World Journal of Social Sciences
Vol. 2. No. 3. May 2012. Pp. 78 - 89

International Financial Risk, Investment and Growth in Nigeria

Pat Donwa* and Osaro Agbontaen**

This study analyzes the impact of international financial risk, domestic investment and the levels of growth in the Nigerian economy. Essentially, the study used data from 1970 to 2008, obtained from the Central Bank of Nigeria. The authors adopted the vector auto-regression (VAR) approach taking into consideration macroeconomic variables such as exchange rate volatility which was used to represent international financial risk, domestic investment which was captured by gross capital formation and economic growth represented by changes in real gross domestic product. This process permits the researchers to test for the hypothesis of diagonal covariance and the symmetric covariance processes. Also, it disclosed the degree of own variance asymmetry exhibited by the variables in the model. This approach was selected in order to ease the analysis of the related concepts of exogeneity and temporal precedence in association with the Granger-causality. The variables in the model indicated basic levels of statistical significance. The impulse response estimates were obtained and interpreted. It was disclosed that the international financial risk variable emit shock impacts with implication for domestic investment and the levels of growth in the economy. This indicates that shocks as a result of fluctuations in international financial risk and the levels of uncertainties in domestic investment shrinks the levels of growth in the economy. This study has implications for investors, scholars and policy makers.

JEL Code: F43, G28, L51 and R11

1. Introduction

Fundamentally, facts emanating from financial risk studies did not distinguish risks that are consciously borne and those that are not (Darghi, Giavazzi and Menton, 2003).Therefore, having a clear knowledge of the impact of the nature of international financial risk on the unanticipated accumulation of large risks by individuals, domestic firms and government mainly due to incomplete information of the risk by overseas firms have implications for domestic economic growth. With substantial evidence, it seems certain that the accelerating expansion of global finance may be indispensable to the continued rapid growth of world trade in goods and services. Recent findings in research show evidences that a more enhanced systematic financial intermediation will be required if we are to capture the full benefit of advances in technology and trade.

In this study, we identify and analyze the nature of the impact of internal and external shocks by testing diagonal and symmetry restrictions on a VAR model which was used to test international financial risk and its influence on the levels of domestic investment and economic growth. Also, we attempt to detect if international financial risk exhibits shocks that influence the levels of domestic investment and its impact on economic growth. Further, we investigate external shock effects exhibited by international financial risk in order to understand if such shocks create uncertainties

*Senior Lecturer, Department of Accounting, University of Benin, Benin City, Edo State.
**Research Assistant, Department of Accounting, Economics and Finance, Lagos Business School, Lagos State, Nigeria.

for investments and economic growth in Nigeria. Although, previous studies in close terms observed that the domestic control of risks is associated with international investments (Devereux and Smith, 1993; Greenspan, 2002). Also, Draghi, Giavazzi and Menton (2003)found that effective international financial linkages exist and it influences the level of growth positively in advance nations. Diebold and Santomero (1999) affirmed that financial industry focused on global views has a reasonable positive impact on the leverage on market liquidity and stabilizes credit risk. From our specific developing economy perspective, we disclosed that the international financial risk variable generated positive shocks which heightened uncertainties in domestic investment and inconsistencies in economic growth. From the results of the impulse responses, we noticed that it pushed economic growth below the zero bound, impeded economic growth and weakened domestic investment.

The review of literature of the study gives ideas of some conceptual, theoretical and empirical issues bordering on international financial risk in relations to its impacts on domestic investment and economic growth. The third section describes the data and the estimation process. The fourth section exposed facts from the results obtained from the analysis. The fifth section discussed the implication of the findings and concludes the study.

2. Literature Review

Financial intermediation has been seriously proliferated with complex risk transfer instruments, credit derivatives and asset-backed securities. Subsequently, most highly placid banks with risk assets put in place business models to distribute and transfer such risk to other forms of investors (Knight, 2007). This form of risk is generally known as international financial risk linked to excessive dollar international base money may create problem that could have serious consequence for world economic growth and stability (Hallwood and MacDonald 2005).

Balu and Armeanu (2002) stated that foreign exchange risk is most, related to the international financial risk and in strong association with the increase in the floating rates. They viewed it as the exposure in a certain currency, multiplied with the variation in time of the foreign exchange and at the microeconomic level; it could be revealed as transaction risk, balance sheet risk and competitiveness risk. They affirmed that for this reason, most economies are confronted with a variety of risks that can negatively affect their domestic activities. It is strongly conceived that economic growth emanate from indirect effects of human capital accumulation through productivity (Romer 1986, Lucas 1988). Consequently, Devereux and Smith (1993) affirm that economic growth in most countries is low because of the unanticipated effect of international risk. Due to this fact, the welfare levels are reduced even without the consideration of international risk.

It is essential to note that the level of international risk which diversifies income risk will likely reduce saving, with constant relative risk aversion. Also, in a situation where the levels of growth is related to international sources of capital accumulation, a reduction the levels of savings in such a situation will likely reduce the levels of growth and the levels of welfare in the society. This is because endogenous growth with international influence on capital accumulation implies a competitive equilibrium growth rate less than the optimal growth rate (Devereux and Smith 1993).Also, Greenspan (2002) reveal that internationally, international financial risk, the bias against investment in foreign assets is apparent in the persistent-high correlation between domestic savings and domestic investment (Greenspan 2002).

But Knight (2007) insist that a favourable global financial condition is causally connected to low and stable inflation which is strongly related to rapid credit growth and low interest rates; mainly as a result of low long-term real yields on financial instruments. The proliferation of risk transfer instruments; the emergence of “new” players and increased portfolio diversification has lead to growth in the global liquidity and generalized compression of risk spreads. To curtail excess international financial shocks, Diebold and Santomero (1999) noted that the financial industry should be more diligent in updating its risk management systems to adequately assess real-time trading exposures. They conclude that, ‘increased sharing of information between financial competitors and additional evaluation of the “effects of leverage on market liquidity and credit risk” would serve as buffer against global trade and financial fluctuations’.

To effectively monitor the impact of international financial risk, it is necessary to test market behavior for widespread down-cycle for credit. Subsequently, we will detect if rapidly growing market in credit derivatives have been proceeding smoothly for the most part of the observation (Greenspan 2002).Further, he emphasized that in order to curtail the risk associated with international investments it is necessary to enhance and grow a larger systematic framework for the world financial system. Also, insufficient quality of information and rigid regulations discouraged the cross-border movement of funds. Recent agreements have reduced regulatory barriers, information and enhanced financial trade openness but bias against cross-border investments is high. But enhanced returns, is poised to create larger global presence of financial linkages in all economies (Greenspan, 2002).

A more opened access to cross-border relation of visible and invisible trades has led to an unprecedented increase in large scale cross-border finance in relation to the value of the trade that it finances. Regardless of this imbalance global finance reflects growing investment portfolios which are strongly supported by international financing, a system that support the efficient international trade framework. Consequently, the present global infrastructure must continue to foster expansion in trade, international movement of funds and investment. It remains resilient to risk due to changes in policies and uncertainties in business environment. Apparently, the outsized implicit compensation for risk associated with investment internationally suggests the necessity for a far larger world financial system (Greenspan, 2002). Basically, with efforts to increasing international financial integration, both investment income flows and capital gains are channels that can potentially provide international risk sharing (Schmitz, 2007). Although Greenspan (2002) proposed that, ‘the inevitable rise in potential systemic risks as the international financial system inexorably expands can be contained by improvements in effective risk management in the private sector, improvements in domestic risk management in the private sector, improvements in domestic bank supervision and regulation, continued cooperation among financial authorities, and should it be necessary, by central banks being as lenders of last resort’.

3. Methodology

3.1 Data

To examine the nature of the impact of internal and external shocks on domestic investment and growth through international financial risks, we considered data from the Nigeria economy since 1970 to 2008. The source of the macroeconomic variables in the estimation process was the Central Bank of Nigeria (CBN 2008) and UNCTAD (2001). The researchers represented international financial risk as the levels of volatility in the prevailing foreign exchange rate over the period studied (UNCTAD 2001 Balu and Armeanu 2002). The domestic investment is the total gross capital formation during this period. The levels of economic growth were derived from the changes in the real gross domestic product. Basically, we introduced the unrestricted Vector Auto-regression estimation technique to evaluate the permanent and transient shocks in the nature of the variables in relation to the model specified.

3.2 Vector Autoregression (VAR) Model

In order to test the hypothesis of diagonal covariance and symmetric covariance, and also deduce the degree of own and cross variance asymmetry among the variables in the model. We introduced a finite order autoregressive model for vector processes (VAR models).

$$A(L)y_t = \varepsilon_t, \quad A(L) = I_n - \sum_{i=1}^{p} A_k L^i, \qquad (1)$$

Where y_t is an n-dimensional random vector, ε_t is an i.i.d. a vector of the linear forecast error with mean of zero and covariance matrix Ω. L is the lag operator, and $0 < p < \infty$. We imposed the 1(0) model conditions (Johansen, 1995). Therefore, rank A(1) = r where 0 ≤ r ≥ n. Also, the inverse characteristic equation $\left[I_n\lambda^p - \sum_{i=1}^{p} A_k \lambda^{p-k}\right] = 0$ has n-r roots equal to 1 and all other roots inside the unit circle, $|\lambda| < 1$.

Fundamentally, we introduced the concept of the Beveridge-Nelson (1981) decomposition which centres on the properties of the transient component. Considering the vector moving average components of the VAR,

$$\Delta y_t = C(L)\varepsilon_t$$

Further,$y_t = C(1)\sum_{i=0}^{\infty} \varepsilon_{t-i} + C^*(L)\varepsilon_t$(2)

The process was expanded to show both the permanent-transient decomposition (Engle and Granger, 1987). Where c(1), the "factor loading" matrix, has rank K=n-r corresponding to the number of independent stochastic trends that underlie permanent movement in y_t, whereas C*(L)=$\sum_{i=0}^{\infty} C_i^* L^i$ is an absolute summed generated function, $\sum_{i=0}^{\infty} |C_i^*| < \infty$, which produces transient stationary fluctuations of the process around these trends. Also, we found it interesting to view the common trends (CT) as proposed by King, Plosser, Stock, and Watson (1987) and has emphasized by Stock and Watson (1988).

$y_t = Fy_t + \hat{y}_t$More,$(1 - L)y_t = G\eta_t$ and $\hat{y}_t = D(L)\eta_t$ (3)

Here, y_t denote a k dimension vector of CT, $\hat{y}_t$ represents an n dimensional vector of transient components, F is an n x k matrix of rank k, D(L) is again an absolutely summed generated function with some elements of structural identities is imposed on the reduced form equation such as;

$\eta_t = \Omega^{-1/2}\varepsilon_t,\quad E\eta_t\eta_t' = I_n$and $\Omega^{1/2}\Omega^{1/2\prime} = \Omega.$ (4)

Further, the anticipated structural innovation which is represented by η_t, from the proposed forecast error ε_t and hence to make inferences about the impulse responses of y_t. Therefore, the matrix of the permanent effect of $\eta_t$on y_t is, $\Psi^\eta = \bar{P}_1\bar{P}^1 S$, where$S\eta_t = \varepsilon_t$ (Geweke, 1999; King, Plosser, Stock and Watson, 1991).

Then the following basic assumptions may be proposed;

(i) The structural identification are mutually uncorrelated and have unit variances, that is $E\eta_t\eta_t' = I_n$
(ii) The structural identification lies in the current and lagged observations, such that $S\eta_t = \varepsilon_t$ where S is nonsingular.
(iii) The number of the structural identification with a permanent shock effect on $y_t$equals the number of underlying stochastic trends and their effect has a recursive structure like; $\Psi^\eta = \left[\Psi_{\mathrm{I}}^\eta 0_{nx(n-k)}\right]$ where Ψ^η is an n x k lower triangular matrix.

These set of assumptions only identify the permanent structural identifications. The transient structural identifications may be identified using the observed standard results from the VAR estimation process. But assuming some degree of recursiveness of the instantaneous shock effects on y_t. Then the estimation of S and $\eta_t$involves the QR factorizations for the vector error correction representation (Hoffman, 2001). This could be obtained as follows;

First, considering the arbitrarily pre-orthonormalize forecast errors, the (Generalized and Cholesky) factor of the estimated covariance matrix, may be represented by the recently created identification ξ_t.

Therefore, $K\xi_t = \varepsilon_t,\ KK' = \Omega$

This will lead to $E\xi_t\xi_t' = \mathrm{I}_n$. In the subsequent steps we only rotate the identifications by unitary matrices and preserve thus the covariance matrix. Therefore,$I_n\colon EM\xi_t\xi_t'M' = MI_nM' = I_n$ for any $MM' = I_n$.

Secondly, it is necessary to separate the permanent and transient shock transformations. Note that shock effects are permanent if it immediately affects $\bar{x}_t$, and its transient if it fails to do so. Clearly, the instantaneous multipliers for the vector x_t with respect to ξ_t are given by the matrix $\Phi^\xi = P^1K$. This can be expressed as;

$$\Phi^{\xi} = \begin{bmatrix}\Phi_1^{\xi}\\ \Phi_2^{\xi}\end{bmatrix}$$

Usually, this conforms with the number of stochastic trends k so that the upper block Φ_1^{ξ} is k x n, and find the QR factors of its transpose,

$\Phi_1^{\xi} = R'Q'$.

Where Q is an n x n matrix such that $QQ' = I_n$ and R is an n x k matrix such that R' is lower triangular with zeros in its last n-k columns. The matrix Q is now a suitable basis for the transformation which gives rise to two subvectors of identifications, permanent and transient. This process will make $Qv_t = \xi_t$, then the estimated impact for $v_t\ on\ x_t$, will be captured by Φ^{v} and obtained as

$$\Phi^{v} = \Phi^{\xi}Q = \begin{bmatrix}R'Q'\\ \Phi_2^{\xi}\end{bmatrix} Q = \begin{bmatrix}R'\\ \Phi_2^{\xi}\end{bmatrix},$$

Such that the first k element of x_t, i.e. the subvector $\bar{x}_t$, are only affected by the first k elements of v_t, represented by $\bar{v}_t$. This means that $\bar{v}_t$ are permanent while the remaining v_t are only transient with respect to their respective effects on y_t. Therefore, $\Psi^{v} = \bar{P}_1R' = \left[\bar{\Psi}^{v}, 0_{nx(n-k)}\right]$.

It is necessary to note that if the VAR model do not cointegrate, then k=n, we have to skip this process, because all permanent shock effects are identical innovations as stated in the third assumption below which exposed the degree of the recursive natures of the instantaneous shock effects.

Therefore, in the third process, we obtain the desired structural identification,η_t in order to get the desired recursive structure of their permanent effect. This is accomplished by a related QR factorization of the transpose of $\bar{\Psi}^{v} = U'Z'$ which gives a unitary k x k matrix Z and a K x n matrix U this will make the U' a lower triangular. Therefore, we set η by a diagonal matrix composed of Z and an identity

$\mathrm{I}_{\mathrm{n-k}}$,

$$\tilde{Z}\eta_t = v_t, \qquad \tilde{Z} = \begin{bmatrix} Z & 0_{kx(n-k)}\\ 0_{(n-k)xk} & I_{n-k}\end{bmatrix}$$

The anticipated permanent effect is in this form;

$$\Psi^{\eta} = \Psi^{v}\tilde{Z} = \left[U'Z'0_{nx(n-k)}\right]\begin{bmatrix} Z & 0_{kx(n-k)}\\ 0_{(n-k)xk} & I_{n-k}\end{bmatrix} = \left[U'0_{nx(n-k)}\right]$$

The transformation obtained will be in this form;

$KQ\tilde{Z}\eta_t = \varepsilon_t$

The result obtained above is nonsingular and can be used to calculate η_t directly from the forecast errors ε_t.

4. Discussion of Findings

This section considers the adequacy of the model specified; interpret the results of the estimation process, and the observed residual covariance. The group unit root test of variables in the model indicate that this variables are stationary confirming that they are I(0) series, as expressed by the Augmented Dickey-Fuller (ADF) (1979) test. The vector error correction (VEC) lag selection criteria tests reveal that the most appropriate lag length for the test is the second lag (DLag 2).

4.1 Specification Tests

It was detected that there is significant conditional heteroscedasticity in the data evaluated. As disclosed by the determinant residual covariance of 3.99. The moderately high outcome of the Akaike information criterion of 36.73 and Schwarz criterion of 37.92 confirms that the estimated coefficients in the model are jointly and individually significant. The result of the test of the hypothesis of a diagonal covariance process shows that the off diagonal elements of the estimated coefficient need to be jointly insignificant. From the results obtained, these estimated coefficients are jointly significant in most cases at the one, five and ten percent levels.

Subsequently, the insignificance of the non-diagonal estimates may most likely increase the persistence of the conditional variances as observed by the results of the determinants residual covariance with a reasonable degree of adjustment of 8.49, which is strongly higher than the result of the determinant residual covariance process observed outcome. Principally, this means that the analogous coefficients levels of significance obtained at various lags in each series may most likely have the same degree of change in impact on the conditional variance of the other series in the model.

Notably, the hypothesis of a symmetric covariance process which viewed the fact that the coefficient of the estimates may be significant from the result obtained. Basically, most of the variables are individually statistically significant and the basic model indicates superior levels for the R-square values and their associated F-test values were reasonable.

Apparently, the international financial risk variable demonstrates own-variance asymmetry at the first lag. This generated positive shock which lead to higher levels of uncertainties (negative shocks) as indicated by the result of the second lagged. Considering the interactions of the domestic investment variable, we noticed that it exhibits own-variance asymmetry with positive shocks which indicates that domestic investment shocks lead to smoother levels of consistent variations in existing and future levels of domestic investment in the economy. The economic growth variable, display negative shocks responses at both lags. This has a dexterous effect on future growth rates, indicating that growth stabilization measures exhibits strong negative shocks that were uncontrollable over the observation. Therefore, this suggests that shocks exhibited by these variables were strong, indicating that own shocks on these variables significantly influence their existing conditional variances. The signs and magnitude of the estimates as observed is in accordance with the impact of the shocks exhibited as necessary indicators.

4.2 Theoretical Implications

The estimates of the error correction result represent the relationship between the estimates in the model and the conditional second moments. With this view in mind, the Ψmatrix can be translated to relate with the response of an increase in shock to a variable, in line with the observed conditional variance properties of the shock and the known changes in the same variables (Johansen 1995).

From this insight, it is essential to identify if an increase in shocks from the variables in the model lower, raise or would not have an impact on the levels of shock from international financial risk in the economy. Also, it is crucial to detect how these shocks influence the nature of entire variables in the model. The estimates reveal strong evidences that the shocks exhibited has negative impacts on the levels of economic growth which is adversely uncertain and domestic investment is significantly unstable. This implies that consistent negative shocks from the levels of economic growth and a weak domestic investment base will subsequently strengthen the impact of the negative shocks from international financial risk. This strong level of instability has consequences that consistently stunt economic growth and weaken domestic investment. Relatively, this implies that reliable levels of economic growth and an adequate level of growth from domestic investment activities will curtail the negative shocks exhibited by the present levels of international financial risk.

4.3 Generalized Impulse Response

The generalized impulse response estimates in figure 1, shows the impact of the shocks from international financial risk in Nigeria with its effect on the levels of economic growth and domestic investment on the second row. While the impact of the range of shock of economic growth and domestic investments and their effects on the levels of international financial risk in the economy are stated in the second column.

The levels of inconsistency of the shocks from international financial risk show that uncertainties in international financial risk inhibit economic growth, pushing it below the zero bound and within the negative region. Also shocks from international financial risk shows reasonable levels of swings that have strengthened the levels of uncertainties in the levels of domestic investment.

Also, it is evident that the economic growth process is not viable since it could not curtail the shocks from international financial risk. Consequently, the levels of shocks exhibited by international financial risk create reasonable levels of uncertainties which restrict the levels of growth in domestic investment.

5. Conclusion

This paper estimated a vector auto-regression model in order to study the impact of shocks exhibited by the levels of economic growth, domestic investment and international financial risk. To detect how policies put in place have influenced the natures of these variables in the quest to attain economic stability for growth in the development process in Nigeria. With the view that abnormalities in policies will cause inconsistencies in the real sector which may likely increase the shocks inthe levels of domestic investment and economic growth in the economy. In return the levels of shocks from international financial risk are strengthened and they inhibit growth in domestic investment and other forms of economic activities in general.

In order to achieve these objectives, the test for the hypothesis of a diagonal covariance and symmetric covariance process were used to justify the theoretical implication of the study and effectively evaluate the impulse responses. The vector auto-regression result reveal that the international financial risk variable generated positive shocks which heightened the levels of uncertainties in investment and inconsistencies in growth. Consequently, economic growth is impeded and domestic investment remains weakened.

The impulse response results show that shocks effects emanating from international financial risk push economic growth below the zero bound. Also, it fosters stronger financial swings that bias domestic investments in the economy. The source of these high forms of uncertainties displayed by these uniquely sensitive macroeconomic variables call for concern in further research. This is because the high levels of uncertainties may be attributed to sample bias due to the nature of data set used.

Considering these forms of weaknesses in an inefficient financial system, the burden of managing international financial exposure should not be viewed only from the private sector perspective. The central bank of Nigeria (CBN) should act where the private cost of capital is high; and put policies in place to stabilize the overall economy's rate of return and adjust it for risk. This informs how much of extreme domestic investment market risk, as a result of international financial risk that government should insulate. Since the CBN make the decision on the most appropriate policies needed to insulate the financial system from risk explicitly or implicitly through advertence.

References

Balu, FO and Armeanu, D 2002,'Foreign Exchange Risk in International Transactions', Theoretical and Applied Economics, Academy of Economic Studies, Bucharest.

Beveridge, S and Nelson, CR 1981,'A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with Particular Attention to Measurement of Business Cycle',*Journal of Monetary Economics*, 7(2), 151-174.

Devereux, MB and Smith, GW 1993,'International risk sharing and economic growth', Social Science and Humanities Research Council, Canada, July.

Dickey, DA and Fuller, W A 1979,'Distribution of the estimation for autoregressive time series with a unit root', *Journal of American Statistical Association*, 74, 427-431.

Diebold, FX and Santomero, AM 1999 'Financial risk management in a volatile global environment', The Measurement and Management of Global Financial Risk round table, Wharton Financial institutions Center, New York. 9 December.

Draghi, M, Giavazzi, Fand Merton, RC 2003,'Transparency, Risk Management and International Financial Fragility', National Bureau of Economic Research (NBER), NBER Working Paper No. w9806, June.

Engle, RF and Granger, C 1987,'Cointegration and Error Correction: Representation, Estimation and Testing', *Econometrica*, 55(2), 251-276.

Geweke, JF 1999,'Computational Experiments and Reality', *Computing in Economics and Finance*, 410.

Greenspan, A 2002, 'International Financial Risk Management', Federal Reserve Bank Council on Foreign Relations, Washington, D.C. November 19.

Hallwood, P and MacDonald, R 2008,'International money and finance', University of Connecticut, Department of Economic Working Paper Series, Working Paper 2008-02, January.

Johansen, S 1995,*Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. Oxford University Press, Oxford.

King, RG, Plosser, CI, Stock, JH and Watson, MW 1987,'Stochastic Trends and Economic Fluctuations', NBER Working Paper Series, 2229.

Knight, MD 2007,'Financial risks: a view from the BIS', Money and Banking Conference, Central Bank of Argentina, Buenos Aires, 4-5 June.

Lucas, RE 1988, 'On the Mechanics of Economic Development', Journal of Monetary Economics 22, 3-42, North-Holland, February.

Pesaran, MH and Shin, Y 1996,'Cointegration and the speed of convergence to equilibrium', *Journal of Econometrics*, 71, 117-143.

Phillip, PCB and Fuller, W A 1988,'Testing for a unit root in time series regression', *Biometrika*, 75, 335-346.

Romer, PM 1986, 'Increasing Returns and Long-run Growth, the Journal of Political Economy, 92(5), 1002-1037, University of Chicago Press, October.

Stock, JH and Watson, MW 1988,'Testing for common trends', *Journal of the American Statistical Association*, 83, 1097-1107.

Schmitz, M 2007,'Financial markets and international risk sharing', IIIS Discussion Paper 233, November.

UNCTAD 2001, *Handbook on Statistics*, United Nation Conference on Trade and Development, Geneva.

Appendix A

Table A1:Distributive Statistics of the Variables in the Model

STATISTICS	EGW	IFR	DIN
Mean	7.591171	29.62974	144570.9
Median	3.902400	19.73400	30626.80
Maximum	85.56190	65.01100	521782.0
Minimum	-26.81340	10.10400	1.00E-05
Std. Dev.	16.81777	17.14651	187668.8
Skewness	2.424969	1.056857	0.963513
Kurtosis	13.35739	2.459394	2.267476
Jarque-Bera	212.5458	7.735065	6.906278
Probability	0.000000	0.020910	0.031646
Sum	296.0557	1155.560	5638264.
Sum Sq. Dev.	10747.82	11172.11	1.34E+12
Observations	39	39	39

Appendix B

Table B1: Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DIFR DDIN DEGW
Exogenous variables: C
Date: 04/23/11 Time: 03:50
Sample: 1970 2008
Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-652.6790	NA	3.75e+12	37.46737	37.60069	37.51339
1	-634.8080	31.65720	2.27e+12	36.96046	37.49372*	37.14454
2	-622.3622	19.91337*	1.89e+12*	36.76355*	37.69676	37.08570*
3	-621.4702	1.274200	3.10e+12	37.22687	38.56003	37.68707

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix C

Figure C1: Impulse response function (Generalized Impulse)