ABSU Journal of Arts, Management, Education, Law and Social Sciences (JAMELSS); Vol 2 (2012); 110-125

Some Selected Macroeconomic Variables and their Relevance in Explaining Balance of Payments Disequilibrium in Nigeria, 1985-2011: An Econometric Investigation

Azubuike Ernest Agugua
Department of Economics
Abia State University, Uturu
elzubbyke@gmail.com
And
Ebbah Patrice Ejembi
Research Fellow Africa Heritage Enugu

Abstract

The part of the objective of every government is to get the balance of payments right. This objective has inspired every major turn of policy; setting of bank rates, changes in taxes, regulation of incomes, the re-structuring of industry, introduction of export rebate, control of money supply, level of government expenditure etc. Balance of payments disequilibria in some countries have reached enviable levels and have become the major binding constraint in the realization of government's objectives. This study did an econometrics analysis to understand the relationship between the external sector and monetary, fiscal and real sector of the economy through the examination of certain identities to deduce the causative agents of the balance of payments disequilibrium. The single equation model with one dependent variable (Balance of payments new position) and four independent variables, (budget deficit, saving-investment gap, exchange rate and private foreign capital) was used. Data testing or validation was based on the multiple regression analysis (MRA) and various tests of significance were used to test the hypothesis. The R^2 test, for the explanatory power of the independent variables and the f-test, to determine the joint significance of the explanatory variables were relevant inputs, The macro-model developed showed that the log linear version of the multiple regression analysis fit the data better this is based on the reasonable R^2 value, the significance of two variables (Exchange rate and saving-investment gap) out of the four explanatory variables and the overall significance of the model based on the f-ratio.

***Key words*:** balance of payments equilibrium and disequilibrium, private foreign capital, exchange rate, budget deficit, saving-investment gap.

Background of the Study

By 1964, fifty years after the amalgamation of 1914, Nigeria was at the height of its growth potential, it was the world's largest producer of groundnuts and palm oil. Petroleum had just started making its debut in the national accounts.

Currently in 2011, petroleum forms twenty-five (25%) percent of our Gross Domestic Product (GDP), over eighty (80%) percent of foreign exchange receipts, and seventy (70%) percent of budget revenues. Gas development is still at its infancy represented by the $3.8billion Liquefied Natural Gas (LNG) plant at Bonny Island, which is currently, as at 2011, being expanded with the construction of the third train to increase gas utilization.

Anya (2008) opined that, in the early 1980s, the oil market weakened, substantial and fiscal imbalances emerged. They were financed by public sector borrowing, depleting international reserves and large accumulation on payment arrears on external trade credits.

In 1984, the austerity measure was introduced to redress the nagging deficits in the country's balance of payments, which included slashing of budgetary expenditure, administrative control for import licenses and upward reviews of tariffs.

In 1986, the structural adjustment policy (SAP)was introduced, which amongst other things, combined exchange rate and trade policy reforms to promote economic efficiency and long term growth in the stabilization policies design to restore balance of payments disequilibrium and price stability, Agiobenebo (2010). Part of the objectives of every government from Tafawa Balewa up till President Goodluck Jonathan is to embrace policy measures that can drastically reduce balance of payments disequilibrium in the economy.

Statement of Problem

Balance of payment problems have reached unsustainable levels in many countries and have tended to constitute logs in the wheel of progress for emerging countries, of which Nigeria is one.

The equilibrium in the balance of payments account has generated questions concerning the causes, of the deteriorations in terms of trade; huge external deficits; slippages in fiscal and monetary policies and the inappropriate interest rate policies amongst others.

This research work undertook an econometric investigation to understand the relationships between the external sector and the real sectors of the economy.

These study summaries the impact of these sectors on the social and economic imperative in Nigeria.

Objectives of the Study

The main emphasis of this study is to determine some of the macroeconomic variables that are related to the frequent oscillations in the balance of payments disequilibria in different countries. To estimate the characteristics of balance of payments from a sample of variables, we tested a set of the hypothesis to determine the probability of significance in causation. Base on the results of model, suggestions are proffered.

Research Hypothesis

This study is hereby guided by the following hypothesis: H_0: $b_i \neq 0$; there is no significant relationship between balance of payments and exchange rate, budget deficit, foreign private capital and saving/investment gap in Nigeria.
Hi" $b_i = 0$ there is significant relationship between balance of payments and exchange rate, budget deficit, foreign private capital and saving/ investment gap in Nigeria.

An Overview of the Nigeria Economy

The Nigeria economy is richly endowed, self-sufficient in energy, a semi-literate population and low level of wealth redistribution, but have suffered from considerable volatility over the years. Such vulnerabilities include: effective economic management for short periods leading to erratic growth cycles, slow GDP growth rate, high inflation, balance of payment crisis, and reduced economic activity. Other vulnerabilities are the reliance on a single commodity export-oil, a weak political structure, and usually military, regional and religious tensions, Ekpakpan (2011).

Up till the time of this study, the Nigeria economy is a typical low-income developing one with an abundance of unskilled and underemployed labour and inadequate industrial capital stock. The economy is stagnant and its structure has a strong agrarian penchant. Savings and investment are at low level and growth rate of the economy is at an abysmal rate lower than the population growth rate. The macroeconomic policy structure is as confusing and inimical as that of many African countries and non-oil exports still negligible. The result is that development dynamics are conspicuously missing. In terms of per capital income, Nigeria is at the bottom of the poverty league.

Following the oil boom in 1975, discovery of oil in Nigeria was characterized by high inflation and surging imports, which raised doubts over the efficiency of the investment programme of government, Corruption in government grew in late 70's

casting doubt that significant part of the oil money was going to development projects.

Monetary policy in Nigeria is targeted, at theoretically, at a set of macroeconomic objectives aimed at influencing the aggregate-level performance of the economy. The broad macroeconomic objectives include price stability, full employment, balance of payments equilibrium, growth in real sector etc. the impact of the Central Bank and monetary policy on all these objectives is essentially direct due to the shallowness and primitive nature of the financial market, capping of interest rate, paucity of debt instruments, amongst other reasons.

Contractionary monetary policies are often recommended wherever inflationary forces appear to pervade the economic space, leading to more inflationary spirals. Interest rates are the most important set of price in any financial system and there always have direct or indirect influence over institutional conditions. They affect the propensity resources amongst other things, Gbosi (2009).

Balance of Payment Theories

Balance of payment equilibrium when, in a year, the basic balance or other chosen balances approximated to zero. Disequilibrium exists if otherwise. Factors causing disequilibria in the BOP can be divided into two categories, according to Barro (2004). They include;

a. Exogenous factors - those beyond the control of the domestic policies for example, act of God and those externally induced from other countries.
b. Endogenous factors – those within the influence of the national government, for example, export bottleneck or excess domestic demand.
c. The BOP theories include; inflation theory, structural and absorption theory, Alexander (1952).

Model Specification

This study involved abstraction through model building to investigate and estimate quantitative relationship levels under the presentation of multiple regression analyses. We focused on:

a. Determining the explanatory variables considered to be significant under the circumstance.
b. Determining the apriori theoretical expectations about the signs of the variable of the function;
c. Determining the mathematical form of the model with a system of equations; We used the following established ratio to rest our hypothesis

i. The coefficient of determination, R^2 test. This was used purely as a measure of the explanatory power of the model;

ii. The estimated regression coefficient test, that is, the t-test to determine whether or not the estimated coefficients of the selected explanatory variable are significantly different from zero;
iii. The F-test, to determine the joint significance of the explanatory variables that is the overall test of the model.

Method of Analysis

Multiple regression analysis was our main measurement tool which includes a number of independent variables. We had to determine if a particular variable is relevant or not. The best guide is economic theory. In identifying the explanatory variable, we considered the factors that affect the components of balance of payments, Garritsem (2005).

Current Account Component

This is very important component. The disequilibrium in this account is a tropical issue today in economic and political discussions because of persistent trade imbalance of the country with the rest of the world. It consists basically of exports, imports and unilateral transfers.

The major factors affecting this component of balance of payments account include: exchange rate, relative national price levels, inflation, money supply, tax rate on income from capital, state of development of the real sector (output level), Ibid (1952).

Capital and Financial Component

The capital component records, net trade between home and foreign citizens in various financial claims. It shows the details of capital transfer e.g. investment grants, debt forgiveness, Echigreen (2001).

The financial account records transactions in financial assets and liabilities e.g. direct investment. Portfolio investment, reserve assets etc. affecting this account is the level of economic development of the economy, political risk, internationalization of the stock market, government deficit, external assets position, interest rate etc.

The Financing Component

This component shows how the government settles a deficit or uses a surplus.

Often, a surplus is used to increase external reserves, while a deficit is met by drawing down external reserves or borrow internationally.

From the foregoing analysis, we can write out a model for balance of payment in the form:

BOP =F (EXR, BDEF, SIG, FPC) …….. (1)

The linear and log linear versions of the equation in (1) above were tried. The choice of a version will finally be based on the goodness of fit and precision of the multiple regression coefficients.

Linear Version

$BOP = a_0+a_1 EXR+a_2BDEF+a_3SIG+a_4fpc+U$ …… (2)

Log-Linear Specification

$\log BOP=\log a_0+a_1\log EXR+a_2\log BDEF+$
$A_3\log SIG+ a_4\log FPC+ U$ ……..…… (3)

NOTATION (Application to the relation in (1) to (3) above)

BOP= Balance of payments

EXR= Exchange Rate

BDEF= Budget Deficits

SIG = saving-investment gap

FPC = Foreign private Capital

U = Error term

a_0 to a_4= coefficients of the respective independent variables

Variables of the model

Balance of Payment (BOP)

The international Monetary fund (IMF) defines balance of payments as the systematic record of all transactions carried out in a given period between a domestic economy and the rest of the world, caves and Jones (2012).

The balance of payments report consists of the following distinct account: the current account, the capital and financial account and the official international reserves.

Surplus or deficits on these accounts are economic concepts that are used to measure disequilibrium in the balance of payments. One place some items ‘above the line’ which are viewed as accommodating the surplus or deficits. Autonomous activities cause gap in the balance of payments while accommodating activities by monetary authorities fill the gap.

This study used the overall balance as a measure of balance of payments and represents the dependent variable or regress and in the model.

Exchange Rate (EXR)
This is price at which a country's currency is exchanged for the currency of another country.
If pressure is brought on the exchange rate, the balance of exchange weakens.

The regression coefficient will be positive $a_1>0$

Budget deficit (BDEF)
Budget deficit is a state where government expenditure is in excess of anticipated revenue. A country could be run on a commercial or political and military deficit but for which ever cause, it has to be financed by borrowing from the domestic banking system or through external liquid capital inflow, balance f payment is a positive function of budget deficit. Hence $a_2> 0$.

Saving-Investment Gap (SIG)
Saving is basically the excess of income over expenditure. All things being equal, domestic savings should be equal to domestic investment but in Nigeria, due to the low level of disposable income, savings. Arising from this, we observe a positive correlation between saving-investment gap and balance of payments. Hence $a_3>0$

Foreign Private Capital (FPC)
Foreign private investment is a source of off shore investment. It could be for purchase of securities and reoffered to as portfolio investment or direct investment, if it involves transfer of capital, technology or management. It could also be private or public. We have considered private foreign capital because its flow is based on economic principles of returns on investment. Since it is an inflow into a country's capital account the regression will be positive. Thus $a_4>0$

Empirical Results
The multiple regression analysis (MRA) was ran for both the linear and log linear versions of equation 1.

Linear Version
BOP = 264728.402 -11584 - 0.149 + 0.125 + 0.084
S.e = (523799.405) (11341.888) (1.473) (0.115) (0.026)

T*a's (0.505) (-1.021) (-0.101) (-1.090) (3.261)

$R_2 = (0.341)\ R^{-2}\ (0.221)$

F* = 2.846 DW= 2.637

Log Linear Version

BOP=1.83+ 1.901-1.326-0.094 +1.544

s.e (2.584) (0.592) (0.683) (0.391) (0.400)

t* a's (0.072) (3.327) (-1.941) (-0.241) (3.860)

R^2 =0.803, R^{-2} 0.767

F* = 22.44 DW =1.296

Our interpretation will be based on the linear version, based on its goodness of fit and precession of the regression result.

The coefficient of determination R_2= 0.803 shows that the model has an explanatory power of 80%. The implication of this statistic is that, the independent variable chosen were able to explain 80.3% of the variation in BOP while 19.7% of the variations were explained by other variables not considered in the model. All the regression coefficients appeared with correct sign except that of foreign private capital.

Test of Significance

The following two tests of significance, as stated in section three were undertaken:

(a) T-test, to determine whether or not estimated coefficients of the explanatory variables are significantly different from zero, and

(b) F-test, to determine the joint significance of the explanatory variables that is overall test of significance of the model.

Test of Overall Significance of the Model (F-Test)

The relationship between R^2 and the F*-ratio is expressed as

$$F^* = \frac{R^2 k=1}{(1-R^2)n-k}$$

Wh(f observations and k=number of variables

Note that f* and R^2 vary directly. This implies that if R^2 = 0, no relationship between the dependent variables, than f= 0.Hence the larger the value of R^2, the larger the of F and vice versa. The observed F* value is compared with the

theoretical F value (obtained from table with v_1= k-1 and v_2=n-k at the chosen level of significance.

The decision rule is:

(a) If F*> F0.05 reject the null hypothesis and accept the alternative hypothesis.
(b) If F* < F0.05, accept the null hypothesis and reject the alternative hypothesis..

Log linear version

F*=22.449

F0.05=3.01

F*>F0.05 implies accepting the alternative hypothesis.

Regression Results and the Hypothesis

The hypothesis guiding this study has been:

Null Hypothesis	Ho: a: = 0: There is no significant relationship, between balance of payments and budget deficit, foreign private capital, exchange rate, and saving/investment gap in Nigeria.
Alternative Hypothesis	H_A: a: = 0 there is significant relationship between balance of payments and budget deficit, foreign private capital, exchange rate, and saving/investment gap in Nigeria.

Based on the t-statistic only, exchange rate and the budget deficit and foreign private capital are significant while saving-investment gap is insignificant. And base on the F-ratio, the macroeconomic model is statistical significant at the 1% level of significance. Acceptance of the alternative hypothesis is required here.

Summary

The multiple regression analysis of the macromodel (equation) in section three threw up only the official exchange rate of the Naira to the dollar and the saving/investment gap as having impact on the balance of payments.
The non-significant variables were budget deficit and foreign private capital flow.

The country's high propensity for imports has great pressure on the exchange rate, which in turn caused current account deficit.

The significance of the saving/investment gap shows that, there exist high value of investment demands in the country and which may have been financed by offshore fund creating the debt overlong. Brazil between 1971 and 1980 had high investment profile which grew the gross external debt from $6 billion or 11% of GDP, to $55 billion or 22% of GDP. The United State for most years prior to 1980 hit a net foreign debt level of $2.9 billion or 21% GNP because it's national saving fell short of investment fund (Beare, 2010).

Conclusion

The log linear version of the macromodel used showed a reasonable high R^2 value, significance of two out of four of the explanatory variables and the overall significance of the model based on the F-ratio. Based on the foregoing, the general conclusion is that the model is significant in explaining variation in the country's balance of payment position.

Recommendations

The balance of payments deficits in Nigeria have become perennial and have persisted because the efforts of government to reverse the negative trend have not yielded the desired results.

It is the intended aim of the researcher to offer suggestions on how to steer the economy towards balance of payments equilibrium and growth.

Some of which include:

i. Government Intervention in the critical sectors like manufacturing should be intensified.
ii. Fiscal Policy programmes of the Government should be strengthened and more vigorously regulated. This implies that government should embrace Contractionary policy.
iii. Monetary policy instruments should be effectively deployed for stabilization of the economy.
iv. Proactive macroeconomic Management should be a sine qua-non to government policy formulators and implementers.
v. Aggressive Outward Orientation Strategy (o=o strategy) should be adopted as a stabilization tool for a robust economic growth. This means a situation of adopting "global scale" by making investments that will allow it to export or produce its products overseas through standardization and internationalization of its products.
vi. Reduction in Risk (such as Religious /Regional tension), will serve as a panacea towards economic growth and development.

vii. Government should intensify effort to increase fund and create an enabling environment for the organized private sector (OPS) to operate.

REFERENCES

Agiobenebo**,** T.J. & Onuchukwu**,** O., (2010); *An Econometric Study of public Investment Behavior in Nigeria (1980-1996),* Emhai printing and publishing Company, Port Harcourt.

Agugua A.E. (2004); *Element of econometric Theory, macroeonomic policy strategy karicel publishers, Owerri*

Akpakpan, E.B, (2011); *The Economy: Towards a new Type of Economics, Belpot* (Nigeria) Company, port Harcourt.

Anya, O.A., (2008); *Re-investing Nigeria for the 21st Century: politics, Science and Development in Nigeria up to 2014 AD*, Obafemi Awolowo Foundation, Lagos.

Barro.R.J. (2010); *Macroeconomics: Cycles, Growth and policy in a monetary Economy*, Macmillan Publishing Company, Inc.

Caves, R.E and Jones R.W.,(2012) *World Trade and payments: An Introduction*, Little, Brown and company, Canada.

Central Bank of *Nigeria, Major Economic, Financial and banking Indicator*, Abuja, 2011.

Das, D. C., (2006); *Korean Economic Dynamism,* Macmillan Academic and professional Limited, London.

Echigreen, B. (2001); Capital Account Liberalization: What do cross country sturdies tell us?; *The World Bank economic review*, vol.15, no.3 341-365,

Foster, J., (1987); *Evolutionary Macroeconomics*, Allen and limited Urwin London.

Garristem de Vries M., (2005); Balance of payments Adjustment (2000-2009): The *IMF Experience*, International Monetary Fund, Washington.

Gbosi A. N.,(2009); Principles of International Trade: *Theory and policy*, Isaeco Press and industries Limited, Aba.

Gbosi, A. N., (1993); *Money, Banking Economics and the Financial System*, Pamunique publishing Company Limited, Port Harcourt.

Jhingan, M.L.,(1998); *Money, Banking and International Trade*, Sthed Virnda Publications(p)Ltd, Delhi.

Jones, E. L., (1987); *The European Miracle*, Cambridge University Press, London.

Koutsoyyiannis A., (1990) *An Introduction* to Econometrics, Weidenfeld Nilcolson Lodon.

Manser, W.A.P.,(1971); *Britain in Balance*, Longman, London.

Agiobenebo, T.J & Onuchkwu, O. (2010*): An Econometric Study of Public Investment Behavior in Nigeria* (1980-1996), Enhai Printing and publishing Company, Port Harcourt.

APPENDIX

DATA Sav

	YEAR	LOGBOP	LOGEXR	LOGFPC	LOGSIG	LOGBOEF
1	1985	2.54	-0.17	3.82	4.45	5.41
2	1986	2.40	-0.14	3.94	4.55	5.46
3	1987	2.20	-0.11	4.00	4.59	5.47
4	1988	2.09	-0.05	4.05	4.60	5.51
5	1989	4.50	0.31	4.04	4.60	5.51
6	1990	3.90	0.60	4.02	4.60	5.58
7	1991	4.00	0.66	4.09	4.66	5.65
8	1992	4.23	0.87	4.31	4.85	5.86
9	1993	4.50	0.91	4.82	4.99	5.96
10	1994	4.30	1.00	4.85	5.02	6.02
11	1995	4.08	1.24	5.08	5.15	6.08
12	1996	3.07	1.35	5.09	5.31	6.02
13	1997	3.03	1.34	5.11	5.39	6.04
14	1998	3.56	1.34	5.18	5.38	6.08
15	1999	5.00	1.34	5.19	5.36	6.53
16	2000	5.50	1.34	5.20	5.52	6.60
17	2001	5.80	1.34	5.21	5.57	6.62
18	2002	5.90	1.93	6.22	5.70	6.71

19	2003	6.80	2.01	5.25	5.94	7.83
20	2004	6.05	1.04	5.40	5.94	7.83
21	2005	6.07	2.08	5.51	5.91	6.63
22	2006	6.90	2.11	5.68	6.19	6.50
23	2007	6.94	2.13	5.74	6.28	7.68
24	2008	6.30	2.11	5.77	6.31	6.45
25	2009	5.73	2.09	5.77	7.06	6.58
26	2010	5.55	2.07	5.78	7.15	6.72
27	2011	5.55	2.08	5.78	7.17	6.73

REGRESSION

MODEL TWO: LOG LINEAR

Variables Entered/ Removed

Model	Variables Entered	Variable Removed	Method
1	LOGBODEF, LOGEXR, LOGSIG, LOGFPC[a]		Enter

a. All required variables entered.

Model Summary[b]

Model	R	R square	Adjusted R Square	Std Error of the estimate
1	.896[a]	.803	.767	73440

a. Predictors: (constant), LOGBDEF, LOGEXR, LOGSIG, LOGFPC
b. Dependent variable: LOGBOP

Model Summary[b]

model	change statistics					
	R Change	F Change	Df1	Df2	Sig.F Change	Durbin Watson
1	.803	22.449	4	22	.000	1.295

Dependent Variable: LOGBOP

ANOVA[b]

Model	Sum of squares	Df	Mean Square	F	Sig
1Regression	48.431	4	12.108	22.449	.000[a]
Residual	11.865	22	.539		
Total	60.297	26			

a. Predators:(constant),LOGGBDEF,LOGEXR, LOGSIG, LOGFPC

a. Dependent variable: LOGBOP

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
1 (Constant)	B	Std. Error	Beta	t	Sig.
LOGEXR	-.185	2.584		-.072	.943
LOGFPC	1,901	.572	.968	3.860	.003
LOGSIG	-1.326	.683	-621	-1.941	.065
LOGBDEF	-.094	.391	-241	-.241	.811
	1.544	.400	.639	3.860	.001

a. Dependent Variable: LOGBOP

Coefficients[a]

Model	95.0% Confidence interval for B		Correlations		
	Lower bound	Upper bound	Zero-order	partial	Part
1 (Constant)	-5.173	5.173			
LOGEXR	.716	5.087	.817	579	.315
LOGFPC	-2.743	.091	.762	-.832	-.184
LOGSIG	-.906	.717	.733	-.051	-.023

LOGBDEF	.717	2.373	.818	.635	.365

a. Dependent Variable Log BOP

Coefficients[a]

Model	Dimension		Variance Proportions			
1	1	Eigen-value	Condition index	(Constant)	LOGEXR	LOGFPC
	2	4.807	1.000	.00	.00	.00
	3	.186	.00	.00	.12	.00
	4	.003	.03	.03	.09	.02
	5	.002	.56	.56	.13	.01
		.001	.42	.42	.65	.97

a. Dependent variable: LOGBOP

	Collinearity Statistic	
Model	Tolerance	VIF
1 LOGEXR,	.106	9.463
LOGSIG,	.087	11.463
LOGFPC[a]	.203	4.916
LOGB	.326	3.068

a. Dependent: LOGBOP

Collinearity Diagnostic[a]

Model	Dimension	Variance Proportions	
1	1	LOGSIG	LOGBDEF
	2	.00	.00
	3	.00	.00
	4	.95	.16
	5	.05	.67
		.00	.17

a. dependent variable: LOGBOP

Residual statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted value	2.3143	7.5050	4.6481	1.36482	27

Residual	-1.37473	1.28051	.00000	.67555	27

a. Dependent variable: LOGBOP

Residuals Statistics

	Medium	Maximum	Mean	Std. Deviation	N
Predicted value	-1.710	2.093	.000	1.000	27
Residual Std. Deviation	-1.872	1.744	.000	.920	27

a. Dependent: LOGBOP