EQUATORIAL GUINEA, SPAIN AND FRANCE: LONG RUN ECONOMIC RELATIONSHIPS AMONG THE THREE ECONOMIES

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Abstract

This paper addresses the analysis of the relationship between GDP in Equatorial Guinea and that of France and Spain. We use univariate and multivariate techniques based on fractional integration and cointegration, we will try to find out if the economies of these three countries are related or cointegrated through the GDP data. After studying the data of the three countries, the univariate results indicate that the three series displays unit roots implying permanency of the shocks. However, the multivariate results based on non-fractional and fractional cointegration reject the hypothesis of long run equilibrium relationships among the variables. Because of this, a Bayesian VAR model is implemented in order to obtain the impulse response functions.

JEL classification: C22; C32; C51; C52;

Key words: Equatorial Guinea, GDP; fractional integration; fractional cointegration

Resumen

Este trabajo aborda el análisis de la relación entre el PIB en Guinea Ecuatorial y el de Francia y España. Utilizamos técnicas univariantes y multivarite basadas en la integración fraccional y la cointegración, trataremos de averiguar si las economías de estos tres países están relacionadas o cointegradas a través de los datos del PIB. Tras estudiar los datos de los tres países, los resultados univariantes indican que las tres series de lost res países contienen una raíz unitaria, implicando que los shocks tendrán una naturaleza permanente. Sin embargo, el analisis multivariate utilizando técnicas de cointegracion fraccional y no fraccional no encuentra ninguna relación a largo plazo entre las tres variables. Debido a ello, utlizamos un modelo VAR Bayesiano con el fin de estudiar las funciones impulse respuesta.

Table of Contents

List of Tables

List of Figures

1. Introduction

Through the treaty of San Ildefonso in 1777 and the treaty of the Brown in 1778, in which the Portuguese ceded the islands of the Gulf of Guinea to Spain in exchange for the islands of Santa Catalina that Spain had in Brazil. From that moment the islands of the Gulf passed into the hands of the Spaniards who soon baptized the name, that happened to make Spanish Guinea and step to become Spanish colony. After World War II, many independence movements took place in the world, which led to Spain in 1956 to denominate the territory as Spanish Province in this way independence would be much more difficult; but due to the international and internal pressure that had in the own country (Equatorial Guinea) towards Spain, this one granted the independence to him 12 of October of 1968.

Since colonial times Spain and Equatorial Guinea have always maintained relations, relations that have been maintained before and after independence (economic, diplomatic, commercial, etc.) that make the two countries to have many things in common. But Spain is not the only country that Guinea has relations with, and one of these countries is France, which in addition to having commercial relations, have an economic relationship since France together with the French Bank design the Economic Policy of Central Africa, and, as Equatorial Guinea is in Central Africa, this policy affects you. Due to all the relationships that exist between the three countries, it is the objective in this paper to study the long run equilibrium relationships among the three economies, testing if the state of economies in Spain and France affects the economy of Equatorial Guinea. In other words we want to know if the economy of Equatorial Guinea is cointegrated with that of France and/or Spain. To carry out this research, we will take the GDP of the three countries at current prices for the time periods that goes from 1962 to 2015.

2. Historical context

Equatorial Guinea is a country of Africa located in the central part of the African continent and in the Gulf of Guinea. Hence the name Equatorial Guinea: Guinea because it is located in the Gulf of Guinea and Equatorial because of its proximity to the equator. Equatorial Guinea consists of a continental part and several islands. The mainland is known as Muni River or Mbini and the island are Bioko Island, Annobon Island and Corisco Islands. The Portuguese, headed by Fernando Poo, during their exploration in the Gulf of Guinea, were the ones who discovered the island of Bioko in 1471 and baptized it the island of Fernando Poo. A year later they discovered the islands of Corisco and Annobón (formerly the island of Pagalú); both islands became posts for the slave trade. After the Treaty of San Ildefonso in 1777 and the Treaty of Pardo in 1778, in which the Portuguese ceded the islands of the Gulf of Guinea to Spain in exchange for the islands of Santa Catalina that Spain had in Brazil, the islands of the Gulf passed into the hands of the Spaniards who soon re-baptized and it became Spanish colony.

In 1956, Spanish Guinea was renamed the Spanish Province because of the independence movements that had emerged in many countries of the world after the Second World War and which had begun to emerge in the country itself. After, many independence movements had arisen in the country and the request in 1965 of the UN Assembly to Spain to set a date for the independence of Guinea, it was granted on the 12^{th} of October of 1968 and from that date, the Spanish province was renamed Equatorial Guinea. Equatorial Guinea is the only country in Africa whose official language is Spanish as recognized by its constitution and is spoken by 87% of the population approximately. Apart from Spanish (official language), other native dialects are spoken, such as Bubi (mainly in Bioko), Anobones (in Annobon), Fang, Bisio, Combe and Ndoye (in Muni River).

Equatorial Guinea's economy used to be dependent on cocoa and wood. These two products were the main source of its income and main export until 1992, when the exploitation of oil took relevance. In previous periods, the economy of Equatorial Guinea hardly grew and if it did, it did so at a very small pace. From 1992 onwards when exploitation of oil began, the economy took a big turn and in the periods from 1993 to 1998 GDP grew by an average of 25.9%.

Oil accounts for 69% of GDP and 86% of its exports, although the country also continues to export cocoa and wood. Thanks to the export of oil, Equatorial Guinea became one of the richest countries in Africa. In 2013, Guinea's economy entered recession. With the drop in oil prices in 2015 the economy even worsened because it is mainly dependent on oil and it is the biggest source of their income. This fall in the price of oil led to a fall in revenues, forcing the government to carry out a series of spending cuts and increasing its public deficit.

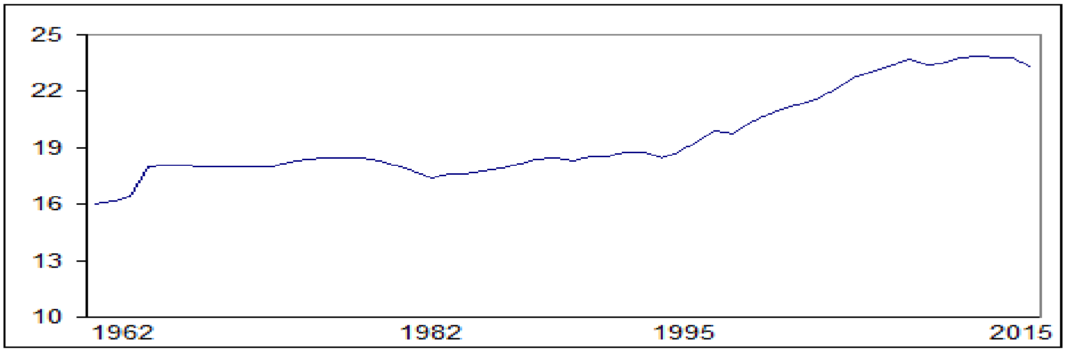
Spain and Equatorial Guinea have a historical relationship since it was Spanish colony, which makes them share the same official language. Apart from the historical relationship between the two countries, there are other types of relationship, such as a diplomatic relationship: in 1971, Spain and Equatorial Guinea signed the consular agreement, in 1979 the two countries signed development cooperation and in 1980 the Treaty of Friendship and Cooperation was signed. Another type of relationship between the two countries is a commercial relationship, since Equatorial Guinea is the first country in Central Africa to export products from Spain such as beverages, vehicles, machinery, etc.; and Guinea exports to Spain hydrocarbons, mainly oil, being thus, one of the countries of the world to which Equatorial Guinea exports the most.

Similarly, France and Equatorial Guinea have a diplomatic relationship since that country (France) has an embassy in Guinea. Another relationship that can be seen between the two countries is trade, as France is also one of the countries in which Guinea exports oil. On the other hand, France is one of the first countries that began to explore the oil of Equatorial Guinea through the company TOTAL, which means that the two countries have had a long relationship.

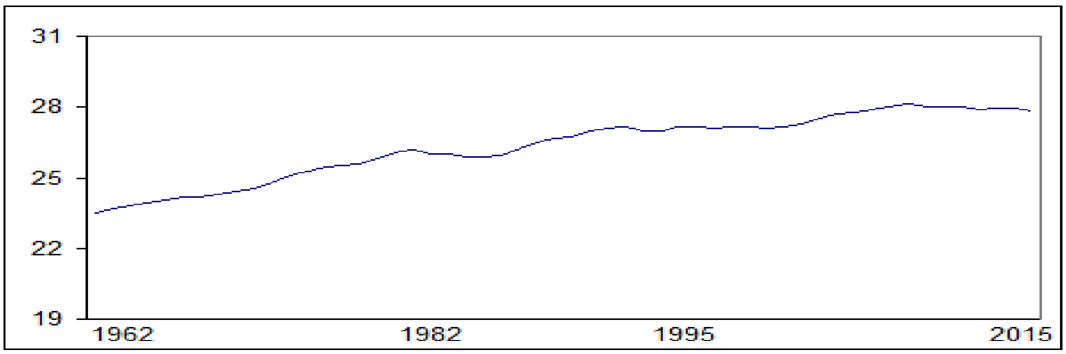
Another remarkable aspect of the relationship between France and Equatorial Guinea is the currency. The currency of Equatorial Guinea is CFA Franc, a currency used by all the former colonies of France in Africa since 1945, but in the case of Equatorial Guinea, which is not a French colony, it adopted the currency in 1984. By using the CFA franc, the relations between the two countries are not only diplomatic and commercial, but also refer to economic policy, since the Central Bank of Equatorial Guinea (BEAC), which is the same as all Central African countries, together with the Bank of France, are the ones who design the Monetary Policy, not only of Equatorial Guinea, but of all the countries of Central and West Africa.

Figure 1: Evolution of the GDP of Equatorial Guinea, Spain and France.

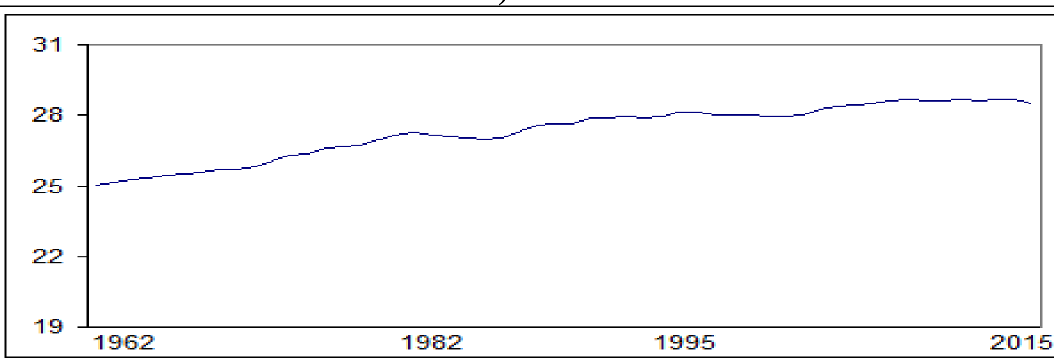
i) Equatorial Guinea



ii) Spain



iii) France



3. Methodology

For the purpose of this work we use techniques based on fractional integration and cointegration (see Gil-Alana and Hualde, 2009). From an univariate viewpoint, we extend the traditional I(0) and I(1) models to the fractional case, allowing for I(d) models where the differencing parameter d can be any real value and thus, potentially fractional. This is a quite flexible approach since we do not restrict ourselves to integer degrees of differentiation.

Let's suppose that y_t is the time series we observe from t = 1, … T. Then, we can consider that y_t contains some deterministic terms of the form:

$$y_t = \beta_0 + \beta_1 t + x_t, \qquad t = 1, 2, ..., \tag{1}$$

where β_0 and β_1 are unknown coefficients corresponding respectively to the intercept and a linear time trend, and x_t is the error term. In this context, we examine the following model,

$$(1 - L)^d x_t = u_t, \qquad t = 1,2, ..., \tag{2}$$

where L represents the lag operator (i.e., $Lx_t = x_{t-1}$) and d can be any real number. In the above equation, d plays a very important role. First, it is an indicator of the degree of persistence in the series: the higher the value d takes on, the greater the persistence is. Second, d is important to determine the nature of the shocks; these will be transitory if $d < 1$ and permanent otherwise ($d \geq 1$). Moreover, it includes the standard cases of stationarity I(0) or nonstationarity or unit roots (I(1)) as particular cases of interest with d = 0 and d = 1 respectively.

The natural generalization of the concept of fractional integration to the multivariate case is throughout the concept of fractional cointegration. Engle and Granger (1987) introduced such a concept by suggesting the case of two processes x_t and y_t which are both I(d), but where there exists a linear combination $w_t = y_t - ax_t$, that is I(d-b) with b > 0. This idea characterizes the concept of cointegration, which they adapted from Granger (1981) and Granger and Weiss (1983). They provided the following definition for multivariate series. Given two real numbers d, b, the components of the vector z_t are said to be cointegrated of order d, b, denoted $z_t \approx CI(d, b)$ if:

i) all the components of z_t are I(d), and

ii) there exists a vector w_t such that $w_t = \beta' z_t \approx I(d - b)$, $b > 0$.

Here, β and w_t are called cointegrating vector and error respectively, and though the original definition was presented for any real values d and b, most of the empirical works carried out since then were conducted based on integer values, with d = b = 1.

The first theoretical papers on fractional cointegration were developed by Peter Robinson and his coauthors (Robinson and Hualde, 2003, 2007; Robinson and Marinucci, 2001; Robinson and Yajima, 2002) and later on, more general multivariate approaches have been presented by Johansen and Nielsen (2010, 2012) throughout the Fractional Cointegration VAR (FCVAR) approach, extending the classical CVAR of Johansen (1991, 1996).

4. Data

The data investigated in this work correspond to the GDP of Equatorial Guinea, France and Spain, for the time period from1961 to 2015, GDP data are in millions of dollars and at constant prices. The data were extracted from the World Bank since in other sources of data, it was difficult to find data of Equatorial Guinea in such a wide period of time. Looking at the set of graphs in Figure 1, we see the evolution that has had the series in this period of 54 years, in the case of Equatorial Guinea, we see that the series at first, has followed a more or less constant trend, in the period that goes from 1962 to 1995 and that from 1995, the series has followed a trend due to the fact that in this year, the country began to exploit the oil, which led to very high increases in GDP terms. In the case of Spain, we see that the series has followed a more or less increasing trend in some periods, constant in other periods (e.g., from 1995 to 2000) and also periods such as the one from 1981 to 1984 where the GDP fell. Finally we observe the French series, whose behavior is more or less similar to that of Spain with the difference in which the French series begins at 25 million dollars, and that of Spain at 23 million dollars which means that the GDP of France is higher than that of Spain, and that of Equatorial Guinea.

5. Empirical results

As a preliminary step, we examine the univariate properties of the series, and consider a model given by equations (1) and (2), that is,

$$y_t = \beta_0 + \beta_1 t + x_t; \qquad (1 - L)^d x_t = u_t; \qquad t = 1, 2, \ldots, \tag{3}$$

where y_t refers to each of the individual series**,** β_0 and β_1 are unknown coefficients corresponding respectively to the intercept and a linear time trend, and the detrended series x_t is assumed to be I(d) where d is an unknown (real)-value parameter that will be estimated for the data; finally, u_t is supposed to be I(0) and we consider the two cases of uncorrelated (white noise) and autocorrelated errors, in the latter case imposing the non-parametric approach of Bloomfield (1973).

Table 1: Estimatedvalues of d and 95% confidencebands

i) No autocorrelation			
Series	No regressors	An intercept	A linear time trend
Equatorial Guinea	0.92 (0.75, 1.17)	1.26 (1.04, 1.56)	**1.22 (1.02, 1.55)**
Spain	0.92 (0.75, 1.17)	1.42 (1.18, 1.76)	**1.38 (1.14, 1.77)**
France	0.92 (0.76, 1.15)	1.16 (1.00, 1.41)	**1.16 (1.00, 1.41)**
ii) Autocorrelation (Bloomfield)			
Series	No regressors	An intercept	A linear time trend
Equatorial Guinea	0.80 (0.41, 1.24)	0.80 (0.58, 1.35)	**0.87 (0.59, 1.28)**
Spain	0.80 (0.42, 1.25)	0.79 (0.60, 1.36)	**0.81 (0.50, 1.30)**
France	0.86 (0.54, 1.31)	1.03 (0.80, 1.47)	**1.05 (0.76, 1.57)**

Source: Own Elaboration based on the World Bank Data

Table 2: Estimated coeffiicients in the selected models

i) No autocorrelation			
Series	d (95% band)	Intercept	Time trend
Equatorial Guinea	1.22 (1.02, 1.55)	24.97837 (260.76)	0.06454 (2.22)
Spain	1.38 (1.14, 1.77)	23.38754 (228.75)	0.08977 (1.67)
France	1.16 (1.00, 1.41)	15.85241 (50.81)	0.13535 (1.78)
ii) Autocorrelation (Bloomfield)			
Series	d (95% band)	Intercept	Time trend
Equatorial Guinea	0.87 (0.59, 1.28)	25.01330 (262.13)	0.06690 (8.07)
Spain	0.81 (0.50, 1.30)	23.47509 (219.97)	0.08399 (10.98)
France	1.05 (0.76, 1.57)	15.87556 (50.16)	0.13535 (2.62)

Source: Own Elaboration based on the World Bank Data

The first thing we observe is that if the error term is white noise, the estimated value of d is higher than 1 in the three series examined, and the I(1) hypothesis is rejected in favour of higher degrees of integration. The estimated values of d are 1.22 for Equatorial Guinea, 1.38 for Spain and 1.16 for France, and a linear time trend is required in the three series (see the estimated coefficients in Table 2). Allowing for (weak) autocorrelation throughout the exponential model of Bloomfield (1973), the time trend is still required, and the estimated values of d are now substantially smaller: 0.87 for Equatorial Guinea, 0.81 for Spain, and 1.05 for France. In this context of autocorrelated errors, the unit root null hypothesis cannot be rejected in any of the three series.

As a robustness method, we also employ a semiparametric approach where no functional form is imposed on the error term. We use here a “local” Whittle method, initially proposed by Robinson (1995) and later extended and improved by Velasco (1999), Shimotsu and Phillips (2005), Abadir et al. (2007) and others.

Table 3: Estimates of d based on a semiparametric method

M / Series	France	Spain	Eq. Guinea	Lower I(1)	Upper I(1)
5	1.056*	0.834*	1.140*	0.632	1.367
6	1.111*	0.978*	1.196*	0.664	1.335
7	1.016*	0.952*	1.194*	0.689	1.310
8	1.056*	1.054*	1.138*	0.709	1.290
9	1.111*	1.100*	1.152*	0.725	1.274
10	1.118*	1.166*	1.135*	0.739	1.260

Source: Own Elaboration based on the World Bank Data *: Evidence of unit roots (i.e., d = 1) at the 5% level.

Table 3 displays the estimates of d for a selected group of bandwidth numbers, specifically from m = 5, 6, …, 9 and 10. The results support the I(1) models in all cases for the three series; for example, the value of d for m = 5 is 1,056 for France, 0.834 for Spain and 1,140 for Equatorial Guinea, which are the three within the I(1) interval for that bandwidth number, (0.632, 1.367).

Based on the fact that the three series seems to be I(1) we thought of carrying out a cointegration analysis of the series under study. This was nevertheless not feasible since all the cointegrating tests applied both in the fractional (Johansen and Nielsen, 2010, 2012) and standard (Johansen, 1991, 1996) scenarios rejected the possibility of a cointegrating relationship between the series; Table 4 reports the results of the Johansen's (1996) tests. Therefore, we decide do conduct a Bayesian VAR analysis for the three series, and the corresponding impulse repsonses are displayed across Figure 2; where it is observed that the effects of the economies of Spain and France are opposite.

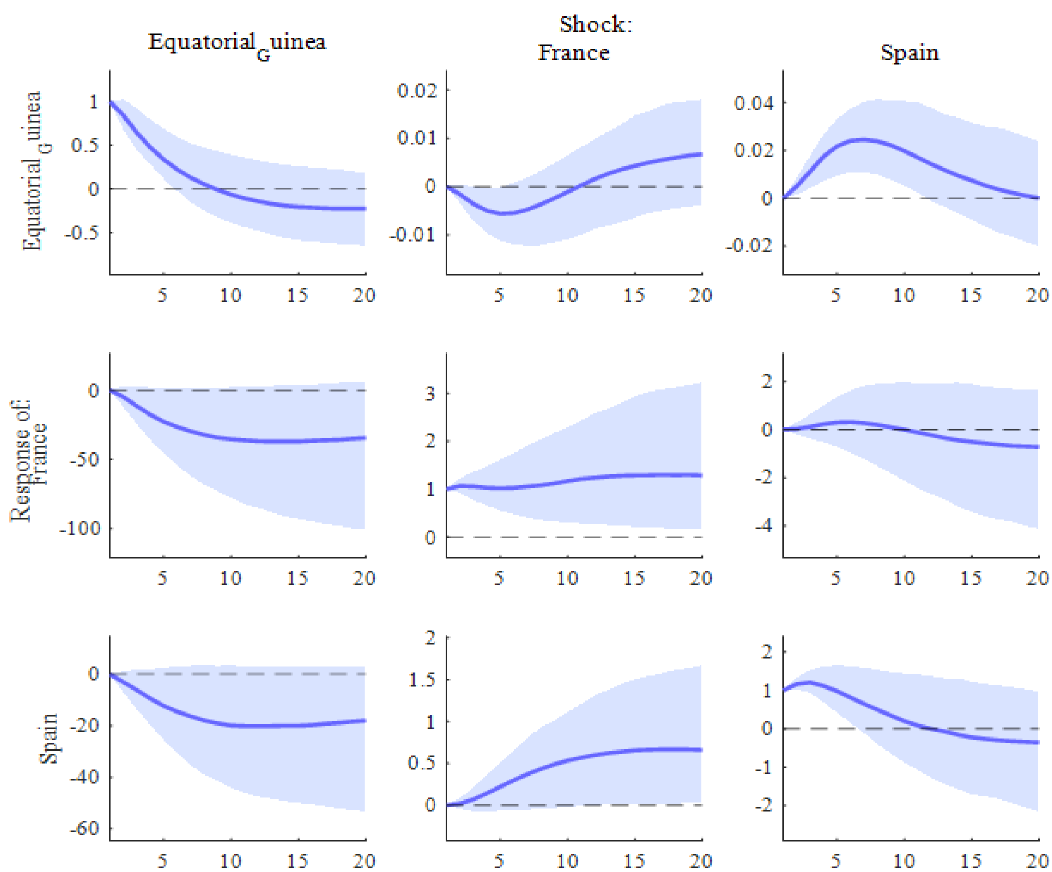
Table 4: Johansen cointegration test.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.210360	14.71403	24.27596	0.4784
At most 1	0.056867	3.377481	12.32090	0.7984
At most 2	0.011747	0.567179	4.129906	0.5134

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Figure 2: Impulse Response Functions, Bayesian VAR Analysis



Conclusions

We have examined in this thesis the relationships between Equatorial Guinea, Spain and France in terms of the GDP by using updated econometric techniques based on the concepts of fractional integration and cointegration. According to the results obtained from the data extracted from the World Bank; we conclude that the three individual series are nonstationary I(1) with shocks persisting forever. When at the cointegration relationships between the three countries (Spain, France and Equatorial Guinea), there is not found any long run equilibrium relationship between them. Therefore, a Bayesian VAR model is implemented. The results indicate that the effect on the economy of one country is contrary to the other.

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