Linkages between Real Sector and Financial Sector in Nepal: A Vector Error Correction Model

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Abstract

The financial development is considered as a pre-requisite condition for the overall economic development of the nation and rousing to economists. This paper investigates the short run and long run causality between monetary variables (M_1, CPI, NFA, DC) and real sector variables (GDP, TE, TI) of Nepal using some of the econometric techniques like Johansen's co-integration analysis and the Vector Error Correction Model (VECM). The study employs the data from 1975 to 2014. The results of the investigation aver that there exists short run and long run causality between monetary and real sector variables. The impulse responses of exports and domestic credits show that these variables have positive impacts on the economic growth which is consistent with the theoretical frameworks. The impulse responses of GDP to domestic credit seemed insignificant in the short run and started to be significant in the long run gradually. On the contrary to this, the impulse response of GDP and domestic credit to export seemed negatively responsive. So, giving proper focus on the macroeconomic policies and strategies which reduces the nebulous situations of economy and promote the allocation of resources, production activities, and competitiveness to increase the domestic credits and exports will probably promote economic development of the nation.

Key Words: *Linkages, Speed of Adjustment, VECM,*

I. INTRODUCTION

. The development of the financial sector is considered as the pre-requisite condition for the development of a nation and this issue is rousing to economists and researchers. A well-developed financial sector can improve the efficiency of allocation of capital resources and also promote savings. Financial development could expand investors' opportunities and increase resource allocation to productive sectors. Financial development can spur economic growth through two channels: capital accumulation and technological innovation. As a result of the

growth of an economy, the demand for financial services rises. Therefore, economic development can also in turn foster development in the financial system (Wongpiyabovorn, 2014).

A close mutual relationship exists between the financial sector and real economy. Capital can trigger economic growth. On the other hand, financial wealth cannot sustain itselfindefinitely without an adequate "real economy" foundation (Peetz & Genreith, 2011). Financial intermediaries aid investment and economic growth by mobilizing savings. They provide lenders financial instruments of high quality and low risk, and buy the liabilities of borrowers at lower liquidity, lower yield and a larger principal (Kularatne, NA).

The development of the financial sector is crucial to drive the development of the economy. Therefore, it is important for developing countries to keep abreast of the development and changes in other countries as well as improving its own economic performance. With the growing integration and complications of the worldwide financial system, the challenge for the developing countries financial system is to cope with the changing market. Attractive investment incentives, a productive workforce and political stability are strong points for the nation, as they can lead to sustained growth in the inflow of investments into the economy. Moreover, the country on which financial systems are well set and cost-effectiveness are abundant to operate business in the long run are suitable for investment and hence economic development. (Taha R.et.al.2009).

An efficient and robust financial structure plays a vital role in the advancement of economic sector. A well-structured, efficient, systematized and sustainable financial system is a pre-requisite for real sector growth. Sound and robust financial structure of a country plays a vital role in the development of an economy through proper and efficient use of financial resources- that a banking system has. Banking institutions plays the role of financial intermediary as they collect savings of the community and then efficiently channelize it to entrepreneurs for productive use. Thus, financial sector developments promote and strengthen competition and innovative activates in the economy that ultimately enhance efficiency. A sound financial system is considered a key to economic development (Rehman & Cheema, 2013).

Financial intermediation is the process through which financial institutions transfer financial resources from surplus units of the economy to deficit ones. However, for financial institutions to discharge this role effectively, they have to be developed in

terms of liquidity, variety of financial assets and efficiency in credit allocation (Abubakar & Gani, 2013).

Nepal is a developing country with a primitive situation of financial development and the low economic growth. The average growth rate of Nepal over the last ten years is 4.0 percent (Economic Survey, 2013). So, what is the existing situation of monetary variables and their influences in economic development? What course of action is essential for the smooth functioning of the economy with the lubrication of financial sector ?The answers of these questions have the great importance. In this scenario this study investigates short run and long run causalities of the monetary and real sector variables to foster the economic development of Nepal. The main objectives of this study are (a) to analyze the short run and long run causality of monetary variables like M_1,CPI, DC and NFA along with the real sector variables like GDP, TE and TI on economic growth. (b) to analyze the impulse responses of gross domestic product, domestic credit and exports (c) to recommend the further analytical frameworks for the research which are of great importance on economic policy implications. This paper uses some of the selected variables only and uses some basic econometric techniques like Johansen's Co-integration test and Vector Error Correction Model to trace out the pith which are the limitations of the study.

The rest of the paper is organized as: second chapter presents some reviews of literatures, third chapter presents the methodology and model specification, chapter four presents the empirical findings and finally chapter five concludes the paper with some recommendations

II. REVIEW OF LITERATURE

The inter-relationships between real and monetary variables is of great importance and researchers are giving proper focus in this area. Among them the studies of Abubakar and Ghani (2013), Samsi,et.al.(2012), Kiszito (2013), Akinbobola (2012), Mello.L.D & Pisu.M.(2009), Rehman,A.& Ceema,A.R.(2013) are reviewed as literatures.

Abubakar and Ghani (2013) made a study related to the interlink ages between financial indicators and real sector indicators of Nigeria using the vector error correction model. The findings of the study revealed that in the long-run, liquid liabilities of commercial banks and trade openness exert significant positive influence on economic growth, conversely credit to the private sector, interest rate spread and government expenditure exert significant negative influence. The findings implied that, credit to the private sector is marked by the identified

problems and government borrowing and high interest rates are crowding out investment and growth.

Samsi.et.al. (2012) explored the dynamic interaction between the real sector and the financial sector in Malaysia. They used the error-correction model to examine the significant role of financial variables on real output in the long-run as well as in the short run. The findings of the study suggest that there exists the long term relationship between the real sector and the financial sector. Based on the study they concluded that for the sustainability of output growth, strengthening and establishing a well-developed banking sector is essential.

Kiszito (2013) discovered from the study that though the long run relationship exists between money market and economic growth in Nigeria, but the current state of the Nigerian money market does not have significant impact on economic growth. Econometrics techniques like OLS, Augmented Dickey Fuller Test, Johansen Co-integration tests and Vector Error Correction models were performed in the study to see the unit root and co-integration of the data as well as the long run and short run causality. The study concludes that the government should create the appropriate macroeconomic policies, legal framework and sustain the current reforms with a view to developing the market so as to promote productive activities, investment opportunities and hence the economic growth.

Akinbobola (2012) analyzed the dynamics of money supply, exchange rate and inflation in Nigeria using the vector error correction approach. The empirical results of the study confirms that in the long run, money supply and exchange rate have significant inverse effects on inflationary pressure, while real output growth and foreign price changes have direct effects on inflationary pressure. There exists a causal linkage between inflation, money supply and exchange rate in Nigeria.

Mello.L.D & Pisu.M.(2009) tested the existence of bank lending channel in the transmission of monetary policy in Brazil using vector error correction model. The main finding of the test is loan supply is negatively related to the interbank deposit certificate rate in the long term and short term dynamics show that loan demand is equilibrium correcting.

Rehman, A. & Ceema, A.R. (2013) empirically examines the long run and casual relationships between financial intermediation and real sector growth in Pakistan. The study tries to dig out the answer of the question like does financial development follows a supply leading, demand following or feedback hypotheses. The results show a single co-integration relationship among the variables of financial

intermediation and real sector growth. The demand following hypothesis (i.e.Causality runs from real sector growth to financial intermediation) is supported through variable of private credit in Pakistan. The conclusion of which is there exists causal relationship between the real and monetary variables.

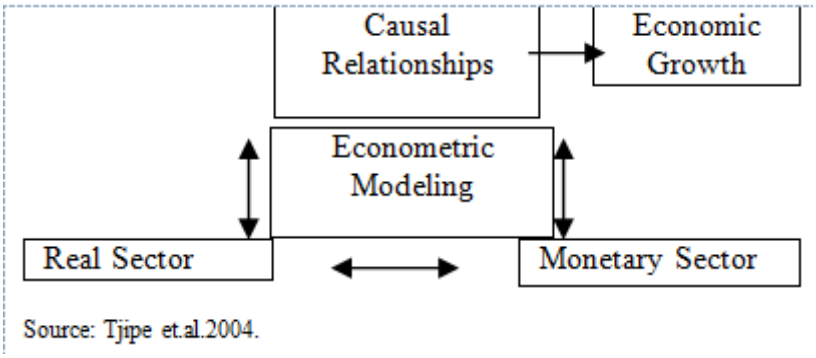
III. METHODOLOGICAL FRAMEWORK

3.1 Data and Test

To analyze the association ship among the variables of real and financial sector the sample data are taken from 1975 to 2014 with 40 sample points published by central bank and Ministry of Finance of Nepal.

After taking the data stationary test is done through the graph and diagnostic test is performed with the help of Augmented Dickey Fuller Test. In addition to this Ljung Box Test is also performed to test the presence of autocorrelation. The level and log data suffer from the unit root revealing that the data are not stationary. So, the further step to manipulate data in log difference form shows absence of unit root (Table 1). This concludes that the data can be used in the modeling process after log difference.

Similarly, the Johansen Co-integration test is performed to the level data whether the variables are co-integrated or not. The test reveals that there exist six co integrating equations. As the variables are co integrated we can use the vector error correction model to specify the short run and long run causality of the variables. The schematic representation of the model is given as follows:



Source: Tjipe et.al.2004.

The theoretical framework of the model is based upon the reduced form of NAMEX (Tjipeet.all 2004) in which different four sectors are considered: Real Sector, Fiscal Sector, Monetary Sector and the Price Sector. Among them only two sectors are taken in this study i.e. real and monetary with the real variables GDP, TE and TI

andthe monetary variables M_1, CPI, NFA and the DC. The interlink ages of these variables are analyzed in the study.

3.2 Model Specification

It is obvious that national output is the complex function of different activities done within the economy plus net exports. In this study a model of GDP is defined as a function of different monetary and real sector variables and this can be represented as:

$$GDP_t = f(GDP_{t-1}, M_1, P, DC, NFA, TE, TI) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where GDP is nominal gross domestic product which is considered as the total output of an economy, M_1 is the money supply which reflects the money available in the transaction channels, P is the price level measured by CPI which is considered as a proxy variable for the measurement of the influence of changes in the price level, DC is the domestic credit that is created by the banking sector and considered as the key channel for the mobilization of resources, NFA is the net foreign assets that is accumulated in the banking systems, TE is the total exports and TI is the total imports.

The vector error correction model based on the study of Abubakar and Ghani(2013) is specified as follows.

$$\begin{aligned}\Delta \ln(GDP)\,t = \beta 0 + \sum_{i=1}^{6} \beta 1 \Delta \ln(GDP)\,t-1 + \sum_{i=1}^{6} \beta 2 \Delta \ln(M1)\,t-1 \\ + \sum_{i=1}^{6} \beta 3 \Delta \ln(CPI)\,t \\ - 1 \sum_{i=1}^{6} \beta 4 \Delta \ln(DC)\,t-1 + \sum_{i=1}^{6} \beta 5 \Delta \ln(NFA)\,t-1 + \sum_{i=1}^{6} \beta 6 \Delta \ln(TE)\,t-1 \sum_{i=1}^{6} \beta 7 \Delta \ln(TI)\,t-1 \\ + \delta ECT\ t-1 + \epsilon\end{aligned}$$

…….. (2)

Where βs are the coefficients of respective variablesΔ is the difference operator of logged variables.

3.3 Impulse Response Analysis

Once the VECM has been estimated, short run dynamics can be examined by considering the impulse response functions (IRF). These functions show the response of each variable in the system to a shock in any of the other variables. The

IRF should be calculated from the Moving Average Representation of the VECM. In this study the impulse response of GDP, domestic credit and exports are observed using the Cholesky IRF with the help of software eviews. The rationale of choosing these three variables is to analyze the link between monetary and real sector with one variable of each

IV. EMPIRICAL RESULTS

4.1. Unit root test

The variables are treated as the unit root test through the Augmented Dickey Fuller Test at level, at log and log difference. The variables bear the unit root at level and log which indicate the presence of non-stationary of the data. When the data are treated the unit root test through ADF in log difference the unit root remained absent which data are employed in modeling process (Table No. 1).

Table No. 1: Unit Root Test

Variables	ADF Test					
	Level		Log		Log Diff.	
	T Statistics	P-values	T Statistics	P-values	T Statistics	P-values
GDP	4.2458	1.0000	-0.2373	0.9248	-4.3780	0.0013
M1	0.3888	0.9792	1.2495	0.6430	-5.9539	0.0000
CPI	3.0110	1.0000	0.4197	0.8958	-4.7834	0.0004
DC	4.9501	1.0000	-1.7936	0.3781	-6.0991	0.0000
NFA	0.9002	0.9941	-0.0342	0.9495	-5.7361	0.0000
TE	1.6733	0.9994	-0.9990	0.7442	-5.3264	0.0001
TI	4.0204	1.0000	-0.3492	0.9079	-5.0970	0.0002

Source : Test Performed by Author

4.2. Co-integration test

The variables are tested whether they are co-integrated or not through the method of Johansen Co-integration Test. As the null hypothesis having the co-integrated equation of none to at most 5 are rejected and at most 6 is accepted. This indicates that there are at most 6 co-integrated equations existing in the model. The result of which is that the variables have the long run association ship. As the variables are co-integrated or having the long run association ship we can use the vector error correction model (Table No.2).

Table No. 2: Johansen Co-integration Test

Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(S)	Eigen value	Trace Statistic	0.05 Critical Value	Porb.**
None*	0.839776	24.8.2786	125.6154	0.0000
At Most 1*	0.767855	178.6937	95.75366	0.0000
At Most 2*	0.716419	123.1987	69.81889	0.0000
At Most 3*	0.543488	75.3089	47.85613	0.0000
At Most 4*	0.483034	45.51153	29.79707	0.0004
At Most 5*	0.386305	20.43993	15.49471	0.0083
At Most 6	0.048424	1.88614	3.841466	0.1696

Source : Test Performed by Author

4.3. Speed of adjustment

The coefficient of the integrated model in vector error correction model is known as speed of adjustment and represented by the first coefficient i.e. C_1. It must be significant and the sign must be negative to have the long run relationship between the variables. The sign of which is negative and also significant. This shows the long run association ships between the monetary and real sector variables to influence GDP. The conclusion of which are the monetary variables are being contributor for the economic growth of Nepal along the real sector variables in the long run (Table No.3).

Table No. 3: Speed of Adjustment

Name of the coefficient	Value	Std. Error	t-Statistic	Prob.**
C(1)	-0.45011	0.100579	-4.475173	0.0004

Source : Solution of System Equation

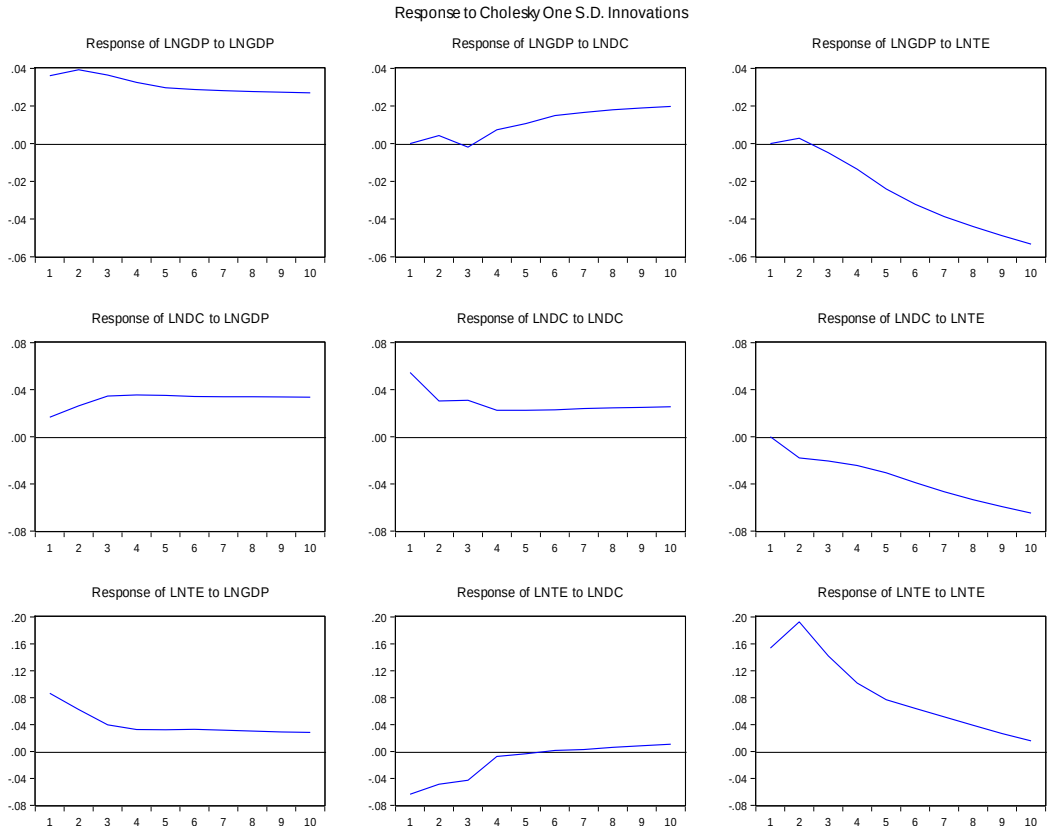
The short run causality can be analyzed through the joint effects of the variables and Wald Test can be performed for the test of joint effect of the variables. The coefficients of the variables D(LNGDP),D(LNM1),D(LNCPI), D(LNDC), D(LNNFA), D(LNTE) and D(LNTI) are tested by the Wald Test whether they have the short run causality to influence GDP or not ? All the respective influences of

other variables as dependent variables are ignored in the model as the model performed by them seem statistically insignificant. In the Wald Test variables like D(LNGDP), D(LNM1), D(LNDC), D(LNNFA) and D(LNTE) have the short run causality running from them to GDP. The variables like D(LNCPI) and D(LNTI) have no short run causality or influence on GDP (Table No.4).

The statistical significance of the model shows that the R-squared 0.9284 i.e.92.84 % and adjusted R-squared of 8.89 %. F-statistic is significant as p-value is 0.00. Similarly, the J-B value is 0.105445 with the p-value of 0.9486. This shows that the residuals or the error terms are normally distributed. Breusch-Godfrey Serial Correlation LM Test indicates the Obs*R-squared value of 2.51 and corresponding Chi-square p-value of 0.2848 i.e.28.48 % and indicates no serial correlation in the model. Similarly, Breusch-Pagan Godfrey test of heteroskedasticity reveals the Obs*R-Squared value 21.76 and corresponding Prob. Chi-squared 41.32 % indicating the absence of heteroskedasticity in the model. The overall statistical inference concludes that the model best describes the causalities of the variables (Table No.5).

4.4. Impulse response analysis

The shocks of a particular variable can generate variations both in itself and in other variables, the orthogonal-zed methodology can be employed to observe the impulse responses. The general representation of this procedure can be found in the seminal works of Bernanke (1986). Some researcher argue that differencing the variables to make them stationary leads to the loss of a significant portion of information related to the co-movements in the data. Many other researchers, however, do not agree with this argument (Gunes, na). Since the data employed in the model contain unit root and do not have the feature of stationary in level we make them log differenced to have stationary feature. In this situation the stationary series are used to obtain the impulse responses. In this scenario only two variables, one monetary and one domestic, are taken to observe the impulse responses which are depicted in the figure given.



In the figure impulse response of different variables is depicted. In the first row of the figure the impulse response of GDP to itself and domestic credit along with total exports is depicted. The impulse response of GDP to itself is high and significant. Initially, the impulse response of GDP to domestic credit is zero and increases in a nominal way and then again decreases up to negative. The impulse response further increased significantly in the long run. The impulse response of GDP to exports is zero initially and starts to be negative in the long run, the speed of which is very significant. In the second row of the figure the impulse response of domestic credit to GDP, with it and exports is shown. Here the impulse response of domestic credit to GDP increased initially and then becomes constant. Similarly, the impulse response of domestic credit to itself is high initially and then decreases and remains more or less constant. The impulse response of domestic credit to export is totally negative. In the third row of the figure the impulse response of exports to GDP, domestic credit and itself is shown. The impulse response of exports to GDP is high and decreases in some extent and then becomes constant. Similarly, the impulse response of exports to domestic credit is initially negative and gradually comes to the positive points but it is revolving around zero. The impulse response of exports itself is high and decreased in a regular way in the long run.

V. CONCLUSIONS AND RECOMMENDATIONS

The variables having the property co-integration can be analyzed through the vector error correction model. The long run and short run causality of the variables to influence the real sector variable can be viewed through the speed of adjustment and the Wald Test. The variables GDP, M_1, CPI, DC, NFA, TE and TI are employed for the analysis in this study. Among these variables M_1, CPI, DC and NFA are the monetary variables whereas the GDP, TE and TI are the real sector variables. The Johansen's Co-integration tests revels that the variables are co integrated and can be utilized in VECM. While going through the VECM it is found that all the monetary and real sector variables have the influence in GDP or have the causality in the long run. In the short run, all the monetary variables except CPI and all the real sector variables except TI have the causality to run from them to GDP. The statistical tests show that the model best describes the phenomenon of consideration. This concludes that the monetary sector of Nepal is really contributing real sector of the economy.

The monetary variables along with the real sector variables are contributing the economic development of the nation in the long run. In the short run also their influences are remarkable. More distinctly the impulse responses observed through the stationary series of data related to exports and domestic credit reveal the positive impacts in economic growth. This concludes that the economic development of the nation can be accelerated with the increase in domestic credit and exports.

As the monetary variables are contributing the GDP, the developmental plans and policies should address the situation which promote the monetary or the financial situation of the nation. This will ultimately promote the financial environment of the nation and promote the climate of healthy financial sector for the high and sustainable economic development.

The analysis of causality of the monetary and real sector variables in the long run and in the short reveals that there exist special type of association ship among the variables and more remarkably the exports and domestic credit seemed significant in the short run. These variables should be analyzed to observe the exact extent of influence in the economic development in different scenarios.

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Appendix I

Table No. 4: Short Run Coefficients of The model and their Causality (Wald Test Results)

Coefficients	Variables	Null Hypothesis	Chi-Square Value	DF	Prob.	Remarks
C(7),C(8)	LNGDP	H_0: C(7)=C(8)=0	32.04294	2	0.0000	The null hypothesis is rejected which indicates that there is a short run causality running from GDP to GDP.
C(9),C(10)	LNM1	H_0: C(9)=C(10)=0	32.5941	2	0.0000	Rejection of null hypothesis and indicates the short run causality running from M1 to GDP.
C(11),C(12)	LNCPI	H_0: C(11)=C(12)=0	2.713211	2	0.2575	The null hypothesis cannot be rejected and this indicates that coefficients are combinely zero and no short run causality running from CPI to GDP.
C(13),C(14)	LNDC	H_0: C(13)=C(14)=0	45.1448	2	0.0000	Rejection of null hypothesis and indicates the existence of short run causality running from DC to GDP.
C(15),C(16)	LNNFA	H_0: C(15)=C(16)=0	24.75098	2	0.0000	Rejection of null hypothesis and indicates the existence of short run causality running from NFA to GDP.
C(17),C(18)	LNTE	H_0: C(17)=C(18)=0	76.87327	2	0.0000	Rejection of null hypothesis and indicates the existence of short run causality running from TE to GDP.
C(19),C(20)	LNTI	H_0: C(19)=C(20)=0	4.243767	2	0.1198	The null hypothesis cannot be rejected and this indicates that coefficients are combinely zero and no short run causality running from TI to GDP.

Source : Test in System Equations

Appendix II

Table No. 5 : Statistical Result of the Model

Test Statistic of the Model	Values	Remarks
R-Squared	0.928442	The model best describes the phenomenon.
Adjusted R-Squared	0.838994	The model best describes the phenomenon.
F-Statistic	10.37970 (Prob.=0.000)	The overall model is best fit.
D-W Test	2.295374	No auto-correlation.
Histogram Normality Test (Jarque-Bera Test)	0.105445 (Prob.=0.948643)	Residuals are Normally distributed.
Serial Correlation Test (Breusch-Godfrey Serial Correlation LM Test) Obs* R-squared, Porb. Chi-square	2.511844 (Prob.=0.2848)	The model is not suffering from serial autocorrelation.
Heteroskedasticity Test (Breusch-Pagan Godfrey Test) Prob. Chi-Squared of Obs * R-Squared	2.76453 (Prob.=0.4132)	No heteroskedasticity exists in the model.

Source : Test Performed by Author

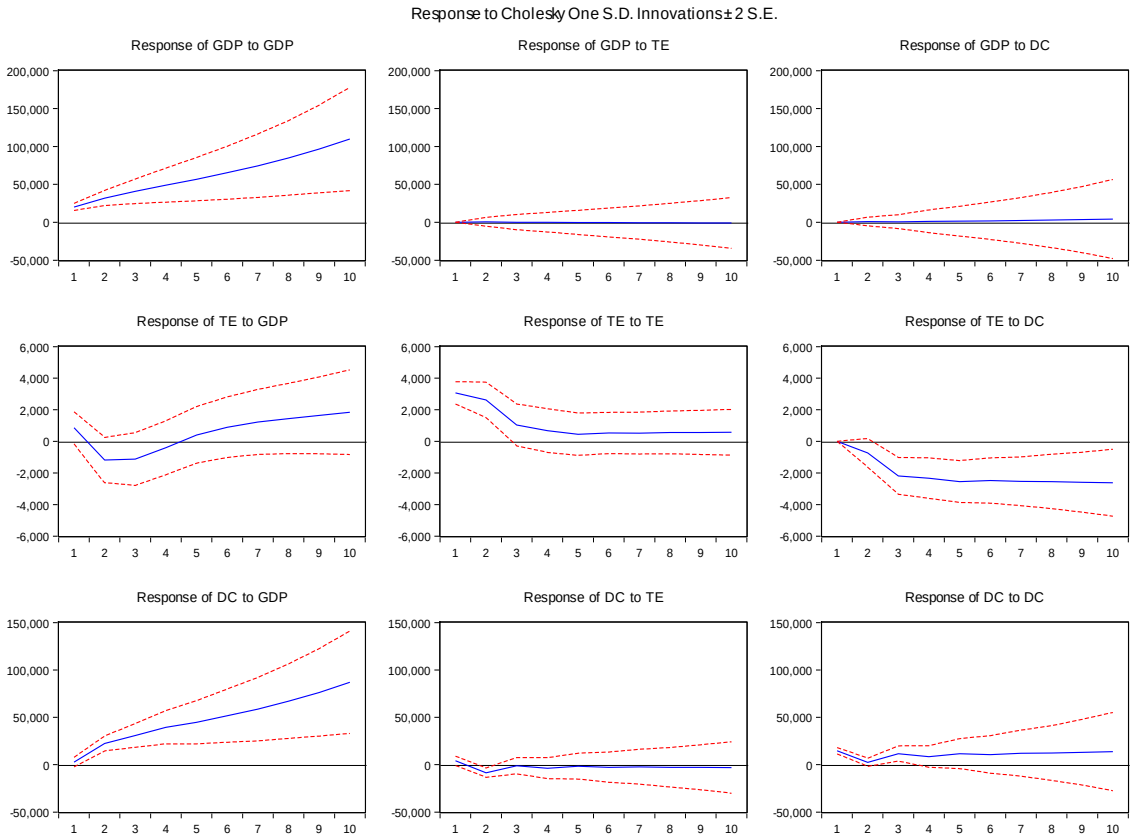
Appendix III

Dependent Variable: D(LNGDP)
Method: Least Squares
Date: 01/19/15 Time: 09:50
Sample (adjusted): 1978 2014
Included observations: 37 after adjustments
D(LNGDP) = C(1)*(LNGDP(-1) - 0.81305841136*LNTI(-1) - 3.49504354252) + C(2)*(LNM1(-1) - 0.885094885381*LNTI(-1) - 0.795465181977) + C(3)*(LNCPI(-1) - 0.519365441501*LNTI(-1) + 1.70438208223) + C(4)*(LNDC(-1) - 1.06090227033*LNTI(-1) + 0.227637240435) + C(5)*(LNNFA(-1) - 1.05071926354*LNTI(-1) + 1.04995333508) + C(6)*(LNTE(-1) - 0.730022811118*LNTI(-1) - 1.6912434251) + C(7)*D(LNGDP(-1)) + C(8)*D(LNGDP(-2)) + C(9) *D(LNM1(-1)) + C(10)*D(LNM1(-2)) + C(11)*D(LNCPI(-1)) + C(12) *D(LNCPI(-2)) + C(13)*D(LNDC(-1)) + C(14)*D(LNDC(-2)) + C(15) *D(LNNFA(-1)) + C(16)*D(LNNFA(-2)) + C(17)*D(LNTE(-1)) + C(18) *D(LNTE(-2)) + C(19)*D(LNTI(-1)) + C(20)*D(LNTI(-2)) + C(21)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.450107	0.100579	-4.475173	0.0004
C(2)	0.988983	0.131258	7.534663	0.0000
C(3)	0.228002	0.209856	1.086466	0.2934
C(4)	-0.404660	0.089062	-4.543575	0.0003
C(5)	-0.153011	0.025323	-6.042476	0.0000
C(6)	-0.116021	0.025992	-4.463720	0.0004
C(7)	-0.947815	0.167480	-5.659260	0.0000
C(8)	-0.332095	0.150001	-2.213949	0.0417
C(9)	-0.466823	0.125914	-3.707469	0.0019
C(10)	0.231487	0.085864	2.695986	0.0159
C(11)	0.121514	0.155542	0.781230	0.4461
C(12)	0.229945	0.139900	1.643640	0.1198
C(13)	0.535381	0.091070	5.878765	0.0000
C(14)	0.067313	0.088275	0.762534	0.4568
C(15)	0.139236	0.030177	4.613988	0.0003
C(16)	-0.007265	0.026437	-0.274815	0.7870
C(17)	0.236927	0.027350	8.662694	0.0000
C(18)	0.144128	0.033464	4.306906	0.0005
C(19)	0.044411	0.063060	0.704273	0.4914
C(20)	-0.061330	0.052938	-1.158531	0.2636
C(21)	0.124008	0.020990	5.907925	0.0000

R-squared	0.928442	Mean dependent var	0.127431
Adjusted R-squared	0.838994	S.D. dependent var	0.039673
S.E. of regression	0.015919	Akaike info criterion	-5.145787
Sum squared resid	0.004055	Schwarz criterion	-4.231482
Log likelihood	116.1971	Hannan-Quinn criter.	-4.823452
F-statistic	10.37970	Durbin-Watson stat	2.295374
Prob(F-statistic)	0.000009		

Appendix III



Schematic

Framework for the linkages between Real Sector and Financial Sector **(Source IMF**)