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THE RELATIONSHIP BETWEEN EXTERNAL RESERVES AND ECONOMIC GROWTH IN NIGERIA (1980-2016)

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Abstract

The study examined the relationship between external reserve and economic growth in Nigeria from 1980 to 2016. The study used three explanatory variables (real gross domestic product, market capitalization and agricultural output) and one explained variable (external reserve). Test carried out include unit root test, co-integration test, ordinary least square and Granger causality test. The study revealed that: There is positive and significant relationship between external reserve and real gross domestic product in Nigeria; there is positive and significant relationship between external reserve and market capitalization in Nigeria; and there is negative and insignificant relationship between external reserve and agricultural output in Nigeria. Based on the findings, the study recommends that, Government should implement policies that will promote the level of real gross domestic product in Nigeria; government should ensure that our capital market is well capitalized and improve upon so as to enable boast the international reserves.

Keywords: External reserve, RGDP, market capitalization and agricultural output

INTRODUCTION

International reserves have expanded rapidly in recent years due to the felt benefits nations attached in holding adequate level of external reserves. Foreign reserve is the nation's external stock of assets. Nzotta (2014) sees foreign reserve as balances of foreign exchange surpluses of a country that accumulated over time. And these international reserves could be held in

foreign currencies and international financial assets. IMF (2000) described foreign reserves as official public foreign assets that are readily available to and controlled by the monetary authorities for direct financing of imbalances, and directly regulating the magnitude of such imbalances, through the intervention in the international markets to affect the currency exchange rate or for other purposes. According to Kashif, Sridharan and Thiyagarajan (2017), international reserves are the country's external assets that include gold, special drawing right, foreign currency deposits and bond by the apex banks and monetary authorities. Akaninyene (2016) implies that foreign reserves serves as a means of assisting the monetary and foreign exchange policies, among other several uses in order to meet the macroeconomic objectives in safeguarding the currency stability and to smoothen the normal functioning of the domestic and external payment system.

A proper management of international reserves could be a key to economic growth and development. Akinwunmi and Adekoya (2016) maintained that, no nation will allow its currency to float in the foreign exchange market without an adequate intervention. Several times, the monetary authorities in Nigeria have influenced the country's exchange rates by buying and selling currencies in order to manage the exchange rates. This is due to the fact that currency rates affect the economy through the trade balances which automatically determine the value and quality of exchange reserves holding of a country.

Over forty years, the Nigerian economy has been experiencing unfavorable exchange rate and fluctuating international reserves that are considered not adequate. Previous studies felt the level of external reserves in a country are influenced by external sector developments such as international trade transactions and other related issues, therefore do not consider domestic issues that could possibly influence the exchange rates and determine the position of international reserves. This study will concentrate on domestic factors that could influence the international reserves; particularly the causal relationship and fill the existing gap in literature and for policy implementation.

LITERATURE REVIEW

International exchange is a means of affecting payments for international transactions. When foreign expenditures are lower than foreign exchange incomes, the gain gives rise to foreign reserves. Nzota(2014) explained that foreign reserves represent balances of foreign exchange surpluses of a country that accumulated over time. Nneka (2012) opined that, foreign reserves of a country determines the country's rating in the global market and a good level international reserves will make a country appear financially responsible and credit worthy. Osuji and Ebiringa (2012) opined that, the purpose of holding foreign reserves is to allow the central bank

an additional means to stabilize the issued currencies from shocks. The precautionary theory explains this fact for holding foreign reserves to meet unforeseen contingencies. Awoderu, Ochalibe and Hephziba (2017) concur that, when applied to the concept of international reserves, it aids savings, investment and generate output for potential times of crises, especially balance of payment crises. Solow's model of economic growth is based on the premise that output in an economy is produced by a combination of labor (*L*) and capital (K), under constant returns, so that doubling input results in doubling output. Contemporary versions distinguish between physical and human capital. Thus, the quantity of output (*Y*) is also determined by the efficiency (A) with which capital and labor is used. Solow sees output as a whole, the only resource of the nation's economy. Its yearly rate of production is designated as $Y(_t)$ which represents the real income of the country, part of it is consumed and the rest is saved and reinvested. That which is saved is a constant s, and the rate of saving is $sY(_t)$. $K(_t)$ is the stock of capital. Thus net investment is the rate of increase of this stock of capital.

Therefore the basic identity K = sY since output is produced by capital and labor, technical possibilities are represented by the production function Y = f(K,L) (Jhingan 2005). It means increase in savings leads to investment and that leads to greater output in turn leads to higher external reserves. According to Fukuda and Kon (2007), when persistent increases of foreign reserves prevail, consumption declines because permanent income decline. But when increased international reserves are temporal, consumption does not decline because of the permanent income hypothesis. They emphasized that temporary increase of foreign exchange reserves could reduce domestic savings and have a negative impact on the domestic investment and economic growth.

EMPIRICAL REVIEW

Awoderu, Ochalibe and Hephziba (2017) ascertained the implications of long run relationship between external reserves and economic growth in Nigeria between 1980 and 2014. The study employed multiple regressions to measure real gross domestic product, external reserves, exchange rate, export and import. The results revealed among others that real gross domestic product and external reserves was positive and significantly related, also indicated a long run relationship. Evans and Egwakhe (2008) ascertained the relationship between external reserves and the Nigerian economy; the dual folded debate from 1994 to 2005 by using regression model, the result shows a positive but insignificant relationship between external reserves and exports. In another similar study carried out by Akinwunmi and Adekoya (2016), investigating the relationship between external reserves management and its effect on Nigeria economic growth, with external reserves, exchange rate, monetary policy rate, inflation rate, gross

domestic product and foreign direct investment from 1985 to 2013. With the aid of the multiple regressions, the results found a significant relationship among the variables. Gross domestic product, monetary policy rate and foreign direct investment were highly statistically significant, while inflation rate and exchange rate were statistically insignificant. Umeora (2013) investigated the influence of external reserves accumulation on exchange rate and inflation rate in Nigeria from 1986 to 2010. The regression result shows a negative and significant relationship between the explained variable and inflation rate. While the explained variable and exchange rate was found to be positive and significant. In using ordinary least square and Granger causality test, Wlliams (2016) from 1996 to 2015 measured external reserves, corruption index, exchange rate, real interest rate and gross domestic product in Nigeria. The study revealed unidirectional relationship between corruption and external reserves. Corruption and exchange rate were found to be positively related with external reserves.

In another development, Ngozi, Abdulkadir, Ismaila, Mohammed, Solomon, Bola and Michael (2016) with a threshold vector error correction model ascertained the relationship between exchange rate and external reserves in Nigeria from January 1, 2014 to July 31, 2015. The error correction coefficients for both the bureau de change exchange rate and external reserves equations were not statistically significant at the 5% significant level. Francis and ThankGod (2016) examined external reserve management and economic growth in Nigeria, using real gross domestic product as dependent variable while external reserve and exchange rate were used as independent variables. The ordinary least square result indicated a negative relationship between real gross domestic product and external reserve. Osuji and Ebiringa (2012) analyzed the effect of external reserves management on macroeconomic stability in Nigeria from 1980 to 2009. In using the var model and granger causality test, the tests pointed out that external reserves was significant in the current year but ends to converge in the previous years. The value of the joint significance indicated that the current values of gross domestic product, capital goods, non capital goods and exchange rate are most influencing factors that determine the current value. Udo and Antai (2014) examined the opportunity cost of Nigeria's external reserves from 1970 to 2011. In measuring external reserves, gross domestic product, private consumption, net international trade, government expenditure and domestic investment with greenspan-guidott and multiple regressions, the results show that external reserves negatively influenced the level of domestic economic productivity and investment. It was therefore recommended that, government should reduce the level of excess reserves and rather used it for investment in the domestic economy. Also from Usman and Ibrahim (2010) that examined external reserve holding in Nigeria; implications for investment, inflation and exchange rate from 1986 to 2006 by using ordinary least square and vector error correction

found that external reserves in the country only influences foreign direct investment and exchange rate but no influence on domestic investment and inflation rates.

Victoria, Emmanuel, Obinna, Esther and Akinde (2016) investigated the relationship between public debt and external reserves in Nigeria from 1981 to 2013. The results from fully modified ordinary least square method show that public debt has a positive and significant effect on external reserve shock. Akaninyene (2016) ascertained the long run relationship between foreign reserve accumulation and macroeconomic environment in Nigeria from 2004 to 2014 with the use of co-integration technique. In measuring gross domestic product, inflation rate, exchange rate, unemployment rate, investment, external debt, and foreign reserves, the results indicated the existence of a long run relationship between foreign reserves and the explanatory variables. Saheed, Sani and Idakwoji (2015) look at the impact of public extended debt on exchange rate in Nigeria from 1981 to 2013. With the aid of the ordinary least square method, the results found among others that foreign reserves proved to be positive and significantly related with exchange rate. Lugman and Adeola (2016) also look at the effect of external reserves and balance of payment changes on economic growth in Nigeria between 1970 and 2011. Gross domestic product, exchange rate and inflation rate were used as explanatory variables while external reserves and balance of payment were used as explained variables. The ordinary least square result revealed a positive and significant relationship between external reserves and gross domestic product for the period. In a wider coverage, Alasan and Shaib (2011) examined the relationship between external reserves management and economic development in Nigeria from 1980 to 2008. The study employed ordinary least square to measure external reserves, gross domestic product, oil export, non oil export, non oil import, capital good, non capital good and political stability. External reserve was found to be positive and significantly related with gross domestic product, oil export and capital goods. External reserve was found to be negatively related with non oil export, non capital goods, non import and political stability. In conclusion external reserve was found to be negatively related with macroeconomic stability.

In foreign experience, Kashif, Sridharan and Thiyagarajan (2017) used error correction mechanism to examined impact of economic growth on international reserve holding in Brazil from 1980 to 2014. Real gross domestic product was used as explained variable while external reserve was used as independent variable. The results revealed that economic growth was highly significant; that economic growth and international reserves indicated positive long run relationship. Borivoje and Tina (2015) empirically analyzed the impact of foreign exchange reserves on economic growth in emerging economies from 1993 to 2012. With the use of ONK method, the results show that an increase in foreign exchange reserves caused the growth of

gross domestic product in Brazil, China and Russia. Isaac (2014) investigated the relationship between international reserves accumulation and economic growth in the West African monetary zone. Lowess technique was used to measure foreign reserves, civil liberty, political rights, labor force, remittances, financial development and foreign direct investment. The outcome indicated a U-shaped relationship between economic growth and international reserves. Emmanuel and Moses (2016) investigated foreign exchange reserve and its impact on stock market in Ghana between 2001 and 2015 with the aid of regression and granger causality test methods. The results show a significant positive impact on stock market capitalization and also indicated a causal relationship among the variables. Kashif and Sridharan (2015) look at the Indian experience on the subject and measured external reserves and gross domestic product between 1993 and 2013. The ordinary least square results show that international reserve was found positive and significantly related with gross domestic product. Kashif, Sridharan and Thiyagarajan (2016) look at the Chinese experience and empirically analyzed the international reserves demand function by measuring real gross domestic product, import, real effective exchange rate, trade openness and international reserves from 1985 to 2014. The ordinary least square and co-integration results indicated a long run relationship among the variables and found a positive significant relationship among the variables. Kashif (2016) also look at the Algerian economy by using Granger causality test and measured international reserves and real gross domestic product from 1985 to 2014. Bidirectional causality between the international reserves and economic growth was noticed. Sarbapriya (2012) concentrated on stock market capitalization and international reserves in India from 1990 to 2010. With the use of Granger causality test, the results show that causality was unidirectional and it runs from foreign exchange reserves to stock market capitalization.

Summary

The debate on the subject is still on as scholarly consensus having not been reached. Close scrutiny of the reviewed papers indicated different results and conclusion on the subject. Awoderu, Ochalibe and Hephziba (2017), Victoria, Emmanuel, Obinna, Esther and Akinnde (2008), Kashif, Sridharan and Thiyagarajan (2017), Saheed, Sani and Idakwoji (2015), Emmanuel and Moses (2016), Lugman and Adeola (2016), and Kashif and Sridharan (2015) found a positive significant relationship between external reserves and economic growth, Udo and Antai (2014), Isaac (2014), found a negative relationship between external reserve and economic growth, etc. Majority of the reviewed studies felt the level of external reserves in a country are influenced by external sector developments such as international trade transactions and other related sectors, therefore do not consider domestic issues that could possibly

influence the exchange rates and determine the position of international reserves. Though Victoria and Ibrahim (2016), Alasan and Shaib (2011) and Udo and Antai (2014) covered some of such domestic sectors but did not include agricultural output and market capitalization. This study will concentrate on domestic factors that could influence the international reserves and fill the existing gap in literature and for policy implementation.

METHODOLOGY

Research design

The study adopted an ex-post facto research design which is a form of descriptive research in which investigator starts with the observation of the explained variable then studies the explanatory variable in retrospect for possible relationship and effects on the dependent variable.

Data collection method

This study collected data from secondary sources. Secondary data were collected from the central bank of Nigeria and as well as journal publications with the scope of 1980 to 2016.

Model specification

In order to achieve the objectives of this work, a linear regression model was formulated and the Granger causality tests were conducted on the formulated model. The model is stated as follows:

ER = f(RGDP, MCAP, AGR) (I)

This equation can be transformed into a linear function thus:

$ER = \gamma_0 + \gamma_1 RGDP + \gamma_2 MCAP + \gamma_3 AGR + \varepsilon$ (2)

where;

ER = External reserves

RGDP= Real gross domestic product

MCAP= Market capitalization

AGR= Agricultural output

γ_0 = the constant

γ_1- γ_3 = the coefficients of the explanatory variables

ε = Error term

Estimation Methods

Different econometric analysis tools have been employed in this study to analyze the relationship between external reserves and economic growth in Nigeria.

Descriptive statistic

The study employed descriptive statistics for the calculation of mean, median, mode, frequencies, variances and standard deviations.

Linear regression

The linear regression is an econometric technique which correlates the changes in the variables to other variables. Regression analysis is used to show the accuracy and appropriateness of model and how much independent variable influence on the dependent variable in the current study.

Correlation analysis

This shows the direction of the relation. The signs – or + will show whether the relationship is in positive direction or in the negative direction.

Unit root test

This test is a pre test that shows the stationarity or otherwise of the variables specified and a yardstick for chosen further investigation approaches. The essence is to determine the nonstationary property of each variable. We must test each of the series in the levels. All variables will be tested in levels using the Augmented Dickey-Fuller (ADF).

Co-integration

The co-integration test is conducted to look at the long run linear relationship using the Johansen co-integrating model, and find out if there is a possibility of an existence of a co-integrating relationship among the variables.

Error Correction Mechanism

The reason for error correction mechanism is to measure the speed of adjustment of the dependent variables to the changes in the independent variables on the short run and to their equilibrium levels. This study expects a negative coefficient as a sign, suggesting an automatic adjustment mechanism and that the capital formation responds to deviations from equilibrium in a balancing manner.

ANALYSIS AND FINDINGS

Data presentation

It shows the variables used for this study on yearly basis from 1980 to 2016. ER represents external reserves, RGDP represents real gross domestic product, MCAP represents market capitalization and AGR represent agricultural output. Data is in the appendix.

Descriptive Statistics

Table 1. Descriptive Statistics

	ER	RGDP	MCAP	AGR
Mean	16422.08	30972.22	4007.191	5083.271
Median	7415.000	22332.87	285.8000	1341.040
Maximum	53599.00	69023.93	19077.40	21523.51
Minimum	933.0000	2244.410	4.460000	10.01000
Std. Dev.	17941.94	18537.92	6177.604	6675.873
Skewness	0.860951	0.813939	1.291866	1.135292
Kurtosis	2.131913	2.382087	3.111188	2.902714
Jarque-Bera	5.732723	4.674028	10.31072	7.962738
Probability	0.056906	0.096616	0.005768	0.018660
Sum	607617.0	1145972.	148266.1	188081.0
Sum Sq. Dev.	1.16E+10	1.24E+10	1.37E+09	1.60E+09
Observations	37	37	37	37

The descriptive statistics on table 1 shows that external reserve (ER) has a mean value of 16422.08, while the maximum and minimum values are 53599 and 933 respectively. Real gross domestic product (RGDP) has a mean value of 30972.22, while the maximum and minimum values are 69023.93 and 2244.41 respectively. Market capitalization (MCAP) has a mean value of 4007.191, while the maximum and minimum values are 19077.40 and 4.46 respectively. Agriculturral output (AGR) has a mean value of 5083.271, while the maximum and minimum values are 21523.51 and 10.01 respectively.

The Jarque-Bera statistic indicated that real gross domestic product (RGDP) and external reserve are normally distributed with the p-value (RGDP = 0.10), (ER =0.06), while market capitalization (MCAP = 0.01), and agricultural output (AGR = 0.02).

Correlation matrix

Table 2. Correlation Output

	ER	RGDP	MCAP	AGR
ER	1	0.8570	0.8522	0.8334
RGDP	0.8570	1	0.9385	0.9757
MCAP	0.8522	0.9385	1	0.9592
AGR	0.8334	0.9757	0.9592	1

The correlation matrix on table 2 shows the correlation among the variables. ER is shown to have a strong positive correlation of 0.8570 with RGDP, strong positive correlation of 0.8522 with MCAP and strong positive correlation of 0.8334 with AGR. RGDP has a positive strong correlation of 0.8570 with ER, a strong positive correlation of 0.9385 with MCAP and a strong positive correlation of 0.9757 with AGR. MCAP has a strong positive correlation of 0.8522 with ER, a strong positive correlation of 0.9385 with RGDP and a strong positive correlation of 0.9592 with AGR. AGR is shown to have a strong positive correlation of 0.8334 with ER, a strong positive correlation of 0.9757 with RGDP and strong positive correlation of 0.9592 with MCAP.

Augumented Dicky-Fuller Unit Root Test

Table 3. Augmented Dickey-Fuller Unit Root test results

Variable	ADF value	Critical Values			Conclusion
		1%	5%	10%	
ER	-4.947583	-4.252879	-3.548490	-3.207094	Stationary @ 1st dif.
RGDP	-9.091193	-4.243644	-3.544284	-3.204699	Stationary @ Ist dif.
MCAP	-6.082384	-4.273277	-3.557759	-3.212361	Stationary @ 1st dif.
AGR	-5.038311	-4.252879	-3.548490	-3.207094	Stationary @ 1st dif.

Source: Extracted from Unit Root Test Result (Appendix)

The Augmented Dickey-Fuller Unit Root test result as summarized above shows that all the variables are stationary at first difference.

Johansen Co-integration

Table 4. Johansen Co-integration test results

Date: 04/05/18 Time: 06:40
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments
Trend assumption: Linear deterministic trend
Series: ER RGDP MCAP AGR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.709021	79.42583	47.85613	0.0000
At most 1 *	0.464511	36.21812	29.79707	0.0079
At most 2	0.329742	14.35800	15.49471	0.0736
At most 3	0.010085	0.354759	3.841466	0.5514

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.709021	43.20770	27.58434	0.0002
At most 1 *	0.464511	21.86013	21.13162	0.0395
At most 2	0.329742	14.00324	14.26460	0.0549
At most 3	0.010085	0.354759	3.841466	0.5514

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

ER	RGDP	MCAP	AGR
1.00E-05	-4.06E-05	0.000711	-0.000651
-2.87E-05	-0.000234	-8.79E-05	0.000591
8.37E-05	-0.000312	-0.000234	0.001018
-0.000123	-7.83E-05	0.000336	0.000288

Unrestricted Adjustment Coefficients (alpha):

D(ER)	-3204.038	512.8518	-292.4422	183.7083
D(RGDP)	-72.57321	925.0771	2398.437	153.6530
D(MCAP)	-1098.002	53.97382	168.9951	-107.5323
D(AGR)	-37.34610	-331.4623	116.6216	14.81044

1 Cointegrating Equation(s): Log likelihood -1243.233

Normalized cointegrating coefficients (standard error in parentheses)

ER	RGDP	MCAP	AGR
1.000000	-4.045516	70.91608	-64.92290
	(4.67537)	(8.93261)	(16.1941)

Adjustment coefficients (standard error in parentheses)

D(ER)	-0.032120
	(0.00539)
D(RGDP)	-0.000728
	(0.00866)
D(MCAP)	-0.011007
	(0.00245)
D(AGR)	-0.000374
	(0.00102)

2 Cointegrating Equation(s): Log likelihood -1232.303

Normalized cointegrating coefficients (standard error in parentheses)

ER	RGDP	MCAP	AGR
1.000000	0.000000	48.39451	-50.19621
		(6.20547)	(6.46929)
0.000000	1.000000	-5.567044	3.640251
		(0.84763)	(0.88367)

Adjustment coefficients (standard error in parentheses)

D(ER)	-0.046860	0.009901
	(0.01611)	(0.12572)
D(RGDP)	-0.027316	-0.213583
	(0.02576)	(0.20106)
D(MCAP)	-0.012559	0.031897
	(0.00744)	(0.05804)
D(AGR)	0.009153	0.079098
	(0.00247)	(0.01924)

3 Cointegrating Equation(s): Log likelihood -1225.301

Normalized cointegrating coefficients (standard error in parentheses)			
ER	RGDP	MCAP	AGR
1.000000	0.000000	0.000000	0.891619
			(0.82515)
0.000000	1.000000	0.000000	-2.236618
			(0.17247)
0.000000	0.000000	1.000000	-1.055653
			(0.04506)
Adjustment coefficients (standard error in parentheses)			
D(ER)	-0.071330	0.101003	-2.254553
	(0.04687)	(0.20623)	(0.39665)
D(RGDP)	0.173371	-0.960745	-0.693381
	(0.06408)	(0.28196)	(0.54231)
D(MCAP)	0.001582	-0.020749	-0.824823
	(0.02158)	(0.09493)	(0.18258)
D(AGR)	0.018911	0.042768	-0.024662
	(0.00695)	(0.03057)	(0.05880)

Both trace test and Maximum Eigenvalue test indicated two co-integrating equation existing between the dependent and independent variables. This reveals that there is a long-run equilibrium relationship between the dependent and independent variables.

Regression estimation

Table 5. Regression output

Dependent Variable: D(ER)
Method: Least Squares
Date: 04/05/18 Time: 07:24 Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	680.2572	922.7893	0.737175	0.4667
D(RGDP)	0.156780	0.135647	1.155793	0.0256
D(MCAP)	0.197894	0.367038	2.667160	0.0122
D(AGR)	-0.379763	1.080158	-1.277371	0.2113
ECM(1)	-0.312603	0.083084	-3.762476	0.0007

R-squared	0.480706	Mean dependent var	591.2857
Adjusted R-squared	0.411467	S.D. dependent var	5476.073
S.E. of regression	4201.020	Akaike info criterion	19.65561
Sum squared resid	5.29E+08	Schwarz criterion	19.87780
Log likelihood	-338.9731	Hannan-Quinn criter.	19.73231
F-statistic	6.942683	Durbin-Watson stat	1.715805
Prob(F-statistic)	0.000442		

The result above shows that, RGDP has a coefficient of 0.16 meaning that one percentage change in real gross domestic product leads to 16 percent change in external reserves in the positive direction in Nigeria. This indicates that there is a high response of external reserves to changes in real gross domestic product in the positive direction, and this is statistically significant at 5% level.

The result above shows that, MCAP has a coefficient of 0.20 meaning that one percentage change in market capitalization leads to 20 percent change in external reserves in the positive direction in Nigeria. This indicates that there is a high response of external reserves to changes in market capitalization in the positive direction, and this is also statistically significant at 5% level.

The result above shows that, AGR has a coefficient of 0.38 meaning that one percentage change in agricultural output leads to 38 percent change in external reserves in the negative direction in Nigeria. This indicates that there is a high response of external reserves to changes in agricultural output in the negative direction, and this is statistically insignificant at 5% level.

The results further show that r-squared is 0.48 while adjusted r-squared is 0.41 indicating that 41 percent of changes in external reserves is attributable to the combined effect of real gross domestic product, market capitalization and agricultural output in Nigeria.

Overall, the results show that F-statistic is 6.942683 with a probability of 0.000442 indicating that the combined impact of the explanatory variables on the explained variable is statistically significant.

Furthermore, Error Correction Co-efficient is appropriately signed with a value of -0.31 with a probability of 0.0007, which is significant at 5% level of significance. It indicates that the model has a 31 percent speed of adjustment from equilibrium position on the long run.

Granger Causality Test

Table 6. Granger Causality test result

Null Hypothesis:	Obs	F-Statistic	Prob.
RGDP does not Granger Cause ER	35	2.76450	0.0541
ER does not Granger Cause RGDP		1.57326	0.2240
MCAP does not Granger Cause ER	35	0.05573	0.0459
ER does not Granger Cause MCAP		4.30786	0.0227
AGR does not Granger Cause ER	35	1.96532	0.1577
ER does not Granger Cause AGR		2.16668	0.1322

The result above indicated a unidirectional causation running from real gross domestic product to Nigeria's external reserves; also a bidirectional relationship running between market capitalization and external reserves but indicated non causation between Agricultural output and external reserves.

DISCUSSION AND SUMMARY OF RESULTS

The relationship between real gross domestic product and external reserve is found to be positive; also the relationship between market capitalization and external reserve is found to be positive while the relationship between agricultural output and external reserve is found to be negative.

Generally, our model suggests a significant relationship between real gross domestic product, market capitalization, agricultural output and external reserves using the f-statistics. The coefficient of determination (R^2) 41% Meaning 41% change in external reserves is influenced by the predictor variables while the remaining 59% is explained by other variables not captured in the model. The result also indicated a unidirectional causation running from real gross domestic product to Nigeria's external reserves; also a bidirectional relationship running between market capitalization and external reserves but indicated non causation between Agricultural output and external reserves.

The findings of this study concur with that of Kashif, Sridharan and Thiyagarajan (2017), Awoderu, Ochalibe and Hephziba (2017), Kashif and Sridharan (2015), Lugman and Adeola (2016), that real gross domestic product and international reserves are positive and significantly related. It is also line with the findings of Emmanuel and Moses (2016) that international reserves and stock market capitalization are positive and significantly related.

To summarized, the research work investigated the relationship between external reserve and economic growth in Nigeria from 1980 to 2016. The following were the findings:

1. There is a positive and significant relationship between external reserve and real gross domestic product in Nigeria.
2. There is a positive and significant relationship between external reserve and market capitalization in Nigeria.
3. There is a negative and insignificant relationship between external reserve and agricultural output in Nigeria.

CONCLUSION

Nigeria is currently facing economic challenges such as high unemployment rate, high inflation rate, unstable exchange rate, etc. This has led to government initiative of different measures

with the purpose of solving these challenges. The rationales for holding external reserves are enormous. These include: to maintain favorable exchange rate, to safeguard the value of the domestic currency, timely meeting of international obligations, to boast the country's credit worthiness, to provide a fall back for the rainy days, to provide a buffer against external shocks, etc. Anything that can contribute to external reserve improvement in this case should be revealed and encouraged. This called for more empirical evidence in providing more understanding of the pattern of economic growth in Nigeria. This motivates the study to examine the relationship between external reserve and economic growth in Nigeria from 1980 to 2016. The variables used in the study include real gross domestic product (RGDP), market capitalization (MCAP) and agricultural output (AGR) as explanatory variables, while external reserve (ER) was used as explained variable. The relationship between external reserve and real gross domestic product is found to be positive and significant. It means if real gross domestic product is increasing, external reserve will also increase. Also the relationship between market capitalization and external reserve is found to be positive and significant. Meaning if market capitalization improves, it will lead to increase in external reserve.

This empirical finding followed fairly close to what economic theory will have suggested. Whenever domestic economic activities improve, it leads to more savings, investments, employments and greater output which will in turn leads to more exports which lead to an increase of international reserve. The results suggest that for a significant increase in external reserve, the focus of policy and strategy should be on measures to increase real gross domestic product and market capitalization.

RECOMMENDATIONS

Based on the findings of the study, we therefore recommend the following;

- There is need for government to restore investor confidence, so as to attain well functioning capital market. Capital market cannot flourish without investors. This is because capital markets thrive on investor interest in the investment opportunities that the markets have to offer. Increase the depth, breadth and sophistication of the market. Improve efficiency and competitiveness in all aspects of the market. Disclosure, transparency and accountability in the capital market. These will boast the capital market operations and will in turn aid improve the nation's external reserves.
- Since real gross domestic products enhances and increase the level of external reserves position of a country, government is therefore encouraged to implement policies that will promote the level of real gross domestic product in Nigeria, so as to increase the level of the nation's external reserves.

SUGGESTIONS FOR FURTHER STUDIES

The study looked at the relationship between external reserve and economic growth in Nigeria from 1980 to 2016. The variables used in the study include real gross domestic product (RGDP), market capitalization (MCAP) and agricultural output (AGR) as explanatory variables, while external reserve (ER) was used as explained variable, using descriptive statistics and normality test, regression analysis, ADF unit root tests, Johansen co-integration, error correction model and causality test. Further studies could increase the time bound (scope) or employ other economic growth indicators as dependent variables, or still, utilize other statistical techniques. This will enable comparison and increase reliance on and robustness of the results of this study. This will also confirm the validity of the findings of this study, since different methods, variables and time horizons will be used. It will also widen the body of existing literature on the subject matter. Also, further study should be conducted on the determinants of external reserves in Nigeria.

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APPENDIX

ADF @ level AGR

Null Hypothesis: AGR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.085041	0.9999
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(AGR)
Method: Least Squares

Date: 04/05/18 Time: 06:16
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGR(-1)	0.028211	0.026000	1.085041	0.2858
C	-266.5455	199.5415	-1.335789	0.1908
@TREND(1980)	39.65515	15.19349	2.610010	0.0135

R-squared	0.631483	Mean dependent var	597.5972
Adjusted R-squared	0.609149	S.D. dependent var	725.2286
S.E. of regression	453.3989	Akaike info criterion	15.15108
Sum squared resid	6783829.	Schwarz criterion	15.28304
Log likelihood	-269.7194	Hannan-Quinn criter.	15.19713
F-statistic	28.27411	Durbin-Watson stat	1.964131
Prob(F-statistic)	0.000000		

ADF @ 1st Dif. AGR

Null Hypothesis: D(AGR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.038311	0.0014
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(AGR,2)
Method: Least Squares
Date: 04/05/18 Time: 06:19
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGR(-1))	-1.213163	0.240788	-5.038311	0.0000
D(AGR(-1),2)	0.270638	0.174324	1.552499	0.1310
C	-594.4383	208.5782	-2.849954	0.0078
@TREND(1980)	68.56779	15.02507	4.563560	0.0001

R-squared	0.519221	Mean dependent var	55.39618
Adjusted R-squared	0.471143	S.D. dependent var	627.1467
S.E. of regression	456.0773	Akaike info criterion	15.19333

Sum squared resid	6240194.	Schwarz criterion	15.37290
Log likelihood	-254.2867	Hannan-Quinn criter.	15.25457
F-statistic	10.79956	Durbin-Watson stat	1.944209
Prob(F-statistic)	0.000056		

ADF @ level MCAP

Null Hypothesis: MCAP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 9 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.511460	1.0000
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MCAP)
Method: Least Squares
Date: 04/05/18 Time: 06:21
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MCAP(-1)	19.28411	5.491765	3.511460	0.0031
D(MCAP(-1))	-19.81728	5.565255	-3.560893	0.0028
D(MCAP(-2))	-19.99493	5.512240	-3.627369	0.0025
D(MCAP(-3))	-19.73936	5.567719	-3.545322	0.0029
D(MCAP(-4))	-20.54325	5.668627	-3.624027	0.0025
D(MCAP(-5))	-19.38075	5.530238	-3.504506	0.0032
D(MCAP(-6))	-19.86154	5.690953	-3.490020	0.0033
D(MCAP(-7))	-21.48414	6.150457	-3.493096	0.0033
D(MCAP(-8))	-23.22723	6.622667	-3.507232	0.0032
D(MCAP(-9))	-33.27406	9.392125	-3.542761	0.0030
C	-1278.317	1589.228	-0.804363	0.4338
@TREND(1980)	88.17056	91.04012	0.968480	0.3482

R-squared	0.747183	Mean dependent var	598.9963
Adjusted R-squared	0.561783	S.D. dependent var	2319.621
S.E. of regression	1535.541	Akaike info criterion	17.81226
Sum squared resid	35368314	Schwarz criterion	18.38818
Log likelihood	-228.4655	Hannan-Quinn criter.	17.98351
F-statistic	4.030126	Durbin-Watson stat	2.884344
Prob(F-statistic)	0.007017		

ADF @ 1st dif. MCAP

Null Hypothesis: D(MCAP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.082384	0.0001
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MCAP,2)
Method: Least Squares
Date: 04/05/18
Time: 06:22
Sample (adjusted): 1985 2016
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MCAP(-1))	-2.735086	0.449673	-6.082384	0.0000
D(MCAP(-1),2)	1.540179	0.372051	4.139697	0.0003
D(MCAP(-2),2)	0.931999	0.269077	3.463683	0.0019
D(MCAP(-3),2)	0.710104	0.177140	4.008712	0.0005
C	-1710.454	810.9470	-2.109206	0.0447
@TREND(1980)	151.2604	43.49209	3.477883	0.0018

R-squared	0.744113	Mean dependent var	-25.54688
Adjusted R-squared	0.694904	S.D. dependent var	3064.651
S.E. of regression	1692.775	Akaike info criterion	17.87349
Sum squared resid	74502629	Schwarz criterion	18.14831
Log likelihood	-279.9758	Hannan-Quinn criter.	17.96458
F-statistic	15.12149	Durbin-Watson stat	1.957386
Prob(F-statistic)	0.000001		

ADF @ level RGDP

Null Hypothesis: RGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.450226	0.3493
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGDP)
Method: Least Squares
Date: 04/05/18 Time: 06:23
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	-0.234083	0.095535	-2.450226	0.0197
C	-615.7132	1703.481	-0.361444	0.7201
@TREND(1980)	479.7629	160.5185	2.988832	0.0053

R-squared	0.214748	Mean dependent var	1250.146
Adjusted R-squared	0.167157	S.D. dependent var	5410.057
S.E. of regression	4937.231	Akaike info criterion	19.92665
Sum squared resid	8.04E+08	Schwarz criterion	20.05861
Log likelihood	-355.6797	Hannan-Quinn criter.	19.97271
F-statistic	4.512354	Durbin-Watson stat	2.556823
Prob(F-statistic)	0.018520		

ADF @ 1st dif. RGDP

Null Hypothesis: D(RGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.091193	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGDP,2)
Method: Least Squares
Date: 04/05/18 Time: 06:24
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1))	-1.429716	0.157264	-9.091193	0.0000
C	-1241.203	1744.881	-0.711340	0.4820
@TREND(1980)	174.3224	84.00991	2.075022	0.0461

R-squared	0.722108	Mean dependent var	187.8660
Adjusted R-squared	0.704740	S.D. dependent var	8804.618
S.E. of regression	4784.242	Akaike info criterion	19.86586
Sum squared resid	7.32E+08	Schwarz criterion	19.99917
Log likelihood	-344.6525	Hannan-Quinn criter.	19.91188
F-statistic	41.57630	Durbin-Watson stat	2.157683
Prob(F-statistic)	0.000000		

ADF @ level ER

Null Hypothesis: ER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.028077	0.5656
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ER)
Method: Least Squares
Date: 04/05/18 Time: 06:25
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER(-1)	-0.151417	0.074660	-2.028077	0.0518
D(ER(-1))	0.844129	0.144910	5.825210	0.0000
D(ER(-2))	-0.439683	0.158837	-2.768134	0.0097

C	-1916.339	1754.591	-1.092186	0.2837
@TREND(1980)	252.4140	129.9309	1.942679	0.0618

R-squared	0.570682	Mean dependent var	826.5882
Adjusted R-squared	0.511465	S.D. dependent var	5403.072
S.E. of regression	3776.490	Akaike info criterion	19.44603
Sum squared resid	4.14E+08	Schwarz criterion	19.67050
Log likelihood	-325.5825	Hannan-Quinn criter.	19.52258
F-statistic	9.637239	Durbin-Watson stat	1.804812
Prob(F-statistic)	0.000044		

ADF @ 1st dif. ER

Null Hypothesis: D(ER) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.947583	0.0017
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ER,2)
Method: Least Squares
Date: 04/05/18 Time: 06:26
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ER(-1))	-0.722023	0.145934	-4.947583	0.0000
D(ER(-1),2)	0.563949	0.153959	3.662978	0.0010
C	77.04608	1526.998	0.050456	0.9601
@TREND(1980)	26.78529	70.51515	0.379852	0.7067

R-squared	0.470963	Mean dependent var	27.58824
Adjusted R-squared	0.418059	S.D. dependent var	5201.015
S.E. of regression	3967.598	Akaike info criterion	19.51984
Sum squared resid	4.72E+08	Schwarz criterion	19.69941
Log likelihood	-327.8373	Hannan-Quinn criter.	19.58108
F-statistic	8.902257	Durbin-Watson stat	1.816169
Prob(F-statistic)	0.000226		

ADF @ level ECM

Null Hypothesis: ECM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.060613	0.0014
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECM)
Method: Least Squares
Date: 04/05/18 Time: 06:32
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.918240	0.181448	-5.060613	0.0000
C	387.5649	1588.726	0.243947	0.8089
@TREND(1980)	-15.70886	71.74087	-0.218967	0.8282

R-squared	0.461864	Mean dependent var	15.02551
Adjusted R-squared	0.425988	S.D. dependent var	5177.135
S.E. of regression	3922.384	Akaike info criterion	19.47329
Sum squared resid	4.62E+08	Schwarz criterion	19.60934
Log likelihood	-318.3094	Hannan-Quinn criter.	19.51907
F-statistic	12.87397	Durbin-Watson stat	1.984207
Prob(F-statistic)	0.000092		

Descriptive Statistics

	ER	RGDP	MCAP	AGR
Mean	16422.08	30972.22	4007.191	5083.271
Median	7415.000	22332.87	285.8000	1341.040
Maximum	53599.00	69023.93	19077.40	21523.51
Minimum	933.0000	2244.410	4.460000	10.01000
Std. Dev.	17941.94	18537.92	6177.604	6675.873
Skewness	0.860951	0.813939	1.291866	1.135292
Kurtosis	2.131913	2.382087	3.111188	2.902714
Jarque-Bera	5.732723	4.674028	10.31072	7.962738
Probability	0.056906	0.096616	0.005768	0.018660

Sum	607617.0	1145972.	148266.1	188081.0
Sum Sq. Dev.	1.16E+10	1.24E+10	1.37E+09	1.60E+09
Observations	37	37	37	37

Correlation Analysis

	ER	RGDP	MCAP	AGR
ER	1	0.8570460912959594	0.8521758134061456	0.8333916307916803
RGDP	0.8570460912959594	1	0.9385478147790476	0.9757353198 6496
MCAP	0.8521758134061456	0.9385478147790476	1	0.9592051540037441
AGR	0.8333916307916803	0.9757353198 6496	0.9592051540037441	1

Johansen Co-integration

Date: 04/05/18 Time: 06:40
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments
Trend assumption: Linear deterministic trend
Series: ER RGDP MCAP AGR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.709021	79.42583	47.85613	0.0000
At most 1 *	0.464511	36.21812	29.79707	0.0079
At most 2	0.329742	14.35800	15.49471	0.0736
At most 3	0.010085	0.354759	3.841466	0.5514

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.709021	43.20770	27.58434	0.0002
At most 1 *	0.464511	21.86013	21.13162	0.0395

At most 2	0.329742	14.00324	14.26460	0.0549
At most 3	0.010085	0.354759	3.841466	0.5514

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

ER	RGDP	MCAP	AGR
1.00E-05	-4.06E-05	0.000711	-0.000651
-2.87E-05	-0.000234	-8.79E-05	0.000591
8.37E-05	-0.000312	-0.000234	0.001018
-0.000123	-7.83E-05	0.000336	0.000288

Unrestricted Adjustment Coefficients (alpha):

D(ER)	-3204.038	512.8518	-292.4422	183.7083
D(RGDP)	-72.57321	925.0771	2398.437	153.6530
D(MCAP)	-1098.002	53.97382	168.9951	-107.5323
D(AGR)	-37.34610	-331.4623	116.6216	14.81044

1 Cointegrating Equation(s): Log likelihood -1243.233

Normalized cointegrating coefficients (standard error in parentheses)

ER	RGDP	MCAP	AGR
1.000000	-4.045516	70.91608	-64.92290
	(4.67537)	(8.93261)	(16.1941)

Adjustment coefficients (standard error in parentheses)

D(ER)	-0.032120
	(0.00539)
D(RGDP)	-0.000728
	(0.00866)
D(MCAP)	-0.011007
	(0.00245)
D(AGR)	-0.000374
	(0.00102)

2 Cointegrating Equation(s): Log likelihood -1232.303

Normalized cointegrating coefficients (standard error in parentheses)

ER	RGDP	MCAP	AGR
1.000000	0.000000	48.39451	-50.19621
		(6.20547)	(6.46929)
0.000000	1.000000	-5.567044	3.640251
		(0.84763)	(0.88367)

Adjustment coefficients (standard error in parentheses)

D(ER)	-0.046860	0.009901
	(0.01611)	(0.12572)
D(RGDP)	-0.027316	-0.213583
	(0.02576)	(0.20106)
D(MCAP)	-0.012559	0.031897
	(0.00744)	(0.05804)
D(AGR)	0.009153	0.079098
	(0.00247)	(0.01924)

3 Cointegrating Equation(s): Log likelihood -1225.301

Normalized cointegrating coefficients (standard error in parentheses)

ER	RGDP	MCAP	AGR
1.000000	0.000000	0.000000	0.891619
			(0.82515)
0.000000	1.000000	0.000000	-2.236618
			(0.17247)
0.000000	0.000000	1.000000	-1.055653
			(0.04506)

Adjustment coefficients (standard error in parentheses)

D(ER)	-0.071330	0.101003	-2.254553
	(0.04687)	(0.20623)	(0.39665)
D(RGDP)	0.173371	-0.960745	-0.693381
	(0.06408)	(0.28196)	(0.54231)
D(MCAP)	0.001582	-0.020749	-0.824823
	(0.02158)	(0.09493)	(0.18258)
D(AGR)	0.018911	0.042768	-0.024662
	(0.00695)	(0.03057)	(0.05880)

Granger Causality Test

Pairwise Granger Causality Tests
Date: 04/05/18 Time: 06:42
Sample: 1980 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
RGDP does not Granger Cause ER	35	2.76450	0.0541
ER does not Granger Cause RGDP		1.57326	0.2240
MCAP does not Granger Cause ER	35	0.05573	0.0459
ER does not Granger Cause MCAP		4.30786	0.0227
AGR does not Granger Cause ER	35	1.96532	0.1577
ER does not Granger Cause AGR		2.16668	0.1322

MCAP does not Granger Cause RGDP	35	0.32749	0.7233
RGDP does not Granger Cause MCAP		8.72278	0.0010
AGR does not Granger Cause RGDP	35	4.73080	0.0164
RGDP does not Granger Cause AGR		1.87604	0.1707
AGR does not Granger Cause MCAP	35	11.9086	0.0002
MCAP does not Granger Cause AGR		0.04011	0.9607

Regression Estimation 1

Dependent Variable: D(ER)
Method: Least Squares
Date: 04/05/18 Time: 07:24
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	680.2572	922.7893	0.737175	0.4667
D(RGDP)	0.156780	0.135647	1.155793	0.0256
D(MCAP)	0.197894	0.367038	2.667160	0.0122
D(AGR)	-0.379763	1.080158	-1.277371	0.2113
ECM(1)	-0.312603	0.083084	-3.762476	0.0007

R-squared	0.480706	Mean dependent var	591.2857
Adjusted R-squared	0.411467	S.D. dependent var	5476.073
S.E. of regression	4201.020	Akaike info criterion	19.65561
Sum squared resid	5.29E+08	Schwarz criterion	19.87780
Log likelihood	-338.9731	Hannan-Quinn criter.	19.73231
F-statistic	6.942683	Durbin-Watson stat	1.715805
Prob(F-statistic)	0.000442		