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**IMPACT OF DEFENCE SPENDING, INTERNAL THREAT,
POLITICAL INSTABILITY AND ARMS IMPORTATION
ON ECONOMIC GROWTH IN NIGERIA**

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**DOCTOR OF PHILOSOPHY
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**IMPACT OF DEFENCE SPENDING, INTERNAL THREATS, POLITICAL
INSTABILITY AND ARMS IMPORTATION ON ECONOMIC GROWTH
IN NIGERIA**

By



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**Thesis Submitted to
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in Fulfilment of the Requirement for the Degree of Doctor of Philosophy**



Kolej Perniagaan
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ABSTRACT

The existence of internal threat, political instability and arms importation has led to the rise in defence expenditure in Nigeria. Whether defence expenditure, with or without threat has a benign or malign impact on the economic growth, is a matter that needs rigorous academic investigation. The objective of this study include examining the impacts of defence expenditure on economic growth in the presence of threats, political instability and arms importation in Nigeria. It also examines the impacts of defence research and development, defence components on the Nigeria`s economic growth. In addition it examines the asymmetric causal relationship between defence expenditure and economic growth in Nigeria. Using the robust Autoregressive Distributive Lag (ARDL) model, and asymmetric causality approach. The results reveal that defence expenditure-internal threat and defence-political instability interactions both have positive and significant impacts on economic growth. On the contrary, it reveals that defence arms import interaction has a significant and negative impact on growth in Nigeria. However, the impact of defence Research and Development on economic growth it is not significant as a result of insufficient funding. The result furthermore found that the causation between defence expenditure on economic growth in Nigeria is unidirectional from defence to economic growth. This implies that defence expenditure stimulates growth during the time of threat and civil unrest. The study recommends a revisit on the funding of defence sector in Nigeria. The current defence budget is grossly inadequate for the defence, considering the threats in Nigeria since it independence and recent threats such as the “Boko Haram” and Niger Delta Militancy among others. Regarding the defence R&D, proper funding, as well as management should be considered on Defence Industrial Cooperation of Nigeria to avoid over dependence on foreign sources.

Keywords: defence, internal threat, economic growth, autoregressive distributive lag model

ABSTRAK

Kewujudan ancaman dalaman, ketidakstabilan politik, dan pengimportan senjata telah meningkatkan perbelanjaan pertahanan di Nigeria. Sama ada perbelanjaan pertahanan, dengan atau tanpa ancaman mempunyai kesan benigna atau buruk terhadap pertumbuhan ekonomi, adalah satu perkara yang memerlukan siasatan akademik yang padu. Kajian ini mengkaji kesan perbelanjaan pertahanan terhadap pertumbuhan ekonomi dalam situasi wujudnya ancaman, ketidakstabilan politik, dan pengimportan senjata di Nigeria. Ia juga menyiasat impak penyelidikan dan pembangunan pertahanan, iaitu komponen pertahanan, terhadap pertumbuhan ekonomi Nigeria. Selain itu, ia turut menilai hubungan sebab dan akibat yang asimetri antara perbelanjaan pertahanan dan pertumbuhan ekonomi di Nigeria. Menggunakan model Autoregresif Lag Teredar (ARDL) yang jitu dan pendekatan sebab akibat asimetri, keputusan kajian mendedahkan bahawa interaksi perbelanjaan pertahanan-ancaman dalaman dan pertahanan-ketidakstabilan politik mempunyai kesan positif dan signifikan terhadap pertumbuhan ekonomi. Sebaliknya, interaksi import senjata pertahanan mempunyai kesan yang signifikan dan negatif terhadap pertumbuhan. Walau bagaimanapun, kesan penyelidikan pertahanan dan pembangunan terhadap pertumbuhan ekonomi tidak signifikan akibat pembiayaan yang tidak mencukupi. Hasil kajian juga mendapati kesan perbelanjaan pertahanan terhadap pertumbuhan ekonomi adalah satu arah, yang menunjukkan bahawa perbelanjaan pertahanan merangsang pertumbuhan pada zaman ancaman dan rusuhan awam. Kajian ini mencadangkan penerokaan semula terhadap pembiayaan sektor pertahanan di Nigeria. Bajet pertahanan semasa adalah tidak memadai untuk pertahanan disebabkan oleh ancaman di Nigeria sejak kemerdekaan dan ancaman baru-baru ini seperti Boko Haram dan Militan Delta Niger antara lainnya. Mengenai penyelidikan dan pembangunan pertahanan, pembiayaan yang betul serta pengurusan perlu mempertimbang Kerjasama Pertahanan Industri Nigeria untuk mengelakkan terlalu bergantung kepada sumber luar.

Kata kunci: perbelanjaan pertahanan, ancaman dalaman, pertumbuhan ekonomi, model autoregresif lag teredar

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LIST OF ABBREVIATIONS

| | |
|---------|---|
| ADF | Augmented Dickey Fuller |
| APC | Arewa People's Congress |
| ARDL | Autoregressive Distributed Lag |
| BRIC | Britain Russia, India and China |
| CBN | Central Bank of Nigeria |
| COMA | Coalition for Militant Action |
| CUSUM | Cumulative sum of Recursive Residuals |
| CUSUMQ | Cumulative sum of Recursive Residuals Square |
| DH | Defence Headquarters |
| DICON | Defence Industrial Cooperation of Nigeria |
| ECT | Error Correction Term |
| FDI | Foreign Direct Investment |
| GPI | Global Peace Index |
| ICRG | International Country Risk Guide |
| IMF | International Monetary Fund |
| IVF | Iduwini Volunteer Force |
| LDCs | Less Developed Countries |
| MASSOB | Movement for the Actualization of the Sovereign State of Biafra |
| MEND | Movement for the Emancipation of the Niger Delta |
| MINT | Mexico, Indonesia, Nigeria and Turkey |
| MoD | Ministry of Defence |
| MOSOP | Movement for the Survival of the Ogoni People |
| MSSND | Movement for the Self-governing State of the Niger Delta |
| NDA | Nigerian Defence Academy |
| NDCG | Niger Delta Coastal Guerillas |
| NDMFS | Niger Delta Militant Force Squad |
| NDPSF | Niger Delta People's Salvation Front |
| NHIS | National Health Insurance Scheme |
| NPC | National Planning Commission |
| OECD | Organization of Economic Cooperation and Development |
| OPC | Oodua People's Congress |
| OPEC | Organization Petroleum Exporting Countries |
| PKO's | Peace Keeping Operations |
| PPF | Production Possibility Frontier |
| R&D | Research and Development |
| SAARC | South Asian Association for Regional Cooperation |
| SAP | Structural Adjustment Programmes |
| SIPRI | Stockholm International Peace Research Institute |
| TCC | Troops Contributing Countries |
| TRADOC | Training and Doctrine |
| UN | United Nations |
| UNAMSIL | United Nations Mission in Sierra Leon |

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Economic growth is a much-desired goal of every nation of the world. The need to study economic growth in countries became more attractive at the end of the Second World War. Then it became glaring that some nations experienced growth while others experienced either very minimal or no growth or even negative growth (Easterly, 2001). The search for economic growth started from the works of Adam Smith, who led an enquiry into the 'Wealth of Nations' and Thomas Malthus, who postulated that population growth would affect economic growth. To the view of scholars, such as Lucas (1988) and Rostow (1960), investment in dams, roads and machines would lead to growth in backwards countries. Solow (1956) however, argues that investment in tools would not lead to growth, but it is technological change that would stimulate growth in a weak economy. This debate persists where economists built more sophisticated models in which one or more of the factors are endogenously determined (Todaro & Smith, 2003).

While the search for economic growth continues, there has been rising debate over the impact of government expenditure on economic growth. Barro (1989) for instance, found the coefficient of government expenditure on economic growth frequently non-significant. When the impact of government expenditure is narrowed down to the field of defence expenditure on growth, an array of conclusions are reached using varying empirical and statistical methods. From the time Benoit (1973)

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APPENDICES

Appendix A

Economic Growth Model

Autoregressive Distributed Lag Estimates

ARDL(2,2,2,2,1,2,2,2,2) selected based on Schwarz Bayesian Criterion

Dependent variable is LRGDPK

30 observations used for estimation from 1985 to 2014

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|------------|-------------|----------------|---------------|
| LRGDPK(-1) | -.22327 | .22533 | -.99085[.378] |
| LRGDPK(-2) | .54713 | .15868 | 3.4480[.026] |
| LDE | .071255 | .12119 | .58796[.588] |
| LDE(-1) | -.92304 | .15321 | -6.0247[.004] |
| LDE(-2) | -.71640 | .17637 | -4.0619[.015] |
| LAI | .54872 | 2.3368 | .23482[.826] |
| LAI(-1) | 18.8811 | 3.0750 | 6.1402[.004] |
| LAI(-2) | 15.3946 | 3.5852 | 4.2939[.013] |
| PI | -.030959 | .018709 | -1.6547[.173] |
| PI(-1) | -.11410 | .026987 | -4.2282[.013] |
| PI(-2) | -.054297 | .021906 | -2.4787[.068] |
| THR | -.13571 | .031182 | -4.3521[.012] |
| THR(-1) | -.11118 | .029936 | -3.7139[.021] |
| LDETHR | .24389 | .080631 | 3.0248[.039] |
| LDETHR(-1) | .35524 | .12305 | 2.8870[.045] |
| LDETHR(-2) | -.084378 | .054376 | -1.5518[.196] |
| LDEPI | .11730 | .089878 | 1.3051[.262] |
| LDEPI(-1) | .14550 | .078070 | 1.8637[.136] |
| LDEPI(-2) | .34999 | .079839 | 4.3838[.012] |
| LDEAI | -.50746 | 2.3343 | -.21739[.839] |
| LDEAI(-1) | -18.8437 | 3.0721 | -6.1338[.004] |
| LDEAI(-2) | -15.3528 | 3.5813 | -4.2869[.013] |
| LEDU | .74256 | .26272 | 2.8265[.048] |
| LEDU(-1) | -1.3985 | .37957 | -3.6846[.021] |
| LEDU(-2) | .68682 | .22451 | 3.0593[.038] |
| INPT | 71.7628 | 12.0927 | 5.9344[.004] |

| | | | |
|----------------------------|----------|----------------------------|---------------|
| R-Squared | .99837 | R-Bar-Squared | .98816 |
| S.E. of Regression | .029264 | F-Stat. F(25,4) | 97.8230[.000] |
| Mean of Dependent Variable | 6.5142 | S.D. of Dependent Variable | .26895 |
| Residual Sum of Squares | .0034254 | Equation Log-likelihood | 93.5978 |
| Akaike Info. Criterion | 67.5978 | Schwarz Bayesian Criterion | 49.3822 |
| DW-statistic | 3.1059 | | |

Testing for existence of a level relationship among the variables in the ARDL model

| F-statistic | 95% Lower Bound | 95% Upper Bound | 90% Lower Bound | 90% Upper Bound |
|-------------|-----------------|-----------------|-----------------|-----------------|
| 8.5486 | 2.8218 | 4.3963 | 2.3301 | 3.7152 |

| W-statistic | 95% Lower Bound | 95% Upper Bound | 90% Lower Bound | 90% Upper Bound |
|-------------|-----------------|-----------------|-----------------|-----------------|
| 76.9375 | 25.3963 | 39.5670 | 20.9707 | 33.4365 |

Diagnostic Tests

| * Test Statistics * | LM Version | * F Version * |
|-----------------------------------|----------------------|-------------------|
| * A: Serial Correlation*CHSQ(1) = | 2.4862[.115]*F(1,2) | = .18073[.712]* |
| * B: Functional Form *CHSQ(1) = | .034747[.852]*F(1,3) | = .0034787[.957]* |

```

*
* C:Normality          *CHSQ(2) = 3.9834[.136]*          Not applicable          *
*
* D:Heteroscedasticity*CHSQ(1) = .068930[.793]*F(1,27) = .064329[.802]*
*****
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals

```

Estimated Long Run Coefficients using the ARDL Approach
ARDL(2,2,2,2,1,2,2,2,2) selected based on Schwarz Bayesian Criterion

```

*****
Dependent variable is LRGDPK
30 observations used for estimation from 1985 to 2014
*****

```

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|-----------|-------------|----------------|---------------|
| LDE | -2.3193 | .35570 | -6.5205[.003] |
| LAI | 51.5043 | 7.9648 | 6.4665[.003] |
| PI | -.29485 | .061146 | -4.8220[.009] |
| THR | -.36514 | .064642 | -5.6487[.005] |
| LDE_THR | .76130 | .16246 | 4.6860[.009] |
| LDE_PI | .90631 | .18769 | 4.8287[.008] |
| LDE_LAI | -51.3263 | 7.9445 | -6.4606[.003] |
| LEDU | .045627 | .18305 | .24926[.815] |
| INPT | 106.1354 | 16.1307 | 6.5797[.003] |

```

*****

```

Testing for existence of a level relationship among the variables in the ARDL model

```

*****
F-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound
8.5486       2.8218           4.3963           2.3301           3.7152

W-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound
76.9375     25.3963           39.5670          20.9707          33.4365

```

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Error Correction Representation for the Selected ARDL Model
ARDL(2,2,2,2,1,2,2,2,2) selected based on Schwarz Bayesian Criterion

```

*****
Dependent variable is dLRGDPK
30 observations used for estimation from 1985 to 2014
*****

```

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|-----------|-------------|----------------|---------------|
| dLRGDPK1 | -.54713 | .15868 | -3.4480[.005] |
| dLDE | .071255 | .12119 | .58796[.567] |
| dLDE1 | -.71640 | .17637 | -4.0619[.002] |
| dLAI | .54872 | 2.3368 | .23482[.818] |
| dLAI1 | -15.3946 | 3.5852 | -4.2939[.001] |
| dPI | -.030959 | .018709 | -1.6547[.124] |
| dPI1 | -.054297 | .021906 | -2.4787[.029] |
| dTHR | -.13571 | .031182 | -4.3521[.001] |
| dLDETHR | .24389 | .080631 | 3.0248[.011] |
| dLDETHR1 | .084378 | .054376 | 1.5518[.147] |
| dLDEPI | .11730 | .089878 | 1.3051[.216] |
| dLDEPI1 | -.34999 | .079839 | -4.3838[.001] |
| dLDEAI | -.50746 | 2.3343 | -.21739[.832] |
| dLDEAI1 | 15.3528 | 3.5813 | 4.2869[.001] |
| dLEDU | .74256 | .26272 | 2.8265[.015] |
| dLEDU1 | -.68682 | .22451 | -3.0593[.010] |
| ecm(-1) | -.67614 | .15000 | -4.5076[.001] |

```

*****

```


Appendix B

Research and Development Model

```

Autoregressive Distributed Lag Estimates
ARDL(1,2,0,0) selected based on Schwarz Bayesian Criterion
*****
Dependent variable is LRGDPK
31 observations used for estimation from 1984 to 2014
*****
Regressor          Coefficient      Standard Error      T-Ratio[Prob]
LRGDPK(-1)         .84832           .10765              7.8806[.000]
LLFT               24.5563          4.3913              5.5921[.000]
LLFT(-1)           -41.8992         7.6338              -5.4886[.000]
LLFT(-2)           23.9600          4.2660              5.6165[.000]
LINV               .17553           .090313             1.9435[.063]
LRD                -.042581         .011518             -3.6968[.001]
INPT              .91337           .51293              1.7807[.087]
*****
R-Squared          .96490           R-Bar-Squared       .95950
S.E. of Regression .053359         F-Stat.             F(4,26)             178.6763[.000]
Mean of Dependent Variable 6.5107         S.D. of Dependent Variable .26514
Residual Sum of Squares .074027         Equation Log-likelihood 49.5912
Akaike Info. Criterion 44.5912         Schwarz Bayesian Criterion 41.0062
DW-statistic       1.7379         Durbin's h-statistic .91141[.362]
*****

Testing for existence of a level relationship among the variables in the ARDL model
*****
F-statistic 95% Lower Bound 95% Upper Bound 90% Lower Bound 90% Upper Bound
7.0973      3.7320          5.0460          3.0233          4.1943

W-statistic 95% Lower Bound 95% Upper Bound 90% Lower Bound 90% Upper Bound
4.3890      14.9281         20.1841         12.0933         16.7770
*****
If the statistic lies between the bounds, the test is inconclusive. If it is
above the upper bound, the null hypothesis of no level effect is rejected. If
it is below the lower bound, the null hypothesis of no level effect can't be
rejected. The critical value bounds are computed by stochastic simulations
using 20000 replications.
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Diagnostic Tests
*****
* Test Statistics * LM Version * F Version *
*****
* A:Serial Correlation*CHSQ(1) = .72142[.396]*F(1,25) = .59566[.447]*
* * * * *
* B:Functional Form *CHSQ(1) = 1.3947[.238]*F(1,25) = 1.1778[.288]*
* * * * *
* C:Normality *CHSQ(2) = .33719[.845]* Not applicable *
* * * * *
* D:Heteroscedasticity*CHSQ(1) = .61783[.432]*F(1,29) = .58973[.449]*
*****
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```

Estimated Long Run Coefficients using the ARDL Approach
 ARDL(1,2,0,0) selected based on Schwarz Bayesian Criterion

 Dependent variable is LRGDPK
 30 observations used for estimation from 1985 to 2014

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|-----------|-------------|----------------|---------------|
| LLFT | 23.0122 | 6.5785 | 3.4981[.002] |
| LINV | -.73512 | .36742 | -2.0008[.057] |
| LRD | -.28833 | .16231 | -1.7764[.089] |
| INPT | -8.4469 | 3.8348 | -2.2027[.038] |

Testing for existence of a level relationship among the variables in the ARDL model

| F-statistic | 95% Lower Bound | 95% Upper Bound | 90% Lower Bound | 90% Upper Bound |
|-------------|-----------------|-----------------|-----------------|-----------------|
| 2.2360 | 3.7038 | 5.0495 | 3.0123 | 4.1752 |

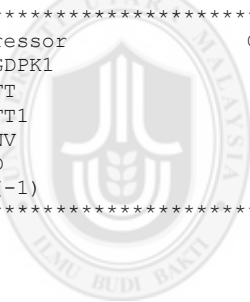
| W-statistic | 95% Lower Bound | 95% Upper Bound | 90% Lower Bound | 90% Upper Bound |
|-------------|-----------------|-----------------|-----------------|-----------------|
| 8.9439 | 14.8151 | 20.1980 | 12.0492 | 16.7008 |

 If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Error Correction Representation for the Selected ARDL Model
 ARDL(1,1,2,0,0) selected based on Schwarz Bayesian Criterion

 Dependent variable is dLRGDPK
 30 observations used for estimation from 1985 to 2014

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|-----------|-------------|----------------|---------------|
| dLRGDPK1 | -.54713 | .15868 | -3.4480[.005] |
| dLLFT | 10.7477 | 3.4844 | 3.0845[.005] |
| dLLFT1 | -11.7444 | 3.6366 | -3.2295[.004] |
| dLINV | -.11887 | .051638 | -2.3019[.030] |
| dLRD | -.046621 | .012458 | -3.7424[.001] |
| ecm(-1) | -.16170 | .080840 | -2.0002[.057] |



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Model B

Autoregressive Distributed Lag Estimates

ARDL(1,2,0,0,0,0) selected based on Schwarz Bayesian Criterion

```

*****
Dependent variable is LRGDPK
30 observations used for estimation from 1985 to 2014
*****
Regressor          Coefficient          Standard Error          T-Ratio[Prob]
LRGDPK(-1)         .46048                .12583                  3.6595[.001]
LLFT               13.2610              4.5643                  2.9054[.008]
LLFT(-1)          -22.9682             7.3133                  -3.1406[.005]
LLFT(-2)          13.9233              3.9062                  3.5644[.002]
LINV              -.10289              .048722                 -2.1119[.047]
LEXA              1.7432              .73503                  2.3716[.027]
LEXAF             -1.6882             1.4861                  -1.1360[.269]
LEXN              1.7032              1.6081                  1.0591[.302]
INPT              -8.1306             1.5588                  -5.2159[.000]
*****
R-Squared          .97896              R-Bar-Squared          .97094
S.E. of Regression .045849            F-Stat.   F(8,21)      122.1135[.000]
Mean of Dependent Variable 6.5142          S.D. of Dependent Variable .26895
Residual Sum of Squares .044144          Equation Log-likelihood 55.2542
Akaike Info. Criterion 46.2542          Schwarz Bayesian Criterion 39.9488
DW-statistic       1.9716          Durbin's h-statistic .10725[.915]
*****

```

Testing for existence of a level relationship among the variables in the ARDL model

```

*****
F-statistic 95% Lower Bound 95% Upper Bound 90% Lower Bound 90% Upper Bound
4.9350      3.1173      4.6127      2.5745      3.8443

W-statistic 95% Lower Bound 95% Upper Bound 90% Lower Bound 90% Upper Bound
29.6103     18.7037     27.6759     15.4469     23.0660
*****

```

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Diagnostic Tests

```

*****
* Test Statistics * LM Version * F Version *
*****
* A:Serial Correlation*CHSQ(1) = .0031882[.955]*F(1,20) = .0021257[.964]*
* * * * *
* B:Functional Form *CHSQ(1) = .80002[.371]*F(1,20) = .54796[.468]*
* * * * *
* C:Normality *CHSQ(2) = 3.5095[.173]* Not applicable *
* * * * *
* D:Heteroscedasticity*CHSQ(1) = .044002[.834]*F(1,28) = .041129[.841]*
*****
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```

Estimated Long Run Coefficients using the ARDL Approach
 ARDL(1,2,0,0,0) selected based on Schwarz Bayesian Criterion

 Dependent variable is LRGDPK
 30 observations used for estimation from 1985 to 2014

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|-----------|-------------|----------------|---------------|
| LLFT | 7.8146 | 1.5371 | 5.0838[.000] |
| LINV | -.19071 | .10184 | -1.8727[.075] |
| LEXA | 3.2311 | 1.5513 | 2.0829[.050] |
| LEXAF | -3.1291 | 2.9606 | -1.0569[.303] |
| LEXN | 3.1568 | 3.0496 | 1.0352[.312] |
| INPT | -15.0701 | 1.9005 | -7.9296[.000] |

Testing for existence of a level relationship among the variables in the ARDL model

| F-statistic | 95% Lower Bound | 95% Upper Bound | 90% Lower Bound | 90% Upper Bound |
|-------------|-----------------|-----------------|-----------------|-----------------|
| 4.9350 | 3.1173 | 4.6127 | 2.5745 | 3.8443 |

| W-statistic | 95% Lower Bound | 95% Upper Bound | 90% Lower Bound | 90% Upper Bound |
|-------------|-----------------|-----------------|-----------------|-----------------|
| 29.6103 | 18.7037 | 27.6759 | 15.4469 | 23.0660 |

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Error Correction Representation for the Selected ARDL Model
 ARDL(1,2,0,0,0) selected based on Schwarz Bayesian Criterion

 Dependent variable is dLRGDPK
 30 observations used for estimation from 1985 to 2014

| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
|-----------|-------------|----------------|---------------|
| dLRGDPK1 | -.44713 | .15868 | -3.4480[.005] |
| dLLFT | 13.2610 | 4.5643 | 2.9054[.008] |
| dLLFT1 | -13.9233 | 3.9062 | -3.5644[.002] |
| dLINV | -.10289 | .048722 | -2.1119[.046] |
| dLEXA | 1.7432 | .73503 | 2.3716[.027] |
| dLEXAF | -1.6882 | 1.4861 | -1.1360[.268] |
| dLEXN | 1.7032 | 1.6081 | 1.0591[.301] |
| ecm(-1) | -.53952 | .12583 | -4.2876[.000] |

Appendix C

Asymmetric Causality

DE+ to GDP+

This program performs an asymmetric causality test developed by Hatemi-J (2012).

Reference: Hatemi-J (2012) Asymmetric Causality Tests with an Application, Empirical Economics, 43:447_456

This program code is the copyright of the authors. Applications are allowed only if proper reference and acknowledgments are provided.
For non-Commercial applications only.

No performance guarantee is made. Bug reports are welcome.

AhatTU=

| | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|----------------|
| -3.4235088e+010 | 1.0090531 | 35.334215 | 4.2893255e+010 | -0.10510747 | -71.811229 | -4.0487966e+010 | 0.092886632 |
| 3.1117674e+008 | 0.00011692263 | 1.6629096 | -2.1101154e+008 | -0.00082807344 | -0.46311271 | 2.0094870e+008 | 0.00067728830 |
| 0.23426455 | -6.9186569e-015 | -4.6536320e-012 | 1.2499832 | 1.6740568e-014 | 6.0311661e-012 | -0.30826727 | 2.1965732e-014 |

AhatTR=

| | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|----------------|
| -3.5988419e+010 | 0.96806206 | 0.00000000 | 4.6567596e+010 | -0.037566640 | 0.00000000 | -4.7037692e+010 | 0.069872302 |
| 3.1117674e+008 | 0.00011692263 | 1.6629096 | -2.1101154e+008 | -0.00082807344 | -0.46311271 | 2.0094870e+008 | 0.00067728830 |
| 0.23426455 | -6.9186569e-015 | -4.6536320e-012 | 1.2499832 | 1.6740568e-014 | 6.0311661e-012 | -0.30826727 | 2.1965732e-014 |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 2.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 2.000
additional lags=1.000

Wstat = 5.493

Wcriticalvals=

10.733

6.489

4.874

DE- to GDP-

This program performs an asymmetric causality test developed by Hatemi-J (2012).

Reference: Hatemi-J (2012) Asymmetric Causality Tests with an Application, Empirical Economics, 43:447_456

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AhatTU=

| | | | | | | |
|----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
| 3.5270072e+009 | 0.90023908 | -1.4528217 | -5.4341599e+008 | -0.026937212 | 3.5054291 | 1.9541471e+009 |
| 84521635. | -0.0011371703 | 1.0795248 | -1.6420204e+008 | 0.00071734546 | -0.085823360 | 2.2372328e+008 |
| -0.16367251 | -4.0926558e-013 | -8.7648350e-012 | 1.2740392 | 1.8080829e-013 | 1.4353625e-011 | -0.28874489 |

AhatTR=

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|----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
| 3.4130834e+009 | 0.90009028 | 0.00000000 | -3.0898607e+008 | -0.025719292 | 2.0489361 | 1.6369805e+009 |
| 84521635. | -0.0011371703 | 1.0795248 | -1.6420204e+008 | 0.00071734546 | -0.085823360 | 2.2372328e+008 |
| -0.16367251 | -4.0926558e-013 | -8.7648350e-012 | 1.2740392 | 1.8080829e-013 | 1.4353625e-011 | -0.28874489 |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 1.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 1.000
additional lags=1.000

Wstat = 0.248

Wcriticalvals=

20.976

3.986

1.630

DE+ to GDP-

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|-----------------|----------------|-----------------|----------------|----------------|----------------|-----------------|
| 9.1663097e+009 | 0.81712759 | -4.5361582 | 6.0945202e+010 | 0.10526717 | 51.650915 | -5.7652022e+010 |
| -1.1914355e+008 | -0.00027341947 | 1.0920909 | 42281196. | 0.00029422555 | -0.11315874 | 20439625. |
| 0.22390637 | 1.8354227e-015 | -7.0936017e-012 | 1.2551992 | 1.7744331e-014 | 5.4520903e-012 | -0.28572687 |

AhatTR=

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|-----------------|----------------|-----------------|----------------|----------------|----------------|-----------------|
| 1.0687393e+010 | 0.81487290 | 0.00000000 | 5.7428947e+010 | 0.10743971 | 47.256223 | -5.4534834e+010 |
| -1.1914355e+008 | -0.00027341947 | 1.0920909 | 42281196. | 0.00029422555 | -0.11315874 | 20439625. |
| 0.22390637 | 1.8354227e-015 | -7.0936017e-012 | 1.2551992 | 1.7744331e-014 | 5.4520903e-012 | -0.28572687 |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 1.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 1.000
additional lags=1.000

Wstat = 0.032

Wcriticalvals=

12.808

4.843

2.674

DE- to GDP+

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|-----------------|----------------|-----------------|-----------------|-----------------|----------------|-----------------|
| -4.5245367e+010 | 0.81221691 | 1.6864994 | 5.0949606e+010 | 0.11110042 | 47.769040 | -5.6016106e+010 |
| 73436426. | -0.00023554493 | 1.0872450 | -1.4635815e+008 | 0.00028296827 | -0.11973666 | 2.0245962e+008 |
| -0.16983602 | 5.3316763e-014 | -9.7610322e-012 | 1.2723172 | -5.8023644e-014 | 1.3377251e-011 | -0.28892188 |

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|-----------------|----------------|-----------------|-----------------|-----------------|----------------|-----------------|
| -4.5108970e+010 | 0.81318819 | 0.00000000 | 5.0651513e+010 | 0.11023630 | 49.379056 | -5.5626778e+010 |
| 73436426. | -0.00023554493 | 1.0872450 | -1.4635815e+008 | 0.00028296827 | -0.11973666 | 2.0245962e+008 |
| -0.16983602 | 5.3316763e-014 | -9.7610322e-012 | 1.2723172 | -5.8023644e-014 | 1.3377251e-011 | -0.28892188 |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 1.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 1.000
additional lags=1.000
Wstat = 0.005
Wcriticalvals=
12.714
4.851
2.598

GDP+ to DE+

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|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|
| 3.1117674e+008 | 1.6629096 | 0.00011692262 | -2.1101154e+008 | -0.46311271 | -0.00082807345 | 2.0094870e+008 | -0.17516685 |
| -3.4235088e+010 | 35.334215 | 1.0090531 | 4.2893255e+010 | -71.811229 | -0.10510747 | -4.0487966e+010 | 37.138261 |
| 0.23426455 | -4.6536320e-012 | -6.9186574e-015 | 1.2499832 | 6.0311662e-012 | 1.6740567e-014 | -0.30826727 | -2.6742868e-012 |

AhatTR=

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|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|
| 3.1863978e+008 | 1.6449330 | 0.00000000 | -2.0085200e+008 | -0.42784977 | 0.00000000 | 1.5785145e+008 | -0.19447531 |
| - | | | | | | | |
| -3.4235088e+010 | 35.334215 | 1.0090531 | 4.2893255e+010 | -71.811229 | -0.10510747 | -4.0487966e+010 | 37.138261 |
| 0.23426455 | -4.6536320e-012 | -6.9186574e-015 | 1.2499832 | 6.0311662e-012 | 1.6740567e-014 | -0.30826727 | -2.6742868e-012 |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 2.000

Varorder chosen by information criterion (excluding augmentation lag(s)) is 2.000

additional lags=1.000

Wstat = 1.234

Wcriticalvals=

11.466

6.574

4.744

GDP- to DE-

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|----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
| 84521635. | 1.0795248 | -0.0011371703 | -1.6420204e+008 | -0.085823360 | 0.00071734546 | 2.2372328e+008 |
| 3.5270072e+009 | -1.4528217 | 0.90023908 | -5.4341599e+008 | 3.5054291 | -0.026937212 | 1.9541471e+009 |
| -0.16367251 | -8.7648350e-012 | -4.0926558e-013 | 1.2740392 | 1.4353625e-011 | 1.8080829e-013 | -0.28874489 |

AhatTR=

| | | | | | | |
|----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
| 79301327. | 1.0794111 | 0.00000000 | -1.7102882e+008 | -0.087793269 | -0.00029091346 | 2.2901594e+008 |
| 3.5270072e+009 | -1.4528217 | 0.90023908 | -5.4341599e+008 | 3.5054291 | -0.026937212 | 1.9541471e+009 |
| -0.16367251 | -8.7648350e-012 | -4.0926558e-013 | 1.2740392 | 1.4353625e-011 | 1.8080829e-013 | -0.28874489 |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 1.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 1.000
additional lags=1.000
Wstat = 0.145
Wcriticalvals=
20.966
3.926
1.794

GDP+ to DE-

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|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|---|
| 2.5487545e+008 | 1.6439418 | -0.0014416043 | -1.6116037e+008 | -0.42952527 | -1.6664417e-005 | 1.4457694e+008 | -0.19143700 | . |
| -3.3638170e+009 | -1.5327630 | 0.95655738 | 7.0822117e+008 | 1.9838225 | 0.0026030504 | -3.1546114e+009 | -0.35007233 | - |
| 0.25594971 | -4.1477742e-012 | -1.9591629e-013 | 1.2455471 | 4.9968646e-012 | 2.3821748e-013 | -0.30871794 | -4.1028943e-013 | |

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| | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|---|
| 2.7266800e+008 | 1.6459022 | 0.00000000 | -1.7714361e+008 | -0.42918714 | 0.00000000 | 1.4912189e+008 | -0.19406135 | - |
| -3.3638170e+009 | -1.5327630 | 0.95655738 | 7.0822117e+008 | 1.9838225 | 0.0026030504 | -3.1546114e+009 | -0.35007233 | - |
| 0.25594971 | -4.1477742e-012 | -1.9591629e-013 | 1.2455471 | 4.9968646e-012 | 2.3821748e-013 | -0.30871794 | -4.1028943e-013 | |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 2.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 2.000
additional lags=1.000
Wstat = 0.123
Wcriticalvals=
18.078
7.980
4.965

GDP- to DE+

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AhatTU=

| | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|---|
| -2.7253824e+008 | 1.6521820 | -0.0011958954 | -7.8135559e+008 | -0.44010476 | -0.00027723355 | 4.5290815e+008 | -0.19051167 | - |
| 5.6882348e+009 | -1.5525218 | 0.94060663 | 2.6175988e+009 | 1.9841414 | 0.00054161131 | -1.8196876e+009 | -0.28667062 | - |
| -0.17239514 | -7.8331183e-012 | -3.0556835e-013 | 1.2897090 | 1.1605222e-011 | 7.7969372e-014 | -0.33977152 | -3.2285125e-012 | - |

AhatTR=

| | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|---|
| -2.8875444e+008 | 1.6537892 | 0.00000000 | -7.8602631e+008 | -0.43932069 | 0.00000000 | 4.4646671e+008 | -0.19330443 | - |
| 5.6882348e+009 | -1.5525218 | 0.94060663 | 2.6175988e+009 | 1.9841414 | 0.00054161131 | -1.8196876e+009 | -0.28667062 | - |
| -0.17239514 | -7.8331183e-012 | -3.0556835e-013 | 1.2897090 | 1.1605222e-011 | 7.7969372e-014 | -0.33977152 | -3.2285125e-012 | - |

Information criterion used; lags based on that =Hatemi-J Criterion (HJC) 2.000
Varorder chosen by information criterion (excluding augmentation lag(s)) is 2.000
additional lags=1.000
Wstat = 0.104
Wcriticalvals=
18.028
7.561
4.838

