A CAUSALITY LINKAGE ANALYSIS OF FOREIGN DIRECT INVESTMENT, INTERNATIONAL TRADE AND ECONOMIC GROWTH IN INDIA

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ABSTRACT

This study has investigated short run causality among foreign direct investment, international trade and economic growth of India during 2000 to 2018 adopting Toda – Yamamoto (1995) modified Granger causality approach under VAR model. The quarterly data of foreign direct investment, export and gross domestic product are used for this study. Initially, the Augmented Dickey-Fuller test and Phillip-Perron test has been used to evaluate stationarity. Along with it, Perron Innovational Outlier and Additive Outlier model used to find out structural break point. As the variables under study have mixed order of integration, Toda – Yamamoto (1995) modified Granger causality test has been used for determining direction of causal linkage. The empirical results are indicating uni-directional causality from foreign direct investment to export and from gross domestic product to export in India.

Keywords: Foreign Direct Investment, Exports, Stationarity, Causality, Structural Break.

I. INTRODUCTION

Recent economic past indicated that two development has transformed the global economy. First, high degree of integration among different nations of the world and second, the fastest change in technological innovations which leads towards growth of the economy. Due to high degree of integration, country has become more opened to other country. The openness of economy has given appropriate channel for transfer of technology, human capital, knowledge and many more things. These transmission has spread rapid economic growth as well as development of international trade and foreign direct investment.

Foreign investment has incorporated an important role in the economic growth and development of most developing countries after 1980s. As such, these countries prefers to foreign direct investment as the primary resource to achieve rapid economic growth. As well as it stimulates exports by accumulating capital to raise export growth, aiding transfer of technologies and support to access new and profitable markets. On the other hand it also influences import of the nation at preliminary investment for setup and operational period. Foreign direct investment are expected to increase a country's output and productivity to boost domestic investment and to rouse the level of development. As such International trade and foreign direct investment are considered as important catalysts for economic growth and development.

With a view to make deep integration of India with global economy, a major economic reformation along with liberalization of trade and investment has been taken place in the year 1991. To accelerate economic growth, a more liberal policy towards foreign direct investment has been adopted by country. As a part of that, the reduction of tariff rate, reduction of quantitative restrictions on imports, opened up several sectors for foreign direct investment and allowed foreign institutional investors to make investment in India have been done. These modification has been realised as significant increase in level of international trade, foreign direct investment as well as economic growth of India.

The purpose of this paper is to evaluate short run causality short run causality among foreign direct investment, international trade and economic growth of India during 2000 to 2018 adopting Toda – Yamamoto (1995) modified Granger causality approach under VAR model.

II. LITERATURE REVIEW

The relationship among international trade, foreign direct investment and economic growth among various nations has been evaluated by numerous researchers. Fosu & Magnus (2006) examined the long run impact of foreign direct investment and trade on economic growth of Ghana. The study was conducted by using bound testing approach of cointegration during 1970 to 2002. The result indicates negative impact of FDI on growth while trade have positive significant impact on economic growth of Ghana.

Jayachandran & Seilan (2010) has evaluated causal relationship between foreign direct investment, international trade and economic growth of India from 1970 to 2007. There is existence of long-run equilibrium relationship among FDI, export, import and GDP. On the other hand, causality test revealed one-way causality running from export to GDP, export to FDI and FDI to GDP.

Fidrmuc & Martin (2011) have evaluated interlink between capital flows, exports and economic growth in the CESEE (Central, Eastern and South-eastern Europe) region from 1995 to 2009. By using vector error correlation model, the results indicated that there is positive relationship found between exports and industrial growth as well as between FDI and industrial growth in the CESEE region.

Adhikary (2011) has carried out linkage analysis among foreign direct investment, trade openness, economic growth and capital formation in Bangladesh. The study analysed variables by using Cointegration test, vector error correction model, impulse response and variance decomposition considering data from 1986 to 2008. The positive significant effect of volume of FDI and level of capital formation on economic growth has identified in Bangladesh while the negative effect of the degree of trade openness on economic growth has been also reported in the study.

Bhattacharya & Bhattacharya (2011) have examined the causal relationship between the volume of merchandise trade, foreign direct investment inflow and economic growth in India from 1996 to 2008. The granger causality test and cointegration analysis have revealed one-way causality running from merchandise trade to economic growth and feedback causality found between economic growth and FDI.

By using principal components analysis, Muibi (2012) has examined interactive and direct effects of capital flows, economic growth and trade openness for Nigeria during 1960 to 2011. The study found significant effect of capital inflow and trade on economic growth in Nigeria. The result of the present study supports the modernization hypothesis which believes that international trade and international capital inflow are complementary and they creates growth enhancing effect in developing economies.

The causal links between foreign direct investment, international trade and economic growth in Bangladesh has been investigated by Meerza (2012). The study has been analysed using variables as export, GDP and FDI by implementing Johansen cointegration test and Granger causality test from 1973 to 2008. The unidirectional causality found from GDP to export, from export to FDI and from GDP to FDI. The interrelationship among foreign direct investment, domestic investment, international trade and economic growth in selected South Asian countries during 1973 to 2010 has been analysed by Awan et.al. (2012). The result indicates more evidence of export based growth compare to FDI based growth in all selected South Asian countries. Imports are caused by economic growth. Alternatively, the bi-directional causality reported between trade openness and FDI.

Keho (2015) analysed the relationship among foreign direct investment exports and economic growth in 12 selected sub-Saharan African countries during 1970 to 2013. The result indicates positive long-run effect of growth on FDI in five countries and positive long-run effect of exports on FDI in four countries. Ali & Xialing (2017) examined relationship of international trade, foreign direct investment and economic growth in Pakistan during 1991 to 2015. The result of the study indicates positive relationship among international trade, foreign direct investment and economic growth of Pakistan.

The discussion of past study indicated mixed results about direction of causality and relationship. Thus, the present study focuses in testing short-run causality among foreign direct investment, international trade and economic growth of India during 2000 to 2018. The Toda and Yamamoto (1995) modified Granger causality approach under VAR model has been used for evaluating relationship. Structural break unit toot tests also used to identify structural break point and to consider it for evaluating causality. The paper is written in following sections. Section 1 covers the brief introduction of the study. Section 2 indicates reviews of the past studies. Section 3 presents data sources and econometric methods used in the study. Section 4 presents the analysis of the empirical results, follows by a very brief summary in section 5.

III. RESEARCH METHODOLOGY

The purpose of the present study is to investigate short-run causality among foreign direct investment, international trade and economic growth of India. The study period is from first quarter of 2000 to second quarter of 2018. This gives 74 quarterly time point observations. The variables considered are foreign direct investment, export and gross domestic product with 2011-12 as base year. The entire data set, has been compiled from Reserve Bank of India: Handbook of Statistics on the Indian Economy, available at the RBI website https://dbie.rbi.org.in.

The analysis proceeded with following steps: First, the time series data is converted in natural logarithm form. The log transmitted quarterly time series data of export, FDI and GDP are used for the analysis. Second, Augmented Dickey Fuller (ADF) test and Phillip- Perron test are used to evaluate stationarity of time series without considering structural break. Third, Structural break unit root tests is conducted to determine break dates. For this study, Perron (1997) unit root test in presence of structural beaks is applied for the variables of under investigation. Finally, the Toda-Yamamoto (1995) modified Granger Causality approach under VAR system is used to investigate causality.

Augmented Dickey-Fuller Test

ADF test is an augmented form of the Dickey-Fuller test for a large and more complicated set of time series models. It is necessary to first focus on Dickey-Fuller test as ADF test drive from DF test. The DF test is estimated in three different forms as given:

Yt is a random walk: $\Delta Yt = \delta Yt\text{-}1 + ut$ (1)

Yt is a random walk with drift: $\Delta Yt = \beta 1 + \delta Yt\text{-}1 + ut$ (2)

Yt is a random walk with $\Delta Yt = \beta 1 + \beta 2t + \delta Yt\text{-}1 + ut$ (3)
drift around a deterministic trend:

Where t is the time or trend variable. In each of the form of DF test, the hypothesis is: H0: $\delta = 0$ (i.e. there is unit root or the time series is non-stationary). If $\delta = 0$, null hypothesis is accepted; i.e. time series variable is non-stationary or there is unit root. While if $\delta < 0$, null hypothesis is rejected; i.e. time series variable is stationary. ADF test is conducted by “augmenting” the above three equations by including the lagged values of the dependent variable ΔYt. The ADF test consist of estimating the following regression:

$$\Delta Yt = \beta 1 + \delta.Yt\text{-}1 + \beta 2.t + \sum_{(t=1)}^{m} \alpha i \Delta Yt\text{-}i + \varepsilon t \quad (4)$$

Where εtis a pure white noise error term, δ is the coefficient of lagged Yt-1 and ΔYt-1 ¬¬is equal to (Yt-1 – Yt-2), ΔYt-2 = (Yt-2 – Yt-3), etc. ADF test will still evaluates the same thing as in DF test whether $\delta = 0$. In short, both the tests have same critical value.

Phillip-Perron Test

The DF test has been modified by Phillips-Perron (1988) and introduced PP test. The PP test can be applied when error terms are not uncorrelated, homoscedastic as well as identically and independently distributed (iid). Phillips- Perron (PP) has introduced a nonparametric method of adjusting serial correlation in the error term using the following regression, which is estimated by using the ordinary least squares (OLS) method:

$$\Delta Yt = \beta 1 + \delta.Yt\text{-}1 + \varepsilon t \quad (5)$$

Where, εtis I(0) and may be heteroskedastic. The benefit of using PP test is that it can be applicable for frequency domain approach. The PP test is follows the critical value similar as DF test. However, the PP test has more power of rejecting the null hypothesis of unit toot.

Beak Point Unit Root Test

A break point is a place or time at which an interruption or change is taken place in the trend. In Econometrics, a structural break or structural change is an unpredicted change in the time series that may create forecasting errors and unreliability of the model in general (Gujarati, 2007). The structural breaks occurs due to economic changes such as; financial crisis, institutional changes, policy changes, regime changes or random shocks at domestic and international level in long run time series variables. In this study Perron (1997) Innovational

Outlier and Additive Outlier model has been used for determining structural break point with evaluation of stationarity.

a. Perron Innovational Outlier Model

Perron (1997) re-examine his 1989 results with modification by introducing unknown break point. He represented statistical procedure which is used to test unit root with unknown structural break in trend function. According to Perron (1997), the Innovational outlier (IO) model evaluates break point considering gradual changes in intercept of time series (IO1) as well as gradual changes in both intercept and the slope (IO2) of the trend function as follows:

IO1: $Y_t = \beta_1 + \gamma.DU_t + \beta_2.t + \theta.D(T_b)_t + \alpha.Y_{t-1} + \sum_{t=1}^{m} c_i\Delta Y_{t-i} + \varepsilon_t$ (6)

IO2: $Y_t = \beta_1 + \gamma.DU_t + \beta_2.t + \delta DT_t + \theta.D(T_b)_t + \alpha.Y_{t-1} + \sum_{t=1}^{m} c_i\Delta Y_{t-i} + \varepsilon_t$ (7)

Where T_b stands for the time of break ($1<T_b<T$) which is unknown, $DU_t = 1$ if $t > T_b$ and zero otherwise, $DT_t = T_t$ if $t > T_b$ and zero otherwise, $D(T_b)_t = 1$ if $t = T_b+1$ and zero otherwise, Y_t is any general ARMA[1] process and ε_t is the white noise residual term. If the absolute value of the t-statistic for $\alpha = 1$ is greater than critical value, the null hypothesis of unit root is rejected.

b. Perron Additive Outlier Model

In contrary to the evaluation of gradual change with the help of IO model, the immediate structural changes in time series allows in Additive Outlier model (AO). The two-step procedure is given for evaluating stationarity under the AO framework. In first step, the trend is removed from the time series:

$Yt = \beta 1 + \beta 2.t + \delta DTt^* + \tilde{y}t$ (8)

¬Where, ỹt is detrended series. The reason for using detrended time series is that the AO framework assumes that only slope coefficient is influenced by the structural break. Thus, the second step evaluates change in the slop coefficient as follows:

ỹt = α.ỹt-1 + ∑_(t=1)^m ciΔYt-i + εt (9)

The IO model and AO model has been applied on time series variables included in the present study.

Modified Granger Causality test under VAR system

This section will be divided into two parts: (1) Illustrating the traditional Granger Causality test and (2) Explaining Toda and Yamamoto modified Granger Causality Procedure

[1]ARMA indicates autoregressive moving average process. This process includes two parts: first, an autoregressive (AR) part represents regressing the variable on its own lagged (past) value. Second, Moving Average (MA) part represents modelling error term as linear combination of error terms happening at different times in the past.

a. Traditional Granger – Causality Test

Granger (1969) has proposed the most common way to investigate causality between two variables. In case of two variables, the definition of Granger Causality stated Y is said to Granger cause X if Variable X can be predicted effectively by using the past values of both variables i.e. X and Y either than just by using past value of variable X. The Granger causality test can be estimated by following simple Vector Autoregression (VAR):

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_j X_{t-j} + u_{1t} \qquad (10)$$

$$Y_t = \sum_{i=1}^{n} \lambda_i Y_{t-i} + \sum_{j=1}^{n} \delta_j X_{t-j} + u_{2t} \qquad (11)$$

Here, it is assumed that the disturbances u_{1t} and u_{2t} are uncorrelated. Equation (10) denotes that variables X is defined by lagged variables Y and X, and similarly Equation (11) Variables Y is defined by lagged variable X and Y. [2]However, traditional Granger-Causality has its own limitations:

First, the problem of specification bias will occur if two variables Granger-Causality test conducted without considering the effect of other variables. Granger causality test will reveal different result if variable is relevant and not included in the model. Second, such tests are prepare based on asymptotic theory. Asymptotic theory is valid only for stationary variables. Third, time series data are often non-stationary. This situation leads towards the problem of spurious regression. Gujarati (2006) has also said that when the variables are integrated, the F-test procedure is not valid, as the test statistics do not have a standard distribution.

b. Toda- Yamamoto (1995) procedure to test Granger Causality

In order to avoid problems of usual Granger Causality test and complexity in deciding integration, Toda and Yamamoto (1995) proposed modified Wald test for testing Granger causality which allow causal link to be conducted in level VARs. Toda and Yamamoto procedure is a methodology of statistical inference, which makes parameter estimation valid even when the VAR system is not co-integrated. Further, the Toda- Yamamoto procedure is simple and convenient to implement as well as allow linear and non-linear tests of restrictions.

The approach for modified Granger causality test used in the study is as follows: First, Unit root test need to be conduct for determined maximum order of integration (m) of each time series variables. In order to identify structural break, breakpoint unit root test has been used and dummy variables is created. Second, VAR model is set in level without considering order of integration of

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[2] VAR can add constant term, which depends on economic theory.

variables. Third, the optimum lag length of each variables in the VAR is determined by using Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion. While selecting lag length, there is need to check autocorrelation in residuals. If selected lag length face problem of autocorrelation, lag length may be increase slightly. Similarly, the normality should also be check for VAR residuals. Forth, if the time series variables have same order of integration, then Johansen cointegration test is applied to check cointegration among variables. Fifth, the selected VAR model is constructed with additional m lags of each variables. These additional m variables are treated as exogenous to the VAR model. The structural dummy is also added as exogenous variable. The new VAR model used for testing modified Granger causality is presented as follows:

$$X_t = \alpha + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=P+1}^{p+m} \alpha_j Y_{t-j} + \sum_{i=1}^{p} \beta_i X_{t-i} + \sum_{j=p+1}^{p+m} \beta_j X_{t-j} + u_{1t} \quad (12)$$

$$Y_t = \beta + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=P+1}^{p+m} \alpha_j Y_{t-j} + \sum_{i=1}^{p} \beta_i X_{t-i} + \sum_{j=p+1}^{p+m} \beta_j X_{t-j} + u_{2t} \quad (13)$$

Finally, the hypothesis testing can be conduct that, coefficient of only p lagged values of variables are restricted to zero. Hypothesis is tested by using standard Wald test. The Wald statistics with the null hypothesis will be asymptotically distributed as chi-square with p degree of freedom. The following section represented empirical results along with its discussion.

IV. DATA AND EMPIRICAL RESULTS

This section presents the empirical results of the study. Stationarity testing is important form the point of knowing the order of integration of time series variables. So before proceeding with Toda-Yamamoto Granger causality test, it is necessary to determine the order of integration for time series. For the same, the ADF and PP test is conducted for log of export, log of FDI and log of GDP to evaluate stationarity property of time series. The result of ADF and PP test is reported in Table 1.

The result of ADF and PP test at level and first difference for each variables are reported in Table 1. The null hypothesis of unit root under ADF test cannot rejected for LEX, LFDI and LGDP, indicating that log of Export, log of FDI and log of GDP contain unit root at the level. After taking the first difference, ADF test are conducted and found that null hypothesis of unit root can be rejected for LEX, LFDI and LGDP. Thus, export, FDI and GDP are integrated of first order, i.e., I(1) as per ADF test.

However, the result of PP test indicates that LEX is stationary at first difference while LFDI and LGDP are stationary at level itself. This indicates that LFDI and LGDP are I(0) while LEX is I(1) as per result of PP test. Thus, ADF and PP unit root test are indicating different result. To make result of order of integration more clear and to identify structural break point, Perron (1997) Innovational Outlier (IO) and Additive Outlier (AO) model has been used. The result of IO and AO models are represented in table - 2:

The result of IO and AO model represented in table 2 indicates that LEX and LFDI are stationary at level while LGDP contain unit root with structural break. Thus, the result of IO model indicates that LEX is found to be stationary with significant structural break at third quarter of 2010. The result of AO model also indicates that LEX is stationary with significant structural break point at third quarter of 2013, LFDI is stationary with significant structural break point at fourth quarter of 2008 while LGDP contain a unit root with significant structural break point at second quarter of 2010.

After testing structural break points and stationarity, the vector autoregression (VAR) among LEX, LFDI and LGDP as well as modified Granger Causality test results are presented and discussed. But first the optimum lag length for the VAR (i.e. the number of lagged regressors to be incorporated in the VAR) needs to be found. The result of optimum lag length selection criteria are presented in Appendix-A1.

Most criteria suggest that 4 endogenous lags must be chosen in the VAR model. According to Toda-Yamamoto (1995) approach (p+m) lags have to be incorporated in the VAR model where m is the minimum order of integration of the variables in the group. While maximum order of integration in the group is 1, an additional 5th period lagged terms of both variables are introduced in the VAR as exogenous variables as per Toda-Yamamoto (1995) requirements. Apart from the intercept or constant, a structural break dummy variables is also included. The estimated results of the VAR among LEX, LFDI and LGDP are presented in Appendix-A2.

Before conducting Wald test for Granger Causality the statistical robustness of the VAR must be ensured. For the same, serial correlation LM test is conducted and results are presented in Table 3.

The result of Table 3 reveals that serial correlation is absent in the VAR residuals till lag 8. Thus, Wald test result for Granger Causality among LEX, LFDI and LGDP are presented in Table 4.

The first null hypothesis that LGDP does not Granger-cause LEX is rejected at 1 percent level of significance. Thus, alternative hypothesis is LGDP causes LEX is accepted. The second hull hypothesis LFDI does not Granger-cause LEX is rejected at 5 percent level of significance. Thus, alternative hypothesis is LFDI causes LEX is accepted. Similarly, the joint hypothesis also indicates that LGDP and LFDI make granger cause impact of LEX.

However, all other null hypothesis are rejected at 5 percent level of significance. Thus, overall result indicates that there is unidirectional causality runs from GDP to export and from FDI to export. So, the level of export in India is found to be influenced by gross domestic product and level of foreign direct investment.

V. CONCLUSION

The present study has tested for short run causality among foreign direct investment, international trade and economic growth of India during 2000 to 2018. The Toda-Yamamoto (1995) modified Granger causality approach under a VAR model is used for the evaluation of causality. The Augmented Dickey Fuller and Phillip- Perron test are used to evaluate stationarity. Along with it, Perron Innovational outlier and additive outlier model are used to evaluate stationarity considering structural break point in time series variables. The findings are suggestive of uni-directional causality from foreign direct investment to international trade and from economic growth to international trade in India. Thus, the short run causality linkage found from foreign investment towards international trade and from economic growth towards international trade, indicates that level of foreign investment and economic growth make influence on level of international trade of India in short run.

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List of Tables

Table 1: Result of Augmented Dickey-Fuller test and Phillip-Perron test

Variables	ADF test		PP test	
	At Level	At First Difference	At Level	At First Difference
LEX	-1.5172 (0.8148)	-10.2161 (0.0000)	-1.3578 (0.8650)	-10.8790 (0.0000)
LFDI	-1.6656 (0.7562)	-9.5283 (0.0000)	-3.8615 (0.0187)	
LGDP	-1.5801 (0.7908)	-3.8598 (0.0191)	-6.6336 (0.0000)	

Table 2: Result of Perron Innovational Outlier and Additive Outlier Model

Variables	IO Model	Break Point	AO Model	Break Point
LEX	-4.8597 (0.0299)	2010Q3*	-46028 (0.0135)	2013Q3*
LFDI	-4.6165 (0.0500)	2008Q3	-4.9339 (<0.01)	2008Q4*
LGDP	-2.8541 (0.5294)	2007Q3	-2.5216 (0.5594)	2010Q2*

Table 3: The Residual Serial Correlation LM Test

Lags	LM-Stat	Prob
1	8.517205	0.4830
2	7.596297	0.5753
3	10.54644	0.3081
4	8.492582	0.4854
5	6.911035	0.6464
6	6.043804	0.7355
7	5.682607	0.7712
8	11.07022	0.2709

Table 4: Modified Granger Causality Test among FDI, Export and GDP

Excluded	Chi-sq	df	Prob.
Dependent variable: LEX			
LGDP → LEX	16.68999	4	0.0022
LFDI → LEX	9.665780	4	0.0465
LGDP & LFDI → LEX	27.71270	8	0.0005
Dependent variable: LGDP			
LEX → LGDP	2.947996	4	0.5666
LFDI → LGDP	5.637247	4	0.2279
LEX & LFDI → LGDP	10.54494	8	0.2288

Dependent variable: LFDI			
LEX → LFDI	2.397808	4	0.6630
LGDP → LFDI	1.878199	4	0.7581
LEX & LGDP → LFDI	5.468605	8	0.7065

Appendix

A1: Optimum Lag Length Selection in the FDI-EX-GDP VAR model

Lag	FPE	AIC	SC	HQ
0	0.000789	1.368644	1.465008	1.406921
1	2.68e-06	-4.314815	-3.929358	-4.161707
2	2.90e-06	-4.238700	-3.564152	-3.970761
3	6.03e-07	-5.813014	-4.849373	-5.430244
4	3.59e-07*	-6.339058*	-5.086325*	-5.841458*

A2: Estimated VAR among FDI-EX-GDP model

	LEX	LFDI	LGDP
LEX(-1)	0.767522	-0.345206	-0.002778
	(0.14452)	(0.70965)	(0.03356)
	[5.31101]	[-0.48645]	[-0.08278]
LEX(-2)	0.122420	1.182137	-0.041230
	(0.17916)	(0.87977)	(0.04161)
	[0.68331]	[1.34369]	[-0.99087]
LEX(-3)	-0.206467	-0.773404	0.019805
	(0.16440)	(0.80731)	(0.03818)
	[-1.25585]	[-0.95800]	[0.51867]
LEX(-4)	0.114365	0.163225	-0.002795
	(0.16544)	(0.81240)	(0.03842)
	[0.69128]	[0.20092]	[-0.07275]
LFDI(-1)	0.027417	0.273959	-0.004893
	(0.02906)	(0.14270)	(0.00675)
	[0.94350]	[1.91987]	[-0.72498]
LFDI(-2)	0.012085	0.159375	-0.009390
	(0.03079)	(0.15118)	(0.00715)
	[0.39252]	[1.05419]	[-1.31316]
LFDI(-3)	-0.096868	0.287880	-0.004176
	(0.03155)	(0.15491)	(0.00733)
	[-3.07058]	[1.85832]	[-0.56990]
LFDI(-4)	0.024631	0.065288	-0.001643
	(0.03419)	(0.16787)	(0.00794)
	[0.72051]	[0.38892]	[-0.20690]
LGDP(-1)	1.056829	2.330340	0.671328
	(0.45969)	(2.25734)	(0.10677)
	[2.29899]	[1.03234]	[6.28789]

	LEX	LFDI	LGDP
LGDP(-2)	-1.086721	0.884293	-0.096885
	(0.37072)	(1.82044)	(0.08610)
	[-2.93137]	[0.48576]	[-1.12524]
LGDP(-3)	0.811544	-0.955701	0.139031
	(0.36678)	(1.80111)	(0.08519)
	[2.21260]	[-0.53062]	[1.63208]
LGDP(-4)	-0.466491	0.356329	0.811990
	(0.36010)	(1.76831)	(0.08364)
	[-1.29543]	[0.20151]	[9.70868]
C	-1.406054	-0.715221	-0.381200
	(1.32624)	(6.51254)	(0.30802)
	[-1.06018]	[-0.10982]	[-1.23757]
D_2008Q4AOFDI	-0.077558	-0.263476	-0.003523
	(0.04819)	(0.23663)	(0.01119)
	[-1.60945]	[-1.11343]	[-0.31476]
D_2010Q2AOGDP	0.075128	-0.112565	-0.025044
	(0.04733)	(0.23239)	(0.01099)
	[1.58748]	[-0.48438]	[-2.27851]
D_2013Q3AOEX	-0.084584	-0.026957	-0.005116
	(0.03517)	(0.17270)	(0.00817)
	[-2.40503]	[-0.15609]	[-0.62637]
LEX(-5)	0.104322	0.322295	0.038314
	(0.12595)	(0.61849)	(0.02925)
	[0.82827]	[0.52110]	[1.30976]
LFDI(-5)	0.043879	-0.028217	0.003450
	(0.03127)	(0.15358)	(0.00726)
	[1.40301]	[-0.18373]	[0.47490]
LGDP(-5)	-0.094126	-2.821249	-0.480612
	(0.46634)	(2.28999)	(0.10831)
	[-0.20184]	[-1.23199]	[-4.43742]
R-squared	0.994469	0.910490	0.998699
Adj. R-squared	0.992477	0.878266	0.998230
Sum sq. resids	0.223751	5.395400	0.012069
S.E. equation	0.066896	0.328494	0.015537
F-statistic	499.4049	28.25540	2132.057
Log likelihood	99.82408	-9.981445	200.5591
Akaike AIC	-2.342727	0.840042	-5.262582
Schwarz SC	-1.727538	1.455231	-4.647394
Mean dependent	7.650360	5.539590	9.763366
S.D. dependent	0.771276	0.941503	0.369337
Determinant resid covariance (dof adj.)		1.13E-07	

	LEX	LFDI	LGDP
Determinant resid covariance		4.29E-08	
Log likelihood		291.5806	
Akaike information criterion		-6.799438	
Schwarz criterion		-4.953872	

ABOUT AUTHOR

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