

Contributory Effects of Financial Inclusion to Per Capita Income

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Abstract

This study employs a block recursive model with more than two blocks within a multivariate cointegration and error correction framework to investigate the relationship between financial inclusion indicators and per capita income in Nigeria, over the period 1960-2010. Panel unit root test showed that the indicators are $I(1)$ with VAR(2) model satisfying stability condition. Logarithmic returns implying per capita income is block recursive in time series sense, and unidirectional causalities are observed between logarithmic returns of the ratio of money supply (M2) to GDP and logarithmic returns implying per capita income; and between logarithmic returns of the ratio of credit to private sector (CPS) to GDP and logarithmic returns implying per capita income. The error correction term reveals that logarithmic returns of financial inclusion indicators contributed positively to logarithmic returns of per capita income in the long-run. Besides, the positive effect of logarithmic returns of the ratio of money supply (M2) to GDP has been larger than logarithmic returns of the ratio of credit to private sector (CPS) to GDP. Our exploration supports the supply-leading hypothesis which asserts that financial inclusion is a necessary condition for accelerating standard of living, which tends to translate as an increase in productivity. However, while financial annexation is important for growth, it must be implemented with tolerable incentives and safeguards.

Keywords: Block Recursive, $I(1)$, VAR(2), Unidirectional Causality, VECM, Financial Inclusion, Standard of Living, Productivity.

Aims Research Journal Reference Format:

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1. INTRODUCTION

The connotation between economic progression and financial scoop out has been a wide-ranging subject of experiential research. Practical evidences suggest that there is a significant positive relationship between financial development and economic growth. Financial inclusion plays an important role in reducing risk and helplessness for disadvantaged groups, and increasing the ability of individuals and households to access basic services like health and education, thus having a more direct impact on poverty reduction. Deep and strong financial markets are important because of the need for market-based and branch out channels of intermediation between borrowers and investors (Bencivenga, et al., 1991). An effective and robust financial system contributes to higher savings and investment, increases the efficiency of resource allocation and diversifies risks, and hence supports long-term growth and poverty reduction. Early financial deepening theories emphasized the need to increase savings in order to stimulate investment and help emerging economies achieve catch-up growth, with poverty reduction to follow. Evidence to support the effectiveness of this approach has been mixed. It was quickly overtaken by the global microfinance movement, which promotes the benefits of direct financial service provision to the poor.

However, microfinance institutions themselves have achieved limited success in sustainably increasing beneficial financial access for the poor. Many financial inclusion promoters now agree that direct access to finance services can improve individual livelihoods amongst the poor by enabling them to manage scarce resources more efficiently, thereby smoothing consumption and protecting against economic shocks (Beck, et al., 2000; Hemachandra, 2003; Jake, 2010; Stuart, 2010).

The CEO of Enhancing Financial Innovation and Access (EFInA), Ms Modupe Ladipo, in her remarks at the 2014 Financial Inclusion Conference (where CBN won an award of regulator that had deepened Financial Inclusion), revealed the result of the access to Financial Services survey showing that the percentage of formally excluded adult Nigerians had reduced to 39.5%, stating that the figure was still relatively high due to that fact that 23% of adult Nigerians lacked formal education and less than 10% were salaried. She, however, expressed gladness that the percentage of adult Nigerians formally included in the financial system had increased to about 50%.

The CBN governor, Mr. Godwin Emefiele, at the 2014 Financial Inclusion Conference, said that, his commitment to financial inclusion was part of the Bank's vision to become the model central bank delivering price and financial system stability and promoting sustainable economic development. Continuing, he said as part of the CBN's commitment, a Financial Inclusion secretariat has been set up in the Bank to coordinate the implementation of the Financial Inclusion Strategy. He also commended EFInA for its work towards promoting financial inclusion in Nigeria and thanked them for all the support the CBN has received in the implementation of its National Financial Inclusion strategy. While noting that the journey to achieving financial inclusion was long, he expressed belief that the sustained efforts of the industry would go a long way towards reaching the financial inclusion goals and targets. The dominant focus of this paper is to apply VAR Granger Causality/Block Exogeneity Wald Tests and the error correction mechanism in order to investigate whether CBN's financial inclusion is a necessary condition for accelerating standard of living, which tends to translate as an increase in productivity in Nigeria, over the period 1960-2010.

2. MATERIALS AND METHODS

Per Capita GDP growth, GP_1 (proxy per capita income) is a measure of the total output of a country that takes the GDP and divides it by the number of people in the country. A rise in per capita GDP signals growth in the economy and tends to translate as an increase in productivity. It is sometimes used as an indicator of standard of living as well, with higher per capita GDP being interpreted as having a higher standard of living. The standard of living includes factors such as income, quality and availability of employment, class disparity, poverty rate, quality and affordable housing, hours of work required to purchase necessities, GDP, inflation rate, number of vacation days per year, affordable (or free) access to quality healthcare, quality and availability of education, life expectancy, incidence of disease, cost of goods and services, infrastructure, national economic growth, economic and political stability, political and religious freedom, environmental quality, climate and safety. The ratio of money supply (M_2) to GDP, F_2 and the ratio of credit to private sector (CPS) to GDP, F_1 (these rates are in percentages) are monetization ratios which indicates the level of financial development indicative of the liquid form of monetary aggregates which are related to the ability of the financial system to provide liquidity or a medium of exchange. It basically supports the view of; development in financial sectors leads to development of the economy as a whole (Odeniran, et al., 2010).

3. BLOCK EXOGENEITY

The causality concept introduced by Granger (1969) is perhaps the most widely discussed form of causality in the econometrics literature. We define the family of VARs with block exogeneity and we cast the choice of variables in a VAR as the choice of one model from this family. Let y_t denote the vector consisting of all N variables in the dataset.

Consider a partition of y_t into three sub vectors, $y_t = \{y_i, y_j, y_k\}$, where y_i denotes N_1 variables of interest and y_j denotes N_2 , y_k denotes N_3 remaining variables. Let Ω denote a family of models such that: (i) each model in the family Ω is a VAR with N variables represented by y_t with zero, one, or more block exogeneity restrictions, and (ii) in

each model in the family Ω , the variables represented by y_i are in the first block of that model. Suppose that $N=3$ and $N_1=1$, i.e. the dataset contains three variables and there is one variable of interest (Hamilton, 1994; Dufour, et. al, 1998):

$$\begin{bmatrix} y_{it} \\ y_{jt} \\ y_{kt} \end{bmatrix} = \gamma + \begin{bmatrix} D_{ii}(L) & D_{ij}(L) & D_{ik}(L) \\ D_{ji}(L) & D_{jj}(L) & D_{jk}(L) \\ D_{ki}(L) & D_{kj}(L) & D_{kk}(L) \end{bmatrix} \begin{bmatrix} y_{i,t-1} \\ y_{j,t-1} \\ y_{k,t-1} \end{bmatrix} + e_t \quad (1)$$

We think of y_i as the variable of interest and think of y_j and y_k as the remaining variables. We study the following queries: In addition to y_i , should we include in the VAR y_j and y_k , only y_j , only y_k or neither y_j nor y_k . We sort four interpretations about these questions. First, "including y_j and y_k in addition to y_i ", means estimating the unrestricted VAR given in equation (1). "Including only y_j in addition to y_i " means estimating the VAR given in equation (1) with the restriction $D_{ik}(L) = D_{jk}(L) = 0$; i.e., with the restriction that y_i and y_j are block exogenous to y_k . "Including only y_k in addition to y_i " means estimating that VAR with the restriction $D_{ij}(L) = D_{kj}(L) = 0$, i.e. with the restriction that that y_i and y_k are block exogenous to y_j . "Including neither y_j nor y_k in addition to y_i " means estimating that VAR with the restriction $D_{ij}(L) = D_{ik}(L) = 0$, i.e., with the restriction that y_i is block exogenous to y_j and y_k .

In particular, one could be concerned that modeling the interaction between the remaining variables matters for the result of the block exogeneity tests deliberated so far. Our approach to modeling the interaction between the remaining variables is to consider block exogeneity restrictions among the remaining variables. This approach leads us to consider two additional models: (i) the VAR given in equation (1) with the restriction $D_{ij}(L) = D_{ik}(L) = D_{jk}(L) = 0$, i.e. with the restriction that y_i is block exogenous to y_{ji} and y_{jj} and y_{ji} is block-exogenous to y_{jj} , and (ii) the VAR given in equation (1) with the restriction $D_{ij}(L) = D_{ik}(L) = D_{kj}(L) = 0$, i.e. with the restriction that y_i is block exogenous to y_{ji} and y_{jj} and y_{jj} is block-exogenous to y_{ji} . Note that with either of those two restrictions, the decision is "include neither y_{ji} nor y_{jj} in addition to y_i " (Lutkepohl, 1993; Jarocinski, et. al, 2011).

3.1 Sources of Data and Method of Analysis

The data used in this study were sourced from the Central Bank of Nigeria publications and those of the World Bank, over the period 1960 - 2010. The epoch chosen for the study encompasses the periods of major reforms in the financial system and the period of amalgamation of the banking and insurance systems in Nigeria. Eviews 7 was used to obtain the model summaries and the standardized coefficients of the regression.

4. RESULTS AND DISCUSSION

Table 1 for the panel unit root test reveals that, the p-values for the tests are greater than 0.05 significance level. Thus, the variables are $I(1)$; hence, we fit an unrestricted VAR model of Table 2.

VAR stability condition of Table 3 showed that, all the inverse roots of AR characteristic polynomial lie inside the unit circle. Thus, the estimated unrestricted VAR(2) model is stable.

In order to determine the robustness of the model, diagnostic tests are implemented in Table 4 which reveals that, no serial correlation amid the residuals. Also, Table 5 showed that, the residuals are multivariate normal and the VAR(2) model is robust. VAR Granger Causality/Block Exogeneity Wald tests of Table 6 include three parts. The first part reports the result of testing whether we can exclude each variable out of the equation per capita income. Similarly, the next part reports the results of testing for the equation of the ratio of money supply (M2) to GDP and the ratio of credit to private sector (CPS) to GDP. Each part of Table 6 includes three columns. The first column lists the variables which will be excluded from the equation. The next columns are the value of χ^2 degrees of freedom and P-value.

The last row in each part of Table 6 reports the joint statistics of the two variables excluded from the equation. The test divulges that, logarithmic returns of per capita income are block recursive with P-value=0.2394 for the joint statistics; while logarithmic returns of the ratio of money supply (M2) to GDP and logarithmic returns of the ratio of credit to private sector (CPS) to GDP are not block recursive with P-values of 0.0010 and 0.0017 for the joint statistics are respectively. At a 0.05 significance level with P-values 0.2315 and 0.1840 respectively, we fail to reject the null hypothesis of excluding the block of logarithmic returns of the ratio of money supply (M2) to GDP and the block of logarithmic returns of the ratio of credit to private sector (CPS) to GDP from the equation implying logarithmic returns of per capita income. It suggests that logarithmic returns of per capita does not Granger cause logarithmic returns of the ratio of money supply (M2) to GDP and logarithmic returns of the ratio of credit to private sector (CPS) to GDP. The test also provides evidence that we ought to reject the null hypothesis of excluding the block of logarithmic returns of per capita income out of the equation implying logarithmic returns of the ratio of money supply (M2) to GDP at 0.05 significance level with P-value=0.0003; but we fail to reject the null hypothesis of excluding the block of logarithmic returns of the ratio of credit to private sector (CPS) to GDP at 0.05 significance level with P-value=0.3987.

These suggest that, logarithmic returns of the ratio of credit to private sector (CPS) to GDP does not Granger cause logarithmic returns of the ratio of money supply (M2) to GDP, but unidirectional causality exists amongst cause logarithmic returns of the ratio of money supply (M2) to GDP and logarithmic returns of per capita income. Furthermore, we ought to reject the null hypothesis of excluding the block of logarithmic returns of per capita income out of the equation implying the logarithmic returns of logarithmic returns of the ratio of credit to private sector (CPS) to GDP at 0.05 significance level with P-value=0.0004; but we fail to reject the null hypothesis of excluding the block of logarithmic returns of the ratio of money supply (M2) to GDP at 0.05 significance level with P-value=0.7138. These suggest that logarithmic returns of the ratio of money supply (M2) to GDP does not Granger cause logarithmic returns of the ratio of credit to private sector (CPS) to GDP, and unidirectional causality exists amongst logarithmic returns of the ratio of credit to private sector (CPS) to GDP and logarithmic returns of per capita income. Tentatively, logarithmic returns of the ratio of money supply (M2) to GDP shows weaker signs of causal impact on logarithmic returns of per capita income than other causal relations.

Centered on this, we do not know whether or not logarithmic returns of the ratio of credit to private sector (CPS) to GDP and logarithmic returns of the ratio of money supply (M2) to GDP have positive or negative effects on Log GP1. It is also unclear whether the impact of Log F1 on GP1 is stronger than that of Log F2 on logarithmic returns of per capita income. To answer these questions, we carry out Johansen cointegration test; estimate VECM for the problem, and take expectations of the error correction term. Johansen cointegration test of Table 7 indicated that, one cointegration relationship exists among the variables. The existence of a long run relationship between the indicators implies that the three variables are causally related in one direction. We progress by estimating VECM(1) in Table 8; the estimates of the coefficients are statistically significant since there t-values are greater than 0.05 significance level. Diagnostic tests implemented in Tables 9 and 10 inferred that the residuals of our VECM are normally distributed and there are no serial correlations or conditional heteroskedasticity in the residuals. The linear combinations of a VAR model will have zero expected values and finite variances, so that not only will zero be the expected value of these terms but will also be meaningful in that there will be a non-trivial probability of being "close" to it.

Assuming that all the constant terms and the short-run adjustment dynamics of VECM are equal to zero, the error correction term which is the normalized cointegrating equation obtained from VEC of Table 8 is as follows:

$$\Delta y_t = \pi y_{t-1} + \varepsilon_t \quad (2)$$

$$\text{Taking expectations of equation (2) we've: } E(\Delta y_t) = E(\pi y_{t-1}) + E(\varepsilon_t) \Rightarrow 0 = \pi y_{t-1} \quad (3)$$

As a set of equilibrium conditions which guide the evolution of y_t over time:

$$\begin{aligned} \Rightarrow 0 &= \Delta \text{LogGP1} + 0.35 - 2.17 \text{Log} \Delta F2 - 0.58 \text{Log} \Delta F1 \\ \Rightarrow -\Delta \text{GP1} &= 0.35 - 2.17 \Delta F2 - 0.58 \Delta F1 \\ \Rightarrow \Delta \text{GP1} &= -0.35 + 2.17 \Delta F2 + 0.58 \Delta F1 \end{aligned} \quad (4)$$

According to normalized equation (4), logarithmic returns of financial inclusion indicators contribute positively to logarithmic returns of per capita income in the long-run. Moreover, the positive effect of logarithmic returns of the ratio of money supply (M2) to GDP has been larger than the ratio of credit to private sector (CPS) to GDP. Our exploration supports the supply-leading hypothesis which asserts that financial inclusion is a necessary condition for accelerating standard of living, which tends to translate as an increase in productivity in Nigeria.

5. CONCLUSION

This study employs a block recursive model with more than two blocks within a multivariate cointegration and error correction framework to investigate the relationship between financial inclusion indicators and per capita income in Nigeria, over the period 1960-2010. Panel unit root test showed that the indicators are I(1) with VAR(2) model satisfying stability condition. Logarithmic returns implying per capita income is block recursive in time series sense, and unidirectional causalities are observed between logarithmic returns of the ratio of money supply (M2) to GDP and logarithmic returns implying per capita income; and between logarithmic returns of the ratio of credit to private sector (CPS) to GDP and logarithmic returns implying per capita income. The error correction term reveals that logarithmic returns of financial inclusion indicators contributed positively to logarithmic returns of per capita income in the long-run. Besides, the positive effect of logarithmic returns of the ratio of money supply (M2) to GDP has been larger than logarithmic returns of the ratio of credit to private sector (CPS) to GDP. Our exploration supports the supply-leading hypothesis which asserts that financial inclusion is a necessary condition for accelerating standard of living, which tends to translate as an increase in productivity.

6. RECOMMENDATION

Financial annexation is important for growth but it must be implemented with tolerable incentives and safeguards. Further studies are encouraged in this regard to validate the observable factors in this study. Future work should consider inferential statistics such as Pearson, T-test, Anova, etc. for data analysis.

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APPENDIX (A)

Table 1: Group unit root test: Summary

Series: LOGGP1, LOGF2, LOGF1

Date: 02/09/15 Time: 14:22

Sample: 1960 2010

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on AIC: 0

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob. **	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.49995	0.6914	3	150
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.49397	0.6893	3	150
ADF - Fisher Chi-square	3.04028	0.8038	3	150
PP - Fisher Chi-square	3.22549	0.7801	3	150

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 2: Vector Autoregression Estimates

Date: 02/09/15 Time: 14:22

Sample (adjusted): 1962 2010

Included observations: 49 after adjustments

Standard errors in () & t-statistics in []

	LOGGP1	LOGF2	LOGF1
LOGGP1(-1)	0.815911 (0.19141) [4.26259]	0.201641 (0.17586) [1.14659]	0.088461 (0.14238) [0.62131]
LOGGP1(-2)	0.233440 (0.22554) [1.03505]	-0.016026 (0.20721) [-0.07734]	0.074917 (0.16776) [0.44656]
LOGF2(-1)	-0.298931 (0.30099) [-0.99314]	0.994759 (0.27654) [3.59716]	0.158267 (0.22389) [0.70689]
LOGF2(-2)	0.489233 (0.28974) [1.68852]	-0.433366 (0.26620) [-1.62796]	-0.171183 (0.21552) [-0.79428]
LOGF1(-1)	0.002559 (0.34366) [0.00745]	-0.213782 (0.31574) [-0.67709]	0.505956 (0.25562) [1.97929]
LOGF1(-2)	-0.504691 (0.34448) [-1.46507]	0.425550 (0.31649) [1.34458]	0.177910 (0.25624) [0.69432]
C	0.353041 (0.18151) [1.94502]	-0.252723 (0.16676) [-1.51546]	0.025075 (0.13501) [0.18572]
R-squared	0.925848	0.847742	0.826320

Adj. R-squared	0.915255	0.825991	0.801509
Sum sq. resids	0.348308	0.294010	0.192717
S.E. equation	0.091066	0.083667	0.067739
F-statistic	87.40040	38.97459	33.30406
Log likelihood	51.66097	55.81304	66.16162
Akaike AIC	-1.822897	-1.992369	-2.414760
Schwarz SC	-1.552637	-1.722109	-2.144500
Mean dependent	2.519550	1.091026	1.302777
S.D. dependent	0.312823	0.200572	0.152043
Determinant resid covariance (dof adj.)		5.85E-08	
Determinant resid covariance		3.69E-08	
Log likelihood		210.7604	
Akaike information criterion		-7.745324	
Schwarz criterion		-6.934544	

Table 3: Roots of Characteristic Polynomial

Endogenous variables: LOGG1 LOGF2 LOGF1

Exogenous variables: C

Lag specification: 1 2

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Root	Modulus
0.911996	0.911996
0.734732	0.734732
0.424932 - 0.174033i	0.459189
0.424932 + 0.174033i	0.459189
-0.089983 - 0.066611i	0.111955
-0.089983 + 0.066611i	0.111955

No root lies outside the unit circle. VAR satisfies the stability condition.

Table 4: VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 02/09/15 Time: 14:32

Sample: 1960 2010

Included observations: 49. Probs from chi-square with 9 df.

Lags	LM-Stat	Prob
1	9.626860	0.3815
2	8.835680	0.4526
3	5.241200	0.8128
4	16.68530	0.0539
5	5.063934	0.8287
6	7.278687	0.6081
7	9.531782	0.3897
8	12.45583	0.1888
9	12.08045	0.2088
10	3.325485	0.9500
11	9.259961	0.4136
12	7.490385	0.5862

Table 5: VAR Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: residuals are multivariate normal

Date: 02/09/15 Time: 14:32

Sample: 1960 2010

Included observations: 49

Component	Skewness	Chi-sq	df	Prob.
1	-0.172381	0.242675	1	0.6223
2	-0.156568	0.200194	1	0.6546
3	0.010520	0.000904	1	0.9760
Joint		0.443773	3	0.9311

Component	Kurtosis	Chi-sq	df	Prob.
1	2.802622	0.079540	1	0.7779
2	4.725777	6.080710	1	0.0137
3	2.453185	0.610471	1	0.4346
Joint		6.770721	3	0.0796

Component	Jarque-Bera	df	Prob.
1	0.322215	2	0.8512
2	6.280904	2	0.0433
3	0.611375	2	0.7366
Joint	7.214494	6	0.3015

Table 6: VAR Granger Causality/Block Exogeneity Wald Tests

Date: 02/09/15 Time: 22:35

Sample: 1960 2010

Included observations: 49

Dependent variable: LOGGP1

Excluded	Chi-sq	df	Prob.
LOGF2	2.926367	2	0.2315
LOGF1	3.386038	2	0.1840
All	5.503532	4	0.2394

Dependent variable: LOGF2

Excluded	Chi-sq	df	Prob.
LOGGP1	16.09435	2	0.0003
LOGF1	1.839342	2	0.3987
All	18.39099	4	0.0010

Dependent variable: LOGF1

Excluded	Chi-sq	df	Prob.
LOGGP1	15.68007	2	0.0004
LOGF2	0.674264	2	0.7138
All	17.24687	4	0.0017

Table 7: Johansen Cointegration Test

Date: 02/11/15 Time: 21:31

Sample (adjusted): 1962 2010

Included observations: 49 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: LOGGP1 LOGF2 LOGF1

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 *	0.429552	49.64938	42.91525	0.0093
At most 1	0.304311	22.14403	25.87211	0.1359
At most 2	0.085215	4.364270	12.51798	0.6890

Trace test indicates 1 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 *	0.429552	27.50535	25.82321	0.0298
At most 1	0.304311	17.77976	19.38704	0.0843
At most 2	0.085215	4.364270	12.51798	0.6890

Max-eigenvalue test indicates 1 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):

LOGGP1	LOGF2	LOGF1	@TREND(61)
3.453878	-7.507934	-2.015565	0.032690
2.502090	21.41276	-27.24859	-0.073168
4.214969	1.958968	0.684635	-0.087148

Unrestricted Adjustment Coefficients (alpha):

D(LOGGP1)	0.022248	0.007650	-0.023732
D(LOGF2)	0.036134	-0.011197	0.019240
D(LOGF1)	0.028647	0.015302	0.014306

1 Cointegrating Equation(s):	Log likelihood	204.3385
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Normalized cointegrating coefficients (standard error in parentheses)

LOGGP1	LOGF2	LOGF1	@TREND(61)
1.000000	-2.173769	-0.583566	0.009465
	(1.10531)	(1.23441)	(0.00575)

Adjustment coefficients (standard error in parentheses)

D(LOGGP1)	0.076843		
	(0.04497)		
D(LOGF2)	0.124803		
	(0.04195)		
D(LOGF1)	0.098943		
	(0.03399)		

Table 8: Vector Error Correction Estimates

Date: 02/11/15 Time: 21:18

Sample (adjusted): 1962 2010

Included observations: 49 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1		
LOGGP1(-1)	1.000000		
LOGF2(-1)	-2.173769 (1.10531) [-1.96667]		
LOGF1(-1)	-0.583566 (1.23441) [-0.47275]		
@TREND(60)	0.009465 (0.00575) [1.64741]		
C	0.345652		
Error Correction:	D(LOGGP1)	D(LOGF2)	D(LOGF1)
CointEq1	0.076843 (0.04497) [1.70878]	0.124803 (0.04195) [2.97521]	0.098943 (0.03399) [2.91106]
D(LOGGP1(-1))	-0.277092 (0.22412) [-1.23636]	0.029974 (0.20906) [0.14338]	-0.018800 (0.16939) [-0.11098]
D(LOGF2(-1))	-0.347777 (0.26133) [-1.33078]	0.383606 (0.24377) [1.57364]	0.320262 (0.19752) [1.62143]
D(LOGF1(-1))	0.261699 (0.30827) [0.84893]	-0.263384 (0.28755) [-0.91595]	-0.295027 (0.23299) [-1.26625]
C	0.032397 (0.01463) [2.21411]	0.012438 (0.01365) [0.91129]	0.007748 (0.01106) [0.70056]
R-squared	0.092702	0.300422	0.273547
Adj. R-squared	0.010220	0.236824	0.207506
Sum sq. resids	0.365489	0.318015	0.208785
S.E. equation	0.091140	0.085015	0.068885
F-statistic	1.123911	4.723757	4.142076
Log likelihood	50.48131	53.89023	64.19960
Akaike AIC	-1.856380	-1.995520	-2.416310
Schwarz SC	-1.663337	-1.802477	-2.223267
Mean dependent	0.022766	0.017261	0.010040
S.D. dependent	0.091610	0.097316	0.077379
Determinant resid covariance (dof adj.)		6.62E-08	
Determinant resid covariance		4.79E-08	
Log likelihood		204.3385	
Akaike information criterion		-7.564836	
Schwarz criterion		-6.831273	

Table 9: VEC Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: residuals are multivariate normal

Date: 02/11/15 Time: 21:52

Sample: 1960 2010

Included observations: 49

Component	Skewness	Chi-sq	df	Prob.
1	-0.270257	0.596484	1	0.4399
2	-0.011747	0.001127	1	0.9732
3	-0.115355	0.108673	1	0.7417
Joint		0.706284	3	0.8717

Component	Kurtosis	Chi-sq	df	Prob.
1	3.388169	0.307628	1	0.5791
2	4.244280	3.160977	1	0.0754
3	2.650070	0.250004	1	0.6171
Joint		3.718609	3	0.2935

Component	Jarque-Bera	df	Prob.
1	0.904113	2	0.6363
2	3.162103	2	0.2058
3	0.358677	2	0.8358
Joint	4.424893	6	0.6194

Table 10: VEC Residual Heteroskedasticity Tests: Includes Cross Terms

Date: 02/11/15 Time: 21:54

Sample: 1960 2010

Included observations: 49

Joint test:			
Chi-sq	df	Prob.	
88.95587	84	0.3349	

Individual components:				
Dependent	R-squared	F(14,34)	Prob.	Chi-sq(14)
res1*res1	0.240085	0.767275	0.6947	11.76416
res2*res2	0.127371	0.354480	0.9792	6.241184
res3*res3	0.190869	0.572884	0.8671	9.352565
res2*res1	0.131222	0.366818	0.9758	6.429896
res3*res1	0.121686	0.336466	0.9835	5.962609
res3*res2	0.153812	0.441444	0.9479	7.536805