especially in Cote d'Ivoire (Akinlo, 2009; Belloumi, 2009; Ezzo, 2010; Ezzo, 2012).

The main goal of this study is to examine the relationship between financial development, economic growth and four sources of energy consumption in Cote d'Ivoire from 1971 to 2011. This involves the following specific objectives. First, the construction of a new proxy for financial development; Second, the empirical investigation of the existence of a long run relationship and the direction of causality and finally, the paper will provide some policy implications. The guiding question of this paper is to know whether there is a dynamic causal relationship between financial development, economic growth and energy consumption sources in Cote d'Ivoire from 1971 to 2011. In other words, is there a long run cointegration relationship between financial development, economic growth and energy consumption sources in Cote d'Ivoire? From this fundamental question, the paper aims to answer three specific questions as follows: does financial development lead to energy consumption in Cote d'Ivoire? How financial development affects energy consumption sources in Cote d'Ivoire? What is the causal relationship between economic growth and energy consumption in Cote d'Ivoire? In other words, what are the effects of economic growth on energy consumption sources in Cote d'Ivoire? Is there a causal link between financial development and economic growth in Cote d'Ivoire?

The originality of our study is to examine the link between financial development, economic growth and four sources of energy consumption in Cote d'Ivoire from 1971 to 2011. As a starting point, this study employs Principal Component Analysis (PCA) to build a composite indicator of financial development which is not limited to only domestic credit to private sector suggested by many studies. Next, the paper uses four main energy sources instead of aggregate energy use employed in most of the previous studies. Furthermore, the main results of this study will be helpful to policy makers for improving the access to energy, energy offers and sustainable development in Cote d'Ivoire as well. We assume that in the long run there is a stable cointegration relationship between financial development, economic growth and energy consumption in Cote d'Ivoire. The specific hypotheses that are tested in this study are: (H₁) there is a long run bidirectional causality between economic growth and energy consumption in Cote d'Ivoire; (H₂) In the long run financial development causes energy consumption in Cote d'Ivoire and (H₃) there is a long run bidirectional causality between financial development and economic growth in Cote d'Ivoire.

The remainder of this paper is structured as follows : section 2 presents the literature review and section 3 describes the data, variables and the methodology of the study. Then, section 4 exposes the results and discussions while section 5 ends up with the conclusion and policy implications.

Literature Review

Growth and energy nexus

There are four hypothetical relationships between economic growth and energy consumption that can be derived from empirical studies on this subject in Africa.

The first relationship is called *growth hypothesis* which means that energy consumption leads to economic growth. For instance, Wolde-Rufael (2006) revealed that electricity consumption causes economic growth in Benin, Congo and Tunisia by using the autoregressive distributed lag (ARDL) and Toda Yamamoto approach over the period 1971-2006. Odhiambo (2009) also found the same conclusion in Tanzania from 1971 to 2006 using ARDL approach. Likewise, the growth hypothesis was also confirmed in other studies such as: Lee (2005), Mehra (2007), Dantama et al. (2012). However, many other studies concluded on the contrary stipulating that economic growth rather causes energy consumption that is the *conservation hypothesis*. Thus, Ezzo (2010) uncovered that economic growth leads to electricity consumption in Congo and Ghana by using threshold cointegration approach over 1970- 2008 period. Ambapour and Massampa (2005) have shown the same result in Congo over the span 1960-1999 via an error correction model (ECM).

As opposed to the two first hypotheses, the third one is more radical. It is the *neutral hypothesis* denoting that both energy consumption and economic growth have no effect on each other, there is no energy-

growth nexus. In other words, all policies being aimed at stimulating economic growth have no effects on energy consumption and vice versa. Supportive studies are those of Esso (2010) for Cameroon, Nigeria, Kenya and South Africa using a threshold cointegration approach over 1970-2007; Huang et al. (2008) in low income countries from 1972 to 2002 via panel generalized method of moments; but also other studies such as: Akinlo (2009) in Nigeria's case. Conversely, the last one is the *feedback hypothesis* which stipulates the bidirectional causality in the energy-growth nexus, supposing the complementarity of economic growth and energy consumption. For instance, Ebohon (1996) confirmed this hypothesis in Nigeria and Tanzania from 1960 to 1981 using a Granger causality test. In the same way, Kouakou (2012) validated this assertion in Cote d'Ivoire over 1971-2008 via an error correction model and Granger causality test. Further similar studies are those of Belloumi (2009) for the case of Tunisia, Esso (2010) and Esso (2012) for the case of Cote d'Ivoire.

Finance and energy nexus

Studies on finance-energy nexus have also shown mixed results. Thus, Shahbaz and Lean (2012) indicated long-run bidirectional causality between financial development and energy consumption in Tunisia. They used the autoregressive distributed lag (ARDL) bounds testing approach to cointegration and Granger causality tests. Furthermore, examining such study on Sub-Saharan Africa through the Granger causality test, Al-mulali and Sab (2012b) discovered that energy consumption had played an important role on the financial and economic developments in that zone. More other recent studies on finance-energy nexus have shown mitigate results in Africa. Abdou and Atya (2014) concluded on a positive relationship between financial development and energy consumption in Algeria and Tunisia but negative in Egypt by employing an error correction model method and Granger causality test. Hamisu et al (2015) proved that the finance-energy nexus is negative and significant in short run but insignificant in long run in Nigeria using an autoregressive distributed lag bounds testing approach.

Finance and Growth nexus

Many studies have investigated the relationship between financial development and economic growth over years. In the recent empirical literature in Africa, we can cite Agbetsiafa (2004), Odhiambo (2007), Aka (2010) and Keho (2012), among others. Indeed, Agbetsiafa (2004) discovered that financial development leads to economic growth in Ghana, Nigeria, Senegal, South Africa, Togo and Zambia while the inverse causality was found in Cote d'Ivoire and Kenya in long run by the means of Johansen tests of cointegration and causality tests based on error correction model. Likewise, Odhiambo (2007) employed causality tests and different proxies of financial development for three Sub-Saharan countries. He confirmed supply leading hypothesis in Tanzania whilst demand following hypothesis was validated in Kenya and South Africa. However, Aka (2010) proved bidirectional causality between financial development and economic growth for many countries in its study on twenty-two Sub-Saharan countries from 1960 to 2002. Finally, Keho (2012) revealed that institutional factors condition the efficacy of financial development on economic growth using the Pool Mean Group method on six West African countries over 1984-2005.

Data and Methodology

This study uses secondary database of the World Bank (World Development Indicator, WDI (2014)) on Cote d'Ivoire (Ivory Coast in English) from 1971 to 2011. The softwares used in this paper are SPSS 16 and Eviews 9. Then, we employ a quantitative analysis using a trivariate model with two explanatory variables: a *synthetic indicator of Financial Development (FD)* and *real GDP (Gross Domestic Product) per capita (Yh)* reflecting Economic Growth. Our dependent variable, Energy Consumption is represented through four energy sources such as *Electric Power Consumption (EPCC, kWh per Capita)*, *Electricity Production from Renewable sources (kWh) / total population (EPRC)*, *Electricity Production from Oil sources (kWh) divided by total population (EPOC)* and *Electricity Production from Hydroelectric sources (kWh) divided by total population (EPHC)*. Moreover, Financial Development (FD) is measured by a

synthetic indicator built through the Principal Component Analysis (PCA) technique with six indicators: *Broad Money* (BMO, % of GDP), *Quasi-Liquid Liabilities* (QLL, % of GDP), *Money and Quasi Money* (MQM, % of GDP), *Domestic credit provided by Financial Sector* (DFS, % of GDP), *Domestic credit to Private Sector* (DPS, % of GDP) and *Domestic credit to Private sector by Banks* (DPB, % of GDP). The PCA technique permits to draw a minimum of factors explaining the largest number of specific variance of the variables. Consequently, the composite indicator of financial development is the (first) principal component accounting for the largest number of specific variance of the six financial indicators above mentioned.

Since the aim of this paper is to investigate empirically the existence of relationship between financial development, economic growth and energy consumption sources, and following Sadorsky (2010) and Shahbaz et al. (2012), our model can be expressed as follows :

$$LNEPCC_t = a_1 + b_1T + c_{11}LNFD_t + c_{12}LNYH_t + u_{1t} \dots \quad (1)$$

$$LNEPRC_t = a_2 + b_2T + c_{21}LNFD_t + c_{22}LNYH_t + u_{2t} \quad (2)$$

$$LNEPOC_t = a_3 + b_3T + c_{31}LNFD_t + c_{32}LNYH_t + u_{3t} \quad (3)$$

$$LNEPHC_t = a_4 + b_4T + c_{41}LNFD_t + c_{42}LNYH_t + u_{4t} \quad (4)$$

where $EPCC_t$, $EPRC_t$, $EPOC_t$, $EPHC_t$, FD_t and YH_t are variables above mentioned in logarithmic form (LN), a_i and b_i ($i = 1, \dots, 4$) are constant terms and coefficients of the trend (T), all c_s terms are the slopes of the variables and u_{it} ($i = 1, \dots, 4$) are error terms supposed to be independently and identically distributed.

The first step of the analytical approach is to study the stationarity of the variables used in our study in order to avoid misleading regressions. Indeed, in the presence of unit roots (cases of non-stationary series), the statistical properties of estimation methods are no longer valid (Sims et al, 1990). Accordingly, we study the stationarity of each variable using the Augmented Dickey-Fuller unit root test (Dickey and Fuller, 1981) ADF, as well as Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (1992) (KPSS) unit root tests. By definition, a variable is stationary when it contains neither tendency nor seasonality. In order to investigate the existence of long run relationship between financial development, economic growth and energy consumption sources, we use the autoregressive distributed lag (ARDL) bounds testing approach to cointegration developed by Pesaran et al. (2001). In fact, the Approach has numerous econometric advantages compared to other methods of cointegration test such as Johansen cointegration test (for I(1) variables). First, ARDL bounds testing approach is suitable for small sample size. Second, this approach does not need all variables to be integrated to the same order I(1) meaning that it is suitable for I(0) or I(1) variables also in the case of mixture of I(0) and I(1) variables. Finally, ARDL approach assumes all variables to be endogenous estimating simultaneously the short-run and long-run dynamics of the model. However, this approach is not applicable for variables being integrated of order 2, I(2).

Accordingly, our dynamic unrestricted error correction model deriving from ARDL approach can be defined as follows :

$$D(LNEPCC_t) = \alpha_{11} + \alpha_{12}T + \beta_1LNEPCC_{t-1} + \beta_2LNFD_{t-1} + \beta_3LNYH_{t-1} + \sum_{i=1}^{k_1} \gamma_i D(LNEPCC)_{t-i} + \sum_{j=0}^{k_2} \gamma_j D(LNFD)_{t-j} + \sum_{n=0}^{k_3} \gamma_n D(LNYH)_{t-n} + \tau_1 DUM + \varepsilon_{1t} \dots \dots \dots (5)$$

$$D(LNEPRC_t) = \alpha_{21} + \alpha_{22}T + \beta_4 LNEPRC_{t-1} + \beta_5 LNFD_{t-1} + \beta_6 LNYH_{t-1} + \sum_{p=1}^{l_1} \gamma_p D(LNEPRC)_{t-p} + \sum_{q=0}^{l_2} \gamma_q D(LNFD)_{t-q} + \sum_{r=0}^{l_3} \gamma_r D(LNYH)_{t-r} + \tau_2 DUM + \varepsilon_{2t} \dots \dots (6)$$

$$D(LNEPOC_t) = \alpha_{31} + \alpha_{32}T + \beta_7 LNEPOC_{t-1} + \beta_8 LNFD_{t-1} + \beta_9 LNYH_{t-1} + \sum_{s=1}^{m_1} \gamma_s D(LNEPOC)_{t-s} + \sum_{u=0}^{m_2} \gamma_u D(LNFD)_{t-u} + \sum_{v=0}^{m_3} \gamma_v D(LNYH)_{t-v} + \tau_3 DUM + \varepsilon_{3t} \dots \dots (7)$$

$$D(LNEPHC_t) = \alpha_{41} + \alpha_{42}T + \beta_{10} LNEPHC_{t-1} + \beta_{11} LNFD_{t-1} + \beta_{12} LNYH_{t-1} + \sum_{w=1}^{n_1} \gamma_w D(LNEPHC)_{t-w} + \sum_{x=0}^{n_2} \gamma_x D(LNFD)_{t-x} + \sum_{y=0}^{n_3} \gamma_y D(LNYH)_{t-y} + \tau_4 DUM + \varepsilon_{4t} \dots \dots (8)$$

where D denotes the first difference operator and T the trend, $LNEPRC$, $LNEPOC$, $LNEPHC$, $LNFD$ and $LNYH$ is natural logarithm of electric power consumption (kWh per capita), electricity production from renewable sources (kWh per capita), electricity production from oil sources (kWh per capita), electricity production from hydroelectric sources (kWh per capita), financial development composite indicator and gross domestic product per capita respectively. However, all α_i are coefficients, all β_i ($i= 1, \dots, 12$) represent the long run coefficients while γ_s are short run coefficients all τ_i are coefficients associated to the dummy variable (DUM). This DUM variable takes the value 1 in 1984 and 2010 periods and 0 otherwise highlighting the energy crisis periods in Cote d'Ivoire .The terms k_i , l_i , m_i , n_i ($i= 1, \dots, 3$) are optimal lag length chosen according to Akaike Information Criterion (AIC), ε_t the error term and t denoting the time period. We test the null hypothesis of no cointegration ($H_0: \beta_1 = \beta_2 = \dots = \beta_{12} = 0$) against the cointegration hypothesis ($H_1: \beta_1 \neq \beta_2 \neq \dots \neq \beta_{12} \neq 0$). Then, the decision rule is based on the lower critical bound (for all I(0) series) and the upper critical bound (for all I(1) series) of Pesaran et al. (2001) table according to a chosen significance level. Moreover, the null hypothesis of no cointegration between the variables (series) is rejected (there is long-run relationship between the variables) when the F-statistic (Wald-test) exceeds the upper critical bound and cannot be rejected when the F-statistic is below the lower critical bound. However, we cannot conclude when the F-statistic falls between the lower and upper critical bounds. For the validation of our ARDL models, we perform diagnostic tests on the residuals such as serial autocorrelation, heteroskedasticity, normality tests, Ramsey test of model specification and Cusum and Cusumsq tests of stability. If there is evidence of cointegration relationship between the variables, the causality tests can be performed through the representation of the following vector error-correction model:

$$D(LNX_t) = \lambda_1 [LNX_{t-1} + \psi_1 LNFD_{t-1} + \psi_2 LNYH_{t-1} + \psi_{11}T + \psi_{12}] + \sum_{i=1}^n \phi_i D(LNX)_{t-i} + \sum_{i=1}^n \phi_{2i} D(LNFD)_{t-i} + \sum_{i=1}^n \phi_{3i} D(LNYH)_{t-i} + \omega_{11} DUM + \omega_{12} + \xi_{1t} \dots \dots (9)$$

$$D(LNFD_t) = \lambda_2 [LNFD_{t-1} + \psi_3 LNX_{t-1} + \psi_4 LNYH_{t-1} + \psi_{21}T + \psi_{22}] + \sum_{i=1}^n \phi_{4i} D(LNFD)_{t-i} + \sum_{i=1}^n \phi_{5i} D(LNX)_{t-i} + \sum_{i=1}^n \phi_{6i} D(LNYH)_{t-i} + \omega_{21} DUM + \omega_{22} + \xi_{2t} \dots \dots (10)$$

$$D(LNYH_t) = \lambda_3 [LNYH_{t-1} + \psi_5 LNX_{t-1} + \psi_6 LNFD_{t-1} + \psi_{31}T + \psi_{32}] + \sum_{i=1}^n \phi_{7i} D(LNYH)_{t-i} + \sum_{i=1}^n \phi_{8i} D(LNX)_{t-i} + \sum_{i=1}^n \phi_{9i} D(LNFD)_{t-i} + \omega_{31} DUM + \omega_{32} + \xi_{3t} \dots \dots (11)$$

where D is the first difference operator, $X_t = \{EPCC_t, EPRC_t, EPOC_t, EPHC_t\}$, n the optimal lag length chosen by Akaike Information Criterion (AIC) and ξ_t the error term to be supposed independently and identically distributed and white noise. Furthermore, λ_i ($i = 1, \dots, 12$)¹ linking the long-run dynamic is the coefficient of the error correction term which must be negative and significant.

This coefficient represents the speed of adjustment of the dependent variable towards the long run equilibrium for any short-run shock. The long-run coefficients are obtained by multiplying the coefficients (ψ) of the one lagged level variables by $(-\frac{1}{\lambda_i})$. However, φ_i denote the coefficients associated to the short-run dynamics, ψ_{0i} and ω_i are the constant terms of the model. There is long run causality running from the independent variables to the endogenous when the coefficient λ_i of the error correction term is negative and significant. The short run causality from each exogenous variable to the dependent variable is indicated by the joint significance of the first differenced lagged exogenous variable through the Wald test. Finally, a vector autoregressive formulation in difference (VAR) is used to investigate the short run causality if there is no long run relationship (no cointegration) between the variables.

Empirical Findings and Discussion

In this section, the study presents the results following the different tests aforementioned in the methodology part. First, the results of the Principal Component Analysis (PCA) from six financial development indicators are below mentioned in *Table 1*. The eigenvalues indicate that the first component accounts for 58.92 % of the total variance; the second component accounts for 30.73 % of the total variance whereas the last four components account for around 10.33 %. Thus, the first component account for around two times the second and around 58.92 % of all the informations contained in the six financial development indicators. Hence, we use the first component as our proxy of financial development explaining better the fluctuations of the initial variables than the other components. The study uses the first component as the synthetic Financial Development indicator (FD) and performs calculations to generate positive values for this indicator.

Second, the descriptive statistics and correlation matrix results show that the asymmetry coefficient (Skewness) is positive for LNy_t variable but negative for the other variables. Thus, LNy_t has a distribution spread to the right (positive bias or right asymmetry) while $LNEPCC_t$, $LNEPRC_t$, $LNEPOC_t$, $LNEPHC_t$ and $LNFD_t$ variables have a distribution spread towards the left (left asymmetry). In other words, economic growth per capita reacts more to a positive shock contrary to financial development and energy sources in Cote d'Ivoire as indicated in *Table 2*. Besides, the coefficient of flattening (Kurtosis) of $LNEPOC_t$, $LNFD_t$ and LNy_t variable is less than 3 meaning that their distribution is lower and shallower (platikurtic distribution) than the normal distribution meanwhile $LNEPCC_t$, $LNEPRC_t$ and $LNEPHC_t$ are leptokurtic distribution (kurtosis > 3). *Figures 1 to 6* also confirm these results. All the variables are normally distributed at 1% of significance level. As a result, electric power consumption (EPCC, kWh per capita), electricity production from renewable sources (kWh) / total population (EPRC) and electricity production from hydroelectric sources (kWh) per capita (EPHC) have negative correlation both with economic growth per capita and financial development contrary to electricity production from oil sources (kWh) per capita (EPOC). Likewise, economic growth (Y_t) and financial development (FD_t) are positively correlated. All these results are recorded above in *table 2*. We performed unit root tests to determine the degree of integration of the variables used in our study. Indeed, these tests are required for examining that none of the variables are integrated of order 2 (I(2)) which is a pre-condition to employ ARDL bounds testing approach.

¹ Here there is twelve equations as X_t contains four variables and each of them has three equations according to the vector error correction model with FD_t and Y_t .

Table 1: Composite financial development (FD) indicator

FD Indicators	Description
<i>BMO</i>	Broad money (% of GDP)
<i>QLL</i>	Quasi-liquid liabilities (% of GDP)
<i>MQM</i>	Money and quasi money (% of GDP)
<i>DFS</i>	Domestic credit provided by financial sector (% of GDP)
<i>DPS</i>	Domestic credit to private sector (% of GDP)
<i>DPB</i>	Domestic credit to private sector by banks (% of GDP)

6 financial development indicators from 1971 to 2011

Principal component	explained variance	Cumulative explained variance
1	58.920 %	58.920 %
2	30.736 %	89.656 %
3	9.559 %	99.216 %
4	0.781 %	99.996 %
5	0.004 %	100.000 %
6	-1.975E-1 %	100.000 %

Source: By author using principal component analysis via SPSS.19 software

The results of the unit root tests are reported in *Table 3* showing that all variables are integrated of order 1, I(1) at 5% level of significance. Thus, *electric power consumption (kWh per capita) (LNEPCC)*, *electricity production from renewable sources (kWh per capita) (LNEPRC)*, *electricity production from oil sources (kWh per capita) (LNEPOC)*, *electricity production from hydroelectric sources (kWh per capita) (LNEPHC)*, *financial development (LNFD)* and *gross domestic product per capita (LNYh)* are stationary at first difference.

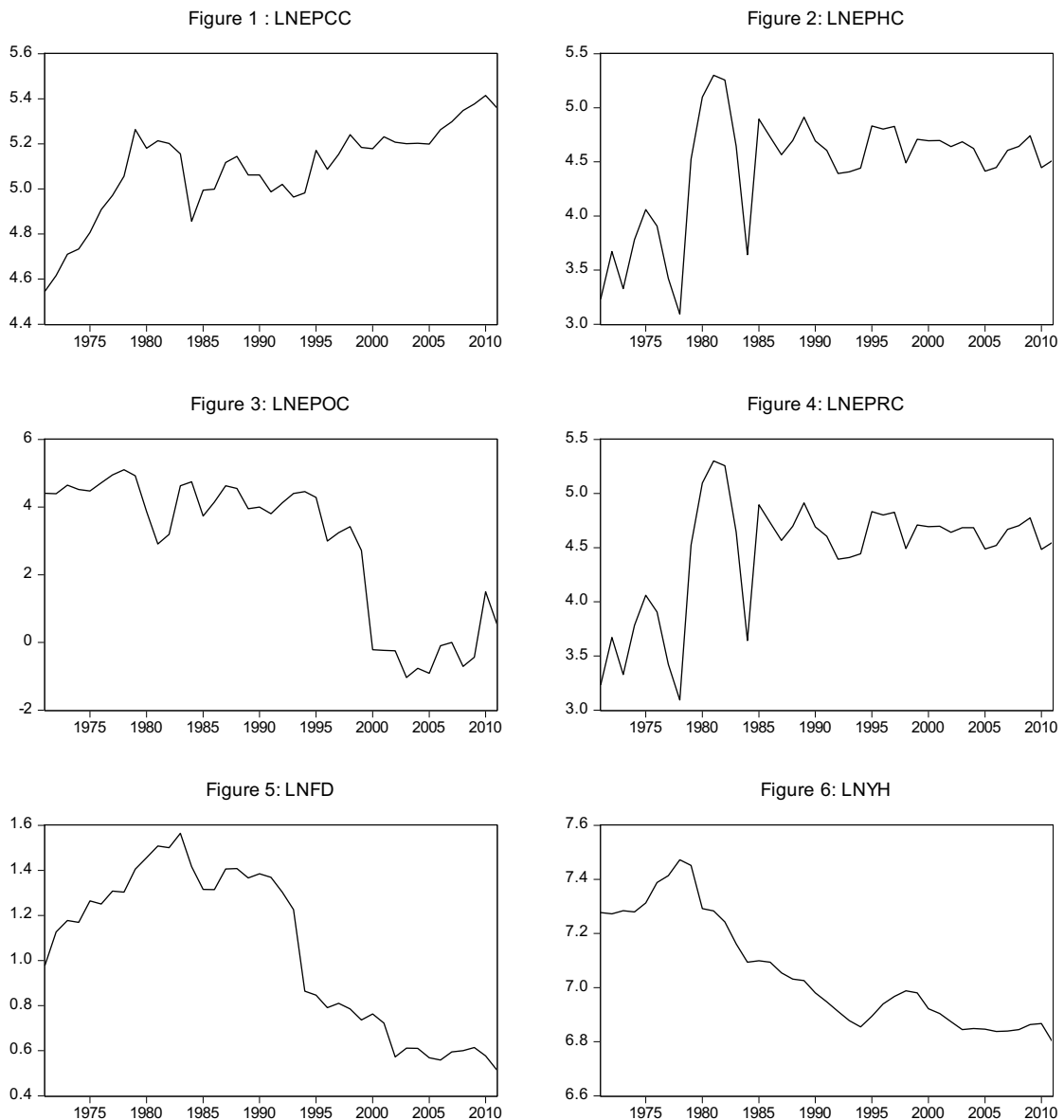
Table 2: Descriptive statistic and correlation matrix

Variables	<i>LNEPCC_t</i>	<i>LNEPRC_t</i>	<i>LNEPOC_t</i>	<i>LNEPHC_t</i>	<i>LNFD_t</i>	<i>LNYh_t</i>
Mean	5.089	4.453	2.861	4.442	1.041	7.053
Median	5.154	4.641	3.872	4.606	1.169	6.981
Maximum	5.415	5.301	5.104	5.301	1.565	7.473
Minimum	4.546	3.094	-1.036	3.094	0.514	6.797
Std. Dev.	0.202	0.531	2.110	0.528	0.351	0.203
Skewness	-0.868	-1.092	-0.795	-1.053	-0.152	0.607
Kurtosis	3.381	3.481	1.959	3.458	1.410	2.009
Jarque-Bera	5.396	8.545	6.170	7.935	4.479	4.198
Probability	0.067	0.014	0.046	0.019	0.106	0.123
Sum	208.666	182.568	117.302	182.133	42.664	289.165
Sum Sq. Dev.	1.631	11.262	178.030	11.152	4.918	1.645
<i>LNEPCC_t</i>	1					
<i>LNEPRC_t</i>	0.685	1				
<i>LNEPOC_t</i>	-0.623	-0.386	1			
<i>LNEPHC_t</i>	0.668	0.999	-0.358	1		
<i>LNFD_t</i>	-0.444	-0.114	0.810	-0.087	1	
<i>LNYh_t</i>	-0.529	-0.495	0.679	-0.476	0.696	1
Observations	41	41	41	41	41	41

Source : by author using Eviews 9

Accordingly, we employed ARDL bounds testing approach to cointegration as none of the variables are $I(2)$. The results of ARDL tests are shown in *Table 4*. We used Akaike Information Criterion (AIC) to determine the optimal lag of the variables and the appropriate ARDL model.

Table 4 shows the optimal lag length for the dependent variable (the first value) and the explanatory variables (the second and third values) respectively in the selected ARDL model. For instance, the set of values (1, 2, 0) in the second column of *Table 4* means that the dependent variable (*EPCC*) takes 1 lag and the exogenous variables, *FD* and *Yh* need 2 and 0 lags respectively in the corresponding ARDL model. Furthermore, the results in *Table 4* confirm that all the F-statistic are greater than the upper critical bounds both in the case of Pesaran (2001) and Narayan (2004) tables, we draw our conclusion based on the latter which is convenient for small sample size.



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Figures 1-6 : Evolution of variables from 1971 to 2011.

Therefore, we conclude that there is long run relationship (evidence of cointegration) between financial development, economic growth and each of the four energy consumption sources used in our study in Cote d'Ivoire from 1971 to 2011. In order to validate our four ARDL models, we check the diagnostic tests in Table 5 which reveals that the assumptions of the classical linear regression model have been satisfied. In other words, there is no serial correlation (χ^2 Serial test) and no heteroskedasticity (χ^2 Arch test) in the models.

Table 3: Unit Root tests

Variables	ADF		PP		KPSS	
	Level	First difference	Level	First difference	Level	First difference
$LNEPCC_t$	-2.951 (0)	-6.823(0) [*]	-2.956 (2)	-6.810 (2) [*]	0.088 (4) [*]	0.098 (2) [*]
$LNEPRC_t$	-2.179 (4)	-5.133 (4) [*]	-3.126 (9)	-16.055 (36) [*]	0.174 (3) [*]	0.500 (39)
$LNEPOC_t$	-2.199 (0)	-5.793 (1) [*]	-2.212 (2)	-5.651 (8) [*]	0.147 (4) [*]	0.091 (7) [*]
$LNEPHC_t$	-2.147 (4)	-5.151 (4) [*]	-3.117 (8)	-16.035 (36) [*]	0.178 (3) [*]	0.500 (39)
$LNFD_t$	-2.829 (0)	-5.495 (0) [*]	-2.829 (0)	-5.490 (1) [*]	0.160 (5) [*]	0.161 (1) [*]
$LNYPH_t$	-1.620 (0)	-3.587 (4) ^{**}	-2.075 (3)	-3.867 (2) ^{**}	0.121 (4) [*]	0.083 (3) [*]

Note : ^{*}, ^{**}, ^{***} indicate statistical significance at 1%, 5% and 10% levels respectively.

ADF : Augmented Dickey-Fuller ; PP : Phillips-Perron ; KPSS : Kwiatkowski-Phillips-Schmidt-Shin

Figure in parenthesis denotes the optimal lag length for ADF test and Bandwidth for PP and KPSS tests.

The normality and Rensay tests indicate that error terms are normally distributed and our models are well specified. Moreover, Cusum and Cusumsq stability tests reveal that all ARDL models are stable but ARDL model (8) is instable over the period 1995-1999 (see figure 7 to figure 14).

Table 4: ARDL cointegration test results

Bounds Testing to Cointegration			Diagnostic tests			
ARDL Models	Optimal lag length	F-statistics	R ²	Adj-R ²	D.W	F-statistic
$EPCC_t = f(FD_t, Y_{ht})$ (5)	1,2,0	8.361 [*]	0.919	0.900	2.093	50.374 [*]
$EPRC_t = f(FD_t, Y_{ht})$ (6)	2,0,2	6.493 ^{**}	0.629	0.530	1.889	6.362 [*]
$EPOC_t = f(FD_t, Y_{ht})$ (7)	1,1,2	8.262 [*]	0.938	0.922	2.221	57.225 [*]
$EPHC_t = f(FD_t, Y_{ht})$ (8)	2,2,2	7.654 [*]	0.678	0.563	2.020	5.898 [*]

Pesaran (2001) critical values		Narayan (2004) critical values			
Lower bounds I(0)	Upper bounds I(1)	Lower bounds I(0)	Upper bounds I(1)		
1% :	6.340	7.520	1% :	5.893	7.337
5% :	4.870	5.850	5% :	4.133	5.260
10% :	4.190	5.060	10% :	3.373	4.377

Note: ^{*}, ^{**}, ^{***} denotes significant at 1%, 5% and 10% level respectively. DUM = 1 for 1984, 2010 and 0 otherwise, DUM is a dummy variable.

However, the Chow test (available upon request) reject this instability period. Since this test is superior to the CUSUM and CUSUMsq tests (Leow, 2004), we can infer from Chow tests that ARDL model [8] is stable. Finally, *Table 5* indicates that our four ARDL models (5), (6), (7) and (8) are stable. The estimated long-run relationship between the variables in each ARDL model (5), (6), (7) and (8) is exposed in *Table 6*.

Table 5: Diagnostic and stability tests

Models	χ^2 Serial	χ^2 Arch	Jarque-Bera (Normality)	Ramsay test (F-statistic)	Cusum	Cusumsq
$EPCC_t = f(FD_t, Y_{ht})$ (5)	0.466 (1)	0.033 (1)	2.197	0.035 [1]	stable	stable
$EPRC_t = f(FD_t, Y_{ht})$ (6)	1.466 (2)	4.563 (2)	0.512	1.164 [2]	stable	stable
$EPOC_t = f(FD_t, Y_{ht})$ (7)	0.959 (1)	0.138 (1)	6.050	2.109 [1]	stable	stable
$EPHC_t = f(FD_t, Y_{ht})$ (8)	3.938 (2)	11.712 (6)	0.431	2.560 [2]	stable	stable

Note : Numbers in parenthesis for columns 2 and 3 are lags while those in brackets are fitted terms.

Thus, the results indicate that financial development has a positive and significant impact on electric power consumption (LNEPCC), electricity production from renewable sources (LNEPRC), electricity production from oil sources (LNEPOC) and electricity production from hydroelectric sources (kWh per capita) (LNEPHC) respectively in the long-run. For instance, a 1% increase in financial development level leads to 0.277% increase in electric power consumption, 1.019% raise in electricity production from renewable sources and 1.009% growth in electricity production from hydroelectric sources *ceteris paribus* in Cote d'Ivoire in the long-run. In addition, this positive impact of financial development is much greater on electricity production from oil sources (5.685%). Accordingly, these results indicate that in long run Ivorian government could solicit the support of financial sector to solve energy problems and diversify the sources of energy. This diversification should go through the promotion of electric energy, electricity production from oil sources and further sustainable energies such as electricity production from renewable sources and electricity production from hydroelectric sources. With respect to economic growth, *Table 6* also reveals similar results except for electricity production from oil sources.

Moreover, we also find that economic growth has positive impact on electric power consumption, electricity production from renewable sources and electricity production from hydroelectric sources respectively but negative impact on electricity production from oil sources in the long-run. As a result, a 1% increase in economic growth boosts electric power consumption by 1.314%, electricity production from renewable sources by 0.737% and electricity production from hydroelectric sources by 1.625%. However, a 1% raise in economic growth negatively affects oil sources by 6.007% which should catch Ivorian government attention on depletion of oil reserves. Thus, it would be better to instigate the diversification of energy sources such as renewable energies leading to a sustainable development.

Our findings are in conformity with those of Zaheer et al (2011), Shahbaz and Lean (2012) and Shahbaz et al (2013). Furthermore, *Table 7* underlines the results of the short-run analysis. These results indicate that financial development and economic growth have positive short-run impact on electric power consumption, electricity production from renewable sources, electricity production from oil sources and electricity production from hydroelectric sources respectively.

Figure 7 : Cusum test for Model (5)

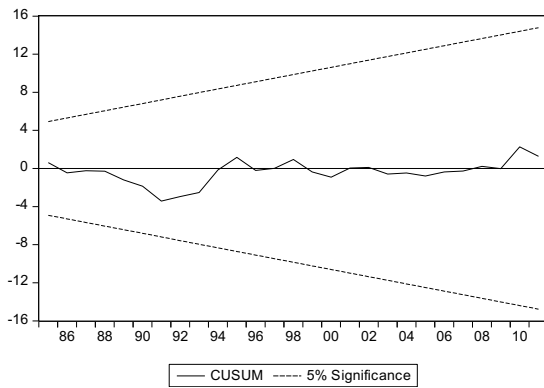


Figure 8 : Cusumsq test for Model (5)

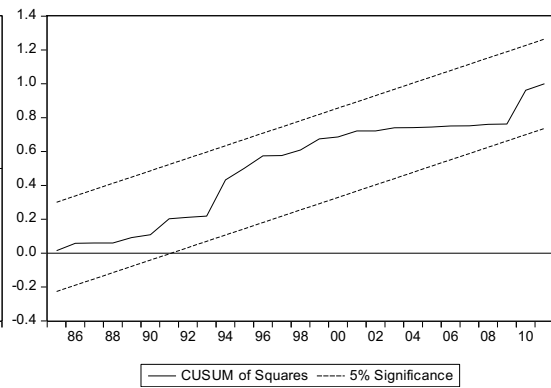


Figure 9 : Cusum test for Model (6)

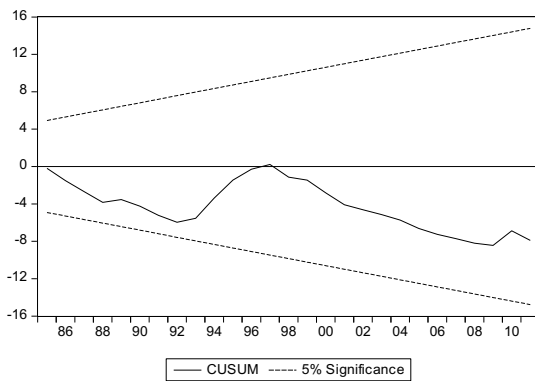


Figure 10 : Cusumsq test for Model (6)

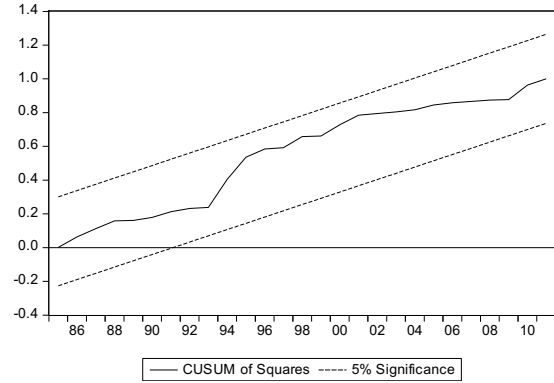


Figure 11 : Cusum test for Model (7)

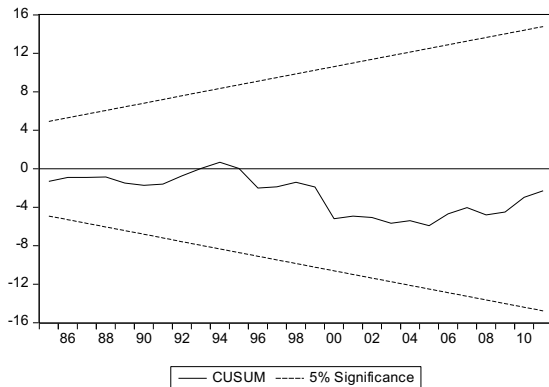
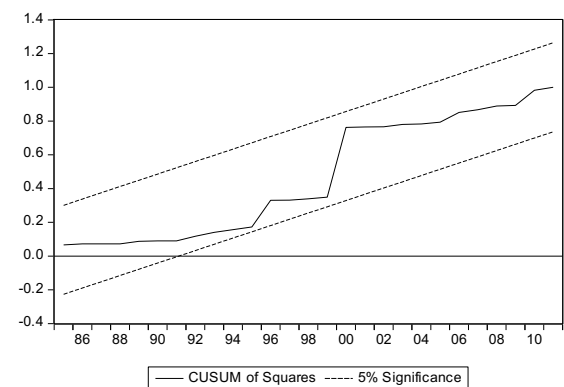


Figure 12 : Cusumsq test for Model (7)



Figures 7-14 : Stability tests (Cusum and Cusumsq)

Figure 13 : Cusum test for Model (8)

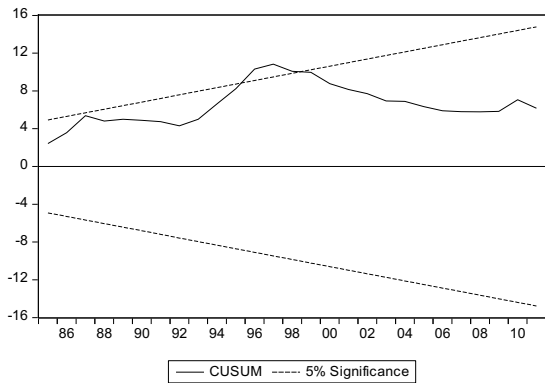
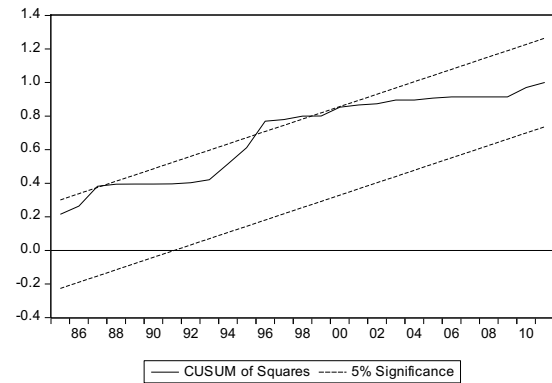


Figure 14 : Cusumsq test for Model (8)



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Figures 7-14 (continued) : Stability tests (Cusum and Cusumsq)

Table 6: Long run analysis

Independent variables	Dependent Variables			
	$LNEPCC_t$ Model (5)	$LNEPRC_t$ Model (6)	$LNEPOC_t$ Model (7)	$LNEPHC_t$ Model (8)
Constant	-5.221* [-2.989]	-3.012 [-0.418]	41.639*** [1.740]	-9.453 [-1.008]
$LNFD_t$	0.277* [2.992]	1.019** [2.196]	5.685* [3.625]	1.009*** [2.024]
$LNyh_t$	1.314* [5.629]	0.737 [0.764]	-6.007*** [-1.885]	1.625 [1.290]

Note: *, **, *** denotes significant at 1%, 5% and 10% levels respectively. Numbers in bracket represent t-Statistics.

The positive impact of financial development is only significant in electric power consumption and electricity production from renewable sources at 5% and 10% levels of significance respectively while the positive impact of economic growth is only significant in the case of electric power consumption at 1% significant level. Finally, Table 7 reveals that the error correction term is negative and significant in all models (from (5) to (8)) at 1% significant level respectively. These results confirm the existence of long-run relationship between financial development, economic growth and the sources of energy consumption in Cote d'Ivoire. Accordingly, the short-run deviations in electric power consumption, electricity production from renewable sources, electricity production from oil sources and electricity production from hydroelectric sources are corrected by 59.2%, 79.4%, 45.3% and 73.5% each year towards the long-run equilibrium respectively. In other words, the adjustment mechanism towards the long run equilibrium in the sources of energy consumption lasts around 1 year and 8 months for electric power consumption.

Likewise, this adjustment mechanism towards the long run equilibrium takes around 1 year and 3 months for electricity production from renewable sources, 2 years and 2 months for electricity production from oil sources and 1 year and 4 months for electricity production from hydroelectric sources respectively.

Table 8a presents the results of the estimated Vector Error Correction Models (VECM) of models (5) and (6) which are the basis of the Granger causality analysis for these models.

Table 7: Short run analysis

Independent variables	Dependent Variables			
	$D(LNEPCC_t)$	$D(LNEPRC_t)$	$D(LNEPOC_t)$	$D(LNEPHC_t)$
	Model (5)	Model (6)	Model (7)	Model (8)
$D(LNFD)$	0.288 ** [2.184]	0.809 *** [1.854]	0.623 [0.422]	0.611 [0.739]
$D(LNYh)$	0.778 * [4.911]	0.035 [0.020]	3.393 [1.136]	0.042 [0.025]
$ETC(-1)$	-0.592 * [-5.136]	-0.794 * [-4.212]	-0.453 * [-4.542]	-0.735 * [-4.112]

Note: *, ** and *** denote significant at 1%, 5% and 10% level respectively. D represents first difference operator and numbers in bracket represent t-Statistics; ECT denotes the error correction term.

This Table 8a shows the coefficients of the joint χ^2 statistics of Wald test for the short run analysis and the coefficients of the error correction terms for the long run analysis and their corresponding P-values in parenthesis.

Table 8a: VECM and Granger causality analysis

Dependent variables	Direction of causality (Model (5))			
	Short run			Long run
	$D(LNEPCC)$	$D(LNFD)$	$D(LNYh)$	ECT_{t-1}
$D(LNEPCC)$		4.242 (0.119)	1.116 (0.572)	-0.481 ** (0.041)
$D(LNFD)$	0.311 (0.855)		0.959 (0.619)	0.063 (0.810)
$D(LNYh)$	2.938 (0.230)	0.065 (0.967)		0.196 (0.146)
Dependent variables	Direction of causality (Model (6))			
	Short run			Long run
	$D(LNEPRC)$	$D(LNFD)$	$D(LNYh)$	ECT_{t-1}
$D(LNEPRC)$		1.148 (0.563)	6.348 ** (0.041)	-0.871 * (0.000)
$D(LNFD)$	1.789 (0.408)		4.886 *** (0.086)	0.019 (0.682)
$D(LNYh)$	4.017 (0.134)	2.979 (0.225)		-0.039 (0.118)

Note: *, ** and *** indicate statistical significance at 1%, 5% and 10% levels respectively and number in parenthesis the corresponding P-value.

The long run causalities between the variables are given by the coefficients of the error correction terms which must be negative and significant. Thereby, the results indicate that financial development and economic growth unilaterally cause electric power consumption per capita and electricity production from renewable sources per capita in the long run at 5% and 1% level of significance respectively.

Meanwhile, there is no evidence of causality between financial development and economic growth in model (5). The short run causalities are based on the joint significance of the related coefficients by using χ^2 statistics of Wald test. Thus, in short run, there is no causality between financial development, economic growth and electric power consumption per capita while economic growth leads to electricity production from renewable sources per capita at 5% level of significance. Likewise, there is unidirectional causality running from economic growth to financial development at 10% level of significance in Model (6).

Table 8b: VECM and Granger causality analysis

Dependent variables	Direction of causality (Model (7))			
	Short run			Long run
	D(LNEPOC)	D(LNFD)	D(LNYh)	ECT _{t-1}
D(LNEPOC)	-	6.366 ** (0.041)	21.122 * (0.000)	-0.586 * (0.000)
D(LNFD)	1.342 (0.511)	-	5.194 *** (0.074)	-0.018 (0.276)
D(LNYh)	2.037 (0.361)	0.009 (0.995)	-	0.009 (0.292)

Dependent variables	Direction of causality (Model (8))			
	Short run			Long run
	D(LNEPHC)	D(LNFD)	D(LNYh)	ECT _{t-1}
D(LNEPHC)	-	1.296 (0.523)	5.899 ** (0.052)	-0.830 * (0.000)
D(LNFD)	2.046 (0.359)	-	4.656 *** (0.097)	0.015 (0.746)
D(LNYh)	4.071 (0.130)	3.179 (0.204)	-	-0.041 *** (0.095)

Note: *, **, *** indicate statistical significance at 1%, 5% and 10% levels respectively and number in parenthesis the corresponding P-value.

Similarly, the results of VECM and causality tests of Models (7) and (8) are reported in *Table 8b*. In long run, financial development and economic growth cause both electricity production from oil sources (Model (7)) and electricity production from hydroelectric sources (Model (8)) at 1% level of significance. However, there is bidirectional causality between economic growth and electricity production from hydroelectric sources (Model (8)) in long run. Moreover, according to Model (8) financial development leads to economic growth in long run at 10% level of significance.

The short run analysis also reveals mixed results. In fact, *Table 8b* indicates that financial development and economic growth cause electricity production from oil sources (Model (7)) at 5% and 1% levels respectively. There is short run causality from economic growth to financial development at 10% significant level in Model (7). With reference to Model (8), in short run only economic growth causes electricity production from hydroelectric sources at 5% level of significance. In the same way, economic growth leads

to financial development at 10% significant level. *Table 9* summarizes the results of Granger causality tests.

Afterwards following Pesaran and Shin (1998), we performed the Generalized Impulse Response Functions (GIRF) of the four energy consumption sources (EPCC, EPRC, EPOC and EPHC) to one standard deviation (S.D) innovation of financial development (FD) and economic growth (Yh) over 10 periods. Basically, the Impulse Response Function (IRF) describes the dynamic interaction between the variables, showing the reaction of one variable to any shock from the other variables. The GIRF is based on nonlinear impulse response function computing the mean impulse response function and is not affected by the ordering of the variables, contrary to Cholesky decomposition (Lin, 2006). *Figure 15* to *Figure 22* show the results of the response functions of energy consumption to positive impulse in financial development and economic growth. Thus, the response of EPCC to one standard deviation innovation in financial development is positive up to 6 periods and becomes negative after this threshold but a shock in economic growth has a positive and persistent effect on EPCC increasing in magnitude (*Figures 15&17*).

Moreover, the positive effect of a shock in financial development on EPRC varies in magnitude but remains positive over periods. A one standard deviation in economic growth has a negative impact on EPRC which increases in magnitude until 3 periods but this impact becomes significantly positive after 5 periods (*Figures 16&18*). Globally, *Figures 19 and 21* also reveal that EPOC has strong and positive reaction to both a shock in financial development and economic growth over periods. Likewise, a one standard deviation (S.D) innovations in financial development has a positive and varied impact on EPHC over periods whereas a one standard deviation (S.D) innovations in economic growth has a negative and significant impact on EPHC but this impact remains positive and persistent beyond 5 periods (*Figures 20&22*).

Table 9: Summary of Granger Causality test results

(EPCC, FD, Yh) Model (5)		(EPRC, FD, Yh) Model (6)	
Long run	Short run	Long run	Short run
FD → EPCC **	FD ≠ EPCC	FD → EPRC *	FD ≠ EPRC
Yh → EPCC **	Yh ≠ EPCC	Yh → EPRC *	Yh → EPRC **
FD ≠ Yh	FD ≠ Yh	FD ≠ Yh	Yh → FD ***
(EPOC, FD, Yh) Model (7)		(EPHC, FD, Yh) Model (8)	
Long run	Short run	Long run	Short run
FD → EPOC *	FD → EPOC **	FD → EPHC *	FD ≠ EPHC
Yh → EPOC *	Yh → EPOC *	Yh → EPHC *	Yh → EPHC **
		Yh ← EPHC ***	
FD ≠ Yh	Yh → FD ***	FD → Yh ***	Yh → FD ***

Note: * , ** , *** indicate statistical significance at 1%, 5% and 10% levels respectively. → and ← indicate the direction of causality. The symbol ≠ denotes the absence of causality.

Finally, we conducted variance decomposition analysis (available upon request) to measure the relative importance of a shock in one variable to the accumulated forecast error variance of other variable. Thereby, a one standard deviation in financial development (FD) (respectively in economic growth) accounts for 7.351% (respectively 26.544%) of the accumulated forecast error variance in electric power consumption per capita (EPCC) after 10 periods.

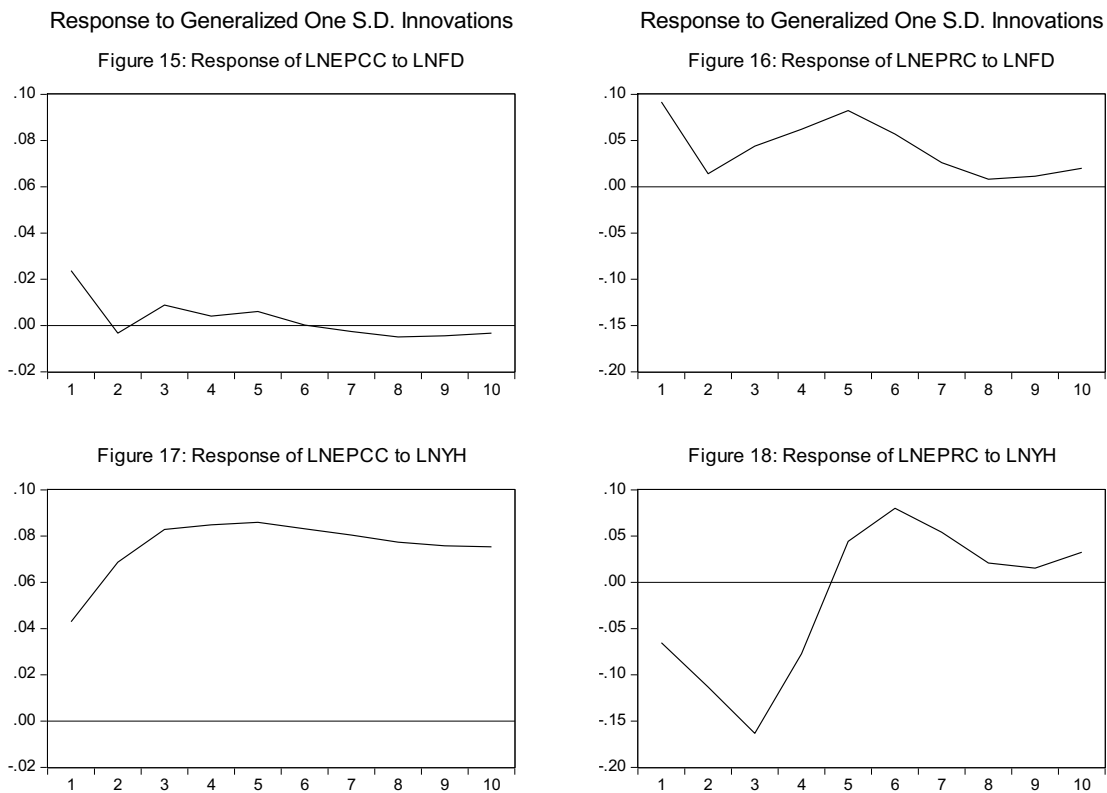
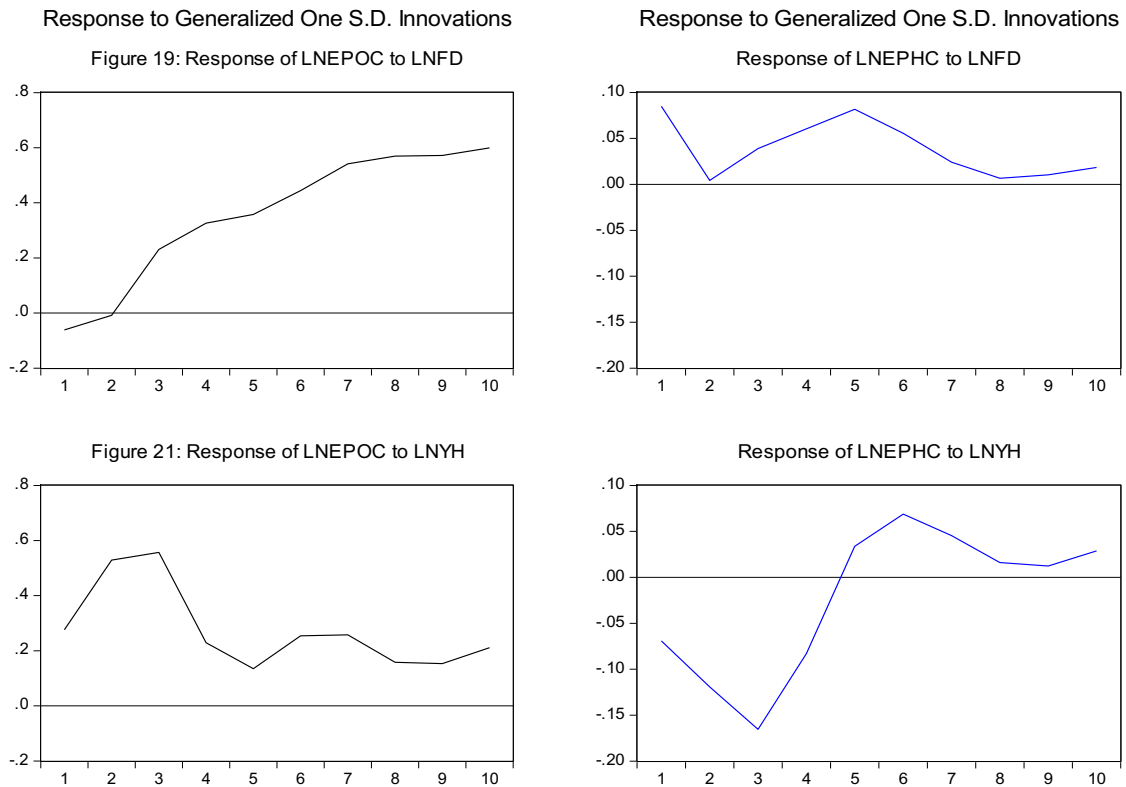


Figure 15-18 : Impulse Response functions to Generalized One S.D. Innovations.



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Figure 18-22 : Impulse Response functions to Generalized One S.D. Innovations.

Likewise, a random shock in FD explains only 8.836% of the accumulated forecast error variance in EPRC and 25.564% of that is caused by a standard deviation in Yh after 10 years. On the other side, the forecast error variance in electricity production from oil sources (EPOC) becomes strongly explained by a shock in financial development (FD) as well as in economic growth (Yh) accounting for 59.028% and 21.672% respectively over the long run. That is not the case for the forecast error variance in electricity production from hydroelectric sources which is explained by only 8.220% by a shock in financial development while 23.984% of that forecast error variance is caused by a one standard deviation in economic growth after 10 years. However, most of the accumulated forecast error variance in the four energy consumption sources (EPCC, EPRC, EPOC and EPHC) are explained by their own shocks than those accounted for by shocks in financial development and economic growth in Cote d'Ivoire over the long run.

Conclusion and policy implications

The present paper empirically analyzed the relationship between financial development, economic growth and energy consumption in Cote d'Ivoire over the period 1971-2011 using secondary database of the World Bank (World Development Indicator, WDI (2014)). Our basic hypothesis have been partially verified. The mixed results stem from the use of different proxies of energy consumption. The autoregressive distributed lag (ARDL) bounds testing approach to cointegration has been employed showing that there is long run relationship between financial development, economic growth and energy consumption sources in Cote d'Ivoire. However, the Vector Error Correction Models (VECM) revealed mixed causality results both in short and long runs. Thus, the hypothesis (H_1) is partially verified since the study revealed both unidirectional and feedback effects between economic growth and energy consumption in long run depending on the use of different proxies for energy. Furthermore, the paper proved the hypothesis (H_2) of unidirectional causality running from financial development to energy consumption sources while financial

development causes economic growth in long run only when using electricity production from hydroelectric sources as energy proxy (Hypothesis H₃ has been partially proved). Overall, financial development and economic growth have positive and significant effect on energy consumption sources but the effect of economic growth on electricity production from oil sources is negative and significant in Cote d'Ivoire in long run. Finally, the results of the impulse analysis show that positive shock either in financial development or economic growth has positive impact on energy consumption in long run with a few exceptions, all other things being equal. The variance decomposition (forecast error variance) analysis generally also indicates that over the years, fluctuations in energy consumption remain largely explained by itself, then by economic growth and financial development changes respectively.

The contribution of this study is twofold. First, we built a synthetic indicator of financial development using the principal component analysis technique (PCA) ; Then we used four energy sources as different proxies of energy consumption contrary to prior studies on this subject and/or in Cote d'Ivoire. As a limitation, the paper does not extend the investigation of the relationship between financial development, economic growth and energy consumption over many countries such as Sub-Saharan Africa or West Africa in particular. Further research should also include the access to finance, the political and legal aspects in the construction of financial development index.

Given these results, the main policy implications of this paper are elaborated as follows. The study suggests the improvement of the level of financial system development in Cote d'Ivoire by optimizing the various financial intermediation functions such as mobilizing funds, producing and disseminating information, controlling and sharing risk, monitoring investments through optimal allocation of resources, reducing transaction costs and liquidity of financial investments. Indeed, in the long run, the development of financial system will increase energy consumption in Cote d'Ivoire through the promotion of investment policies in energy production and supply. In addition, financial development should favor an optimal allocation of credit allowing the population to access the basic energy services throughout Cote d'Ivoire, a guarantee of self-sustained growth and thereby factor of sustainable development. On the other hand, unidirectional long-term causality ranging from economic growth to energy consumption suggests that energy conservation policies would not directly impede short- and long-term economic growth. Thus, a second policy implication is that the Ivorian government should further promote the diversification of energy consumption sources and environmental protection policies by increasing the production of renewable energies because they are less polluting; by enhancing efficiency in energy demand management to avoid squandering; encourage investment promotion in research and development to find energy-saving technologies. Finally, the Ivorian government should solicit the assistance of financial sector to support economic growth and promote productive investments in the main economic sectors, since financial development causes economic growth in Cote d'Ivoire. Energy production and consumption are also helpful means for the development of the industrial sector, urbanization therefore for economic growth, and consequently for sustainable development in Cote d'Ivoire.

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