ISSN 1608-6627

ECONOMIC REVIEW

Occasional Paper April 2009 Number 21

NEPAL RASTRA BANK

Number 21 April 2009 ECONOMIC REVIEW Occasional Paper

The Editorial Board, *Economic Review: Occasional Paper* (ISSN 1608-6627), has the pleasure of releasing this twentieth issue of the Review on the occasion of the 54th Anniversary of the Nepal Rastra Bank (NRB). This issue incorporates analytical articles from the staff of the NRB and academicians outside the NRB on contemporary issues of the economy.

Though the articles are reviewed by the Editorial Board, the Board does not guarantee the accuracy of the data and analytical results along with their implications. Moreover, the views and interpretations included in the articles are those of the authors and do not necessarily reflect and represent the views and policies of the NRB. The Editorial Board would also like to thank Ms. Sushma Regmi, Deputy Director and Mr. Amar Ratna Bajracharya, Supervisor (Computer), Research Department for their valuable assistance in the publication of this issue.

The Editorial Board invites applications of quantitative, econometric, and analytical tools and techniques as developed by the authors of the articles to draw on conclusions and suggestions to be most useful to the readers. Those interested in contributing analytical articles to the *Economic Review* on any pertinent subject of the economy such as money, banking and finance, trade and balance of payments, government finance, broad-based and sustained economic growth, socio-economic development, etc. are requested to submit the articles for consideration in the forthcoming issues.

Any comments, queries, suggestions, and correspondence should be directed to the Editorial Board.

ECONOMIC REVIEW

Occasional Paper April 2009 Number 21

Verification of Causality through VAR and Intervention Analysis: Econometric Modeling on Budget Deficit and Trade Deficit in Nepal

Shankar Prasad Acharya*

Direction of causality between budget deficit and trade deficit, which is popularly known as Twin Deficit Hypothesis (TDH), has been tested in this paper covering the period 1964-2004. Stationarity, co-integration, and error correction tests have been performed as fundamental groundwork on real-term datasets. Datasets are found to be stationary at first difference. Long-run relationship (co-integration) among model variables is found at first difference. Long-run stability has been supported since short-run dynamics indicated converging pattern. Residual tests and conventional Granger Causality tests suggested trade deficit has been Granger Caused by the budget deficit. This initial gesticulation has further been reinforced by the vector autoregressive (VAR) modeling and intervention analysis (impulse response function and variance decomposition) also as it has reconfirmed unidirectional causality from budget deficit to trade deficit indicating need of a policy revisit regarding efficient public expenditure management, export-led growth and strategic capital formation with the help of revised fiscal, monetary and financial policies in the present globalization context.

I. INTRODUCTION

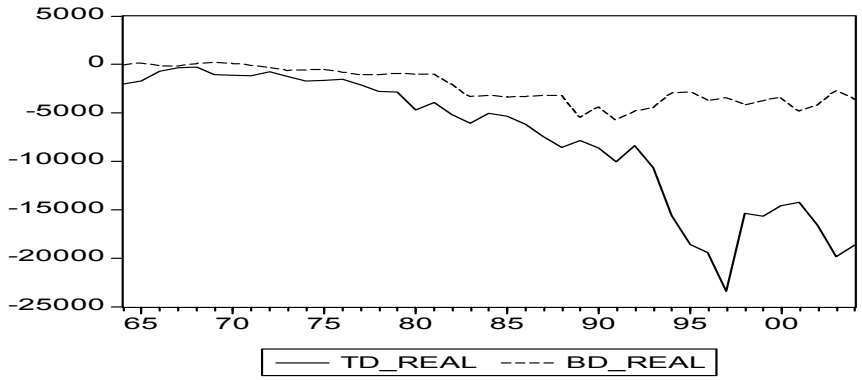
Budget Deficit and Trade Deficit in Nepal

Trade deficit has never shown positive sign indicating absence of trade surplus over the past forty-one years. Budget deficit has also registered positive balances only in selected years such as in 1965, 1968, 1969, and 1970. The graphical representation in Figure 1 suggests that both the trade deficit (TD_t) and budget deficit (BD_t) balances (in real terms) in Nepal for 1964-2004 are in an increasing trend with frequent upswings and downswings during these periods. These movements of the TD_t and BD_t in the defined periods are the motivations to examine the twin deficit hypothesis (TDH) which has been

* Director, Public Debt Management Department, Nepal Rastra Bank and Ph.D. Scholar (Private and Part Time Researcher), University of North Bengal, West Bengal, India, E-mail: shankar329@gmail.com

widely tested for the other countries, but not yet in the Nepalese context by applying contemporary time series econometric tools. Superimposed time plots of the TD_t and BD_t have been presented in Figure 1 below.

FIGURE 1 : Time Plots of Real Trade Deficits and Budget Deficits (1964-2004)



Objectives and Hypothesis

The twin deficits would demonstrate multiple linkages to the macroeconomic variables and they may produce substantial effects on the economy. In fact, they have a blending feature of national and international relation reflected through their oscillations forcing the economy forward (or backward) accordingly. Considering their importance in the economy, the following are the specific objectives of this study:

(i) To explore the causal relationship between trade deficit and budget deficit in Nepal through Granger Causality test method.

(ii) To reconfirm the causality through VAR modeling and intervention analysis (impulse response function and variance decomposition).

With these objectives, this paper is primarily concerned with verifying the causal relationship between budget deficits and trade deficits postulating the following hypotheses:

(i) The budget deficit causes the trade deficit in Nepal i.e. twin deficit hypothesis (Null Hypothesis), against

(ii) The budget deficit does not cause the trade deficit in Nepal (Alternative Hypothesis).

Literature Synthesis

This section discusses the causal relationship between budget deficit (domestic) and trade deficit (external). More specifically, the hypothesis indicates that government deficit would force trade deficit to move either way depending upon the direction of its change. How the budget deficit implicates the trade deficit is inherent to the interactions among different concerned macroeconomic variables depending upon the market

movements and policy measures taken by the country. There are basically four types of possible transmission mechanism:

(i) The first one is the Mundel Fleming perspective. Any increase in budget deficit would cause an upswing of interest rate with a net result of capital inflow and current account deficit. However, it is determined with the situation of capital account convertibility, openness of the economy, and response of the economic agents. In Nepal, this transmission channel would be less effective since capital account is regulated and the economy is not fully opened.

(ii) The second transmission mechanism pertains to the Keynesian absorption theory. This proposition tells that any increase in budget deficit would result in increase in trade deficit through high volume of import. This mechanism is called 'domestic absorption'. This is a second choice of the economy to accommodate rising aggregate demand created through the liberal government expenditure. In Nepal, this diffusion conduit would be more operative because of the prevalence of structural rigidity in production, open border with China and India, high degree of marginal propensity to consume (MPC), high volume of consumption and capital expenditure.

(iii) The third one is the combined effect. With a simple intuition from point (i) and (ii), combined effect would be observed through capital inflow and domestic absorption. However, it would be difficult to segregate the exact and accurate measurement of such joint effect.

(iv) The last one is the opposite effect on trade deficit by the budget deficit. In contrast to other views, this view has been proposed as Ricardian Equivalence Hypothesis (REH). This proposition conveys that any change in government tax does not affect real interest rates, volume of investments and current account deficit. It is because of rational expectation of the taxpayers, who assume that present tax cut is a future burden and government would extract it ultimately in the future so that they start saving at present for meeting the future burden. Such behavior would nullify the net effect so that the twin deficit hypothesis would not appear.

By aforesaid propositions, four possibilities of relationships can be visualized, which are usually found in empirical investigations. These include the following:

(i) Budget deficit has positive relationship with and significant effect on trade deficit (Keynesian proposition).

(ii) Even though not very well defined theoretically, there exists a possibility of trade deficit that causes the budget deficit. This is sometimes seen in petroleum exporting economies. [Reverse proposition of (i)].

(iii) By natural deduction from (i) and (ii), both of them may be mutually dependent or bi-directional relation may hold. (Feed-back effect).

(iv) By the same token, no relation may prevail between the trade and budget deficits. (Ricardian Equivalence Hypothesis).

Based on the above possibilities, relevant research studies are reviewed. The empirical findings are summarized in Annex 2.

II. CAUSALITY TEST

Causality Defined

Causation is normally understood as a direction of change in one variable due to the change in another variable in an appropriately defined econometric model. While, Fisher believed that 'causation runs from price inflation to unemployment', Phillips believed that 'causation runs from unemployment to wage inflation'. The disagreement of propositions between Fisher (1926) and Phillips (1958) related to the appropriate direction of causation between inflation and unemployment which has led the foundation for causality testing historically.[1] The Fisher-Phillips dichotomy suggests only two types of causation; however, direction of causation would have broadly five theoretical possibilities as presented below. Let Y_t be the trade deficit (TD_t) and X_t be the budget deficit (BD_t) under bi-variate postulates; the possible directions of casualty would be:

$$\text{(a) } Yt \Rightarrow Xt \text{ (b) } Xt \Rightarrow Yt \text{ (c) } Yt \not\Rightarrow Xt \text{ (d) } Xt \not\Rightarrow Yt \text{ and, (e) } Xt \Leftrightarrow Yt$$

The symbol $\Rightarrow$ implies one-way causation; $\not\Rightarrow$ implies no causation and $\Leftrightarrow$ implies mutual causations.

Vector Autoregression (VAR) Modeling

While testing the long-run dynamic relationship between the variables concerned, any *priori* assumption of endogeneity and exogeneity of variables concerned may not always be made. In such situation, a vector autoregressive model (VAR) can be a best solution. This model treats all variables systematically without making reference to the issue of dependence or independence. A VAR model additionally offers a scope for intervention analysis through the study of impulse response functions for the endogenous variables in the model. Moreover, a VAR model allows the analysis of 'variance decompositions' for these variables and further helps to understand the interrelationships among the variables concerned. Hence, a VAR model for the twin deficit relationship is used in the study.

Impulse Response Function

Any shocks to any variable (presumably i-th variable) not only directly affect the respective variable (i-th variable) only, but also it would be transmitted to all of the endogenous variables in the model through dynamic (lag) structure of VAR. An impulse response function (IRS) tries to find out the effect of one time shock to one of the innovations on current and future values of the endogenous variables. Due to this feature, impulse response function in VAR System is widely used in describing the dynamic behaviors of variables in the system related to shocks in the residual of the time series under study.

---

[1] The disagreement of propositions between Fisher and Phillips are discussed in Paterson (2000), pp. 536-537

Variance Decomposition

Specifically, the IRS discovers the effects of a shock to one and thereby transmitted to other endogenous variables in the VAR System. However, it cannot tell the magnitude of shocks in the system. To overcome this problem, variance decomposition mechanism is applied to separate out the variation in an endogenous variable into the constituent shocks to the VAR system. So, the variance decomposition is applied in the model to find out the information about relative importance of every random innovation in question of its effects to the variables concerned in the VAR system.

Data

This study is related to the relationship between budget deficit and trade deficit in Nepal for the period 1964-2004. The time series of trade deficit (TD_t) and budget deficit (BD_t) of Nepal have been taken from the different issues of the *International Financial Statistics* (IFS). The real data of budget deficits and trade deficits have been utilized. The nominal and real (1985=100) figures of the TD_t and BD_t are presented in Annex 1. Nominal time series datasets are normally influenced by the same price index/deflator affecting their movements. In real practice too, nominal data are seldom modeled for deriving the conclusions.

Methodology and Preliminary Tests

The background tests have been conducted on concerned variables before jumping into the core study intended in this paper. For any time series data that are used in econometric analyses, the preliminary econometric test step is to verify the stationarity of each individual series. Non-stationary data would contain unit roots. The main objective of unit root test is to determine the degree of integration of each individual time series data. The results derived from the regression models would produce 'spurious results' if the data was employed without checking their stationarity properties. The nature of stationarity or non-stationarity of the datasets is examined with the help of (a) graphics: time plots of the data (b) battery of tests: (ADF unit-root tests and Philip-Perron unit-root tests), and (c) correlograms. Data are found to be stationary at first difference. The nature of long-run relationship of the model variables through both the Engle-Granger and Johansen Maximum Likelihood co-integration test results suggest that the budget deficit and trade deficit are co-integrated at first order. Short-run dynamics through vector error correction (VEC) analysis indicated that the short-run dynamics appeared in converging pattern suggesting prevalence of long-run stability. With this background, the following methodology has been followed for causality verification and further reinforcing it through intervention analysis (if there is any causality).

Granger Causality Test Method and Estimable Models

The model for *Granger Causality Test* is based on the following Equations 1 and 2 which are developed in line with Maddala (2002, pp 379):

$$TD_t = \sum_{i=1}^{m} \alpha_{1i} BD_{t-i} + \sum_{i=1}^{n} \beta_{1i} TD_{t-i} + \eta_t \quad (1)$$

$$BD_t = \sum_{i=1}^{p} \alpha_{2i} TD_{t-i} + \sum_{i=1}^{r} \beta_{2i} BD_{t-i} + \varepsilon_t \quad (2)$$

where, BD_t and TD_t represent the budget deficit (real) and trade deficit (real) respectively.

Pursuing the model developed for Granger Causality Test above, the testable 'causality equations' have been developed below:

$$\Delta TD_t = \alpha_1 + \beta_1 \Delta TD_{t-1} + \gamma_1 \Delta BD_{t-1} + \gamma_2 \Delta BD_{t-2} + \gamma_3 \Delta BD_{t-3} + u_t \quad (3)$$

$$\Delta BD_t = \alpha_2 + \beta_2 \Delta BD_{t-1} + \theta_1 \Delta TD_{t-1} + \theta_2 \Delta TD_{t-2} + \theta_3 \Delta TD_{t-3} + w_t \quad (4)$$

The VAR Method and Estimable Model

The vector autoregression (VAR) model for trade deficit (TD_t) and budget deficit (BD_t) for the economy of Nepal consists of the equations as:

$$\Delta TD_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1i} \Delta TD_{t-i} + \sum_{i=1}^{n} \gamma_{1i} \Delta BD_{t-i} + u_{1t} \quad (5)$$

$$\Delta BD_t = \alpha_2 + \sum_{i=1}^{p} \beta_{2i} \Delta BD_{t-i} + \sum_{i=1}^{r} \gamma_{2i} \Delta TD_{t-i} + u_{2t} \quad (6)$$

where,

α_s	=	intercepts
u_{1t} and u_{2t}	=	stochastic error terms (alternatively called as impulses or innovations or shocks in VAR modeling)
$\sum_{i=1}^{m} \beta_{1i} \Delta TD_{t-i}$ and $\sum_{i=1}^{r} \gamma_{2i} \Delta TD_{t-i}$	=	all summation values of lagged variables of trade deficit (TD_t) in the model
$\sum_{i=1}^{n} \gamma_{1i} \Delta BD_{t-i}$ and $\sum_{i=1}^{p} \beta_{2i} \Delta BD_{t-i}$	=	all Summation values of lagged variables of budget deficit (BD_t) in the model

Furthermore, the VAR model consists of Equations 5 and 6 which requires that (i) ΔTD_t and ΔBD_t be stationary and (ii) u_{1t} & u_{2t} be white noise terms such that: $u_{1t} \sim iid\ N(0, \sigma^2 u_1)$, and $u_{1t} \sim iid\ N(0, \sigma^2 u_2)$

The estimable VAR model, therefore, consists of the following equations:

$$\Delta Y_t = \alpha_1 + \beta_{11}\Delta Y_{t-1} + \beta_{12}\Delta Y_{t-2} + \beta_{13}\Delta Y_{t-3} + \beta_{14}\Delta Y_{t-4} + \beta_{15}\Delta Y_{t-5} + \beta_{16}\Delta Y_{t-6} + \gamma_{11}\Delta X_{t-1} + \gamma_{12}\Delta X_{t-2} + \gamma_{13}\Delta X_{t-3} + \gamma_{14}\Delta X_{t-4} + \gamma_{15}\Delta X_{t-5} + \gamma_{16}\Delta X_{t-6} + u_{1t} \quad (7)$$

$$\Delta X_t = \alpha_2 + \beta_{21}\Delta X_{t-1} + \beta_{22}\Delta X_{t-2} + \beta_{23}\Delta X_{t-3}\beta_{24}\Delta X_{t-4} + \beta_{25}\Delta X_{t-5} + \beta_{26}\Delta X_{t-6} + \gamma_{21}\Delta Y_{t-1} + \gamma_{22}\Delta Y_{t-2} + \gamma_{23}\Delta Y_{t-3} + \gamma_{24}\Delta Y_{t-4} + \gamma_{25}\Delta Y_{t-5} + \gamma_{26}\Delta Y_{t-6} + u_{2t} \quad (8)$$

where,

ΔY_t is the first difference of real trade deficit (TD_t) and ΔX_t is the first difference of real budget deficit (BD_t).

Stability Conditions for the VAR Model

Equation 7 can be expressed as the following:

$$\Delta Y_t - \beta_{11}\Delta Y_{t-1} - \beta_{12}\Delta Y_{t-2} - \beta_{13}\Delta Y_{t-3} - \beta_{14}\Delta Y_{t-4} - \beta_{15}\Delta Y_{t-5} - \beta_{16}\Delta Y_{t-6} = \alpha_1 + \gamma_{11}\Delta X_{t-1} + \gamma_{12}\Delta X_{t-2} + \gamma_{13}\Delta X_{t-3} + \gamma_{14}\Delta X_{t-4} + \gamma_{15}\Delta X_{t-5} + \gamma_{16}\Delta X_{t-6} + u_{1t}$$

or, $$\Delta Y_t - \beta_{11}L\Delta Y_t - \beta_{12}L^2\Delta Y_t - \beta_{13}L^3\Delta Y_t - \beta_{14}L^4\Delta Y_t - \beta_{15}L^5\Delta Y_t - \beta_{16}L^6\Delta Y_t = \alpha_1 + \gamma_{11}\Delta X_{t-1} + \gamma_{12}\Delta X_{t-2} + \gamma_{13}\Delta X_{t-3} + \gamma_{14}\Delta X_{t-4} + \gamma_{15}\Delta X_{t-5} + \gamma_{16}\Delta X_{t-6} + u_{1t}$$

or, $$(1 - \beta_{11}L - \beta_{12}L^2 - \beta_{13}L^3 - \beta_{14}L^4 - \beta_{15}L^5 - \beta_{16}L^6)\Delta Y_t = \alpha_1 + \gamma_{11}L\Delta X_{t-1} + \gamma_{12}L^2\Delta X_{t-2} + \gamma_{13}L^3\Delta X_{t-3} + \gamma_{14}L^4\Delta X_{t-4} + \gamma_{15}L^5\Delta X_{t-5} + \gamma_{16}L^6\Delta X_{t-6} + u_{1t}$$

or, $$A(L)\Delta Y_t = \alpha_1 + (\gamma_{11}L + \gamma_{12}L^2 + \gamma_{13}L^3 + \gamma_{14}L^4 + \gamma_{15}L^5 + \gamma_{16}L^6)\Delta X_t + u_{1t}$$

or, $$A(L)\Delta Y_t = \alpha_1 + \gamma(L)\Delta X_t + u_{1t}$$

$$\Delta Y_t = [A(L)]^{-1}[\alpha_1 + \gamma(L)\Delta X_t + u_{1t}] \quad (9)$$

where,

$$\gamma_1(L) = (\gamma_{11}L + \gamma_{12}L^2 + \gamma_{13}L^3 + \gamma_{14}L^4 + \gamma_{15}L^5 + \gamma_{16}L^6)$$

Stability of Equation 9 requires that the roots of the characteristic polynomial A(L) be less than one.

By the similar simplification process, Equation 8 can also be written as:

$$\Delta X_t = [B(L)]^{-1}[\alpha_2 + \gamma_2(L)\Delta Y_t + u_{2t}] \quad (10)$$

where,

$B(L) = (1 - \beta_{21}L - \beta_{22}L^2 - \beta_{23}L^3 - \beta_{24}L^4 - \beta_{25}L^5 - \beta_{26}L^6)$, and

$$\gamma_2(L) = (\gamma_{21}L + \gamma_{22}L^2 + \gamma_{23}L^3 + \gamma_{24}L^4 + \gamma_{25}L^5 + \gamma_{26}L^6)$$

Stability of Equation 10 requires that the roots of the characteristic polynomials B(L) be less than unity.

It, therefore, follows that the estimated VAR model, consisting of equations (9) and (10) will be stable if (i) the roots of the characteristic polynomials A(L) are less than unity, and (ii) the roots of the characteristic polynomials B(L) are less than unity

Impulse Response Function and Variance Decomposition

Innovations are normally correlated and may be viewed as having common properties that cannot be associated only to a specific variable. In order to explain the impulses, a transformation *P* is widely applied to the innovations so that they become uncorrelated.

$$\upsilon_t = P \text{™}_t \sim (O, D) \quad (11)$$

where D = diagonal co-variance matrix (Equation 11 is discussed in E-views 4.1 Users Guide, 2001)

Specifically, impulse response function discovers the effects of a shock to one and thereby transmitted to other endogenous variables in the VAR System. However, it cannot tell us the magnitude of shocks in the system. To overcome this problem, variance decomposition mechanism is applied to separate out the variation in an endogenous variable into the constituent shocks to the VAR system. So, variance decomposition is applied in the models to find out the information about relative importance of every random innovation and question of its effects on the variables concerned in the VAR system developed in this study.

III. CAUSALITY ANALYSIS

Granger Causality Test

Test results from the estimation of the Equations 3 and 4 are presented in Tables 1 and 2.

TABLE 1 : Results of Equation (3)

Dependent Variable: DTD_REAL		Sample (adjusted): 1968-2004		
Included observations: 37 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-827.7407	376.4408	-2.198860	0.0352
DTD_REAL(-1)	-0.213085	0.184320	-1.156059	0.2562
DBD_REAL(-1)	-0.429874	0.498753	-0.861897	0.3952
DBD_REAL(-2)	-0.662719	0.526301	-1.259200	0.2171
DBD_REAL(-3)	-0.904591	0.512940	-1.763542	0.0874
R-squared	0.117538			
Adjusted R-squared	0.007231	F-statistic		1.065550
Durbin-Watson stat	1.906190	Prob(F-statistic)		0.389600

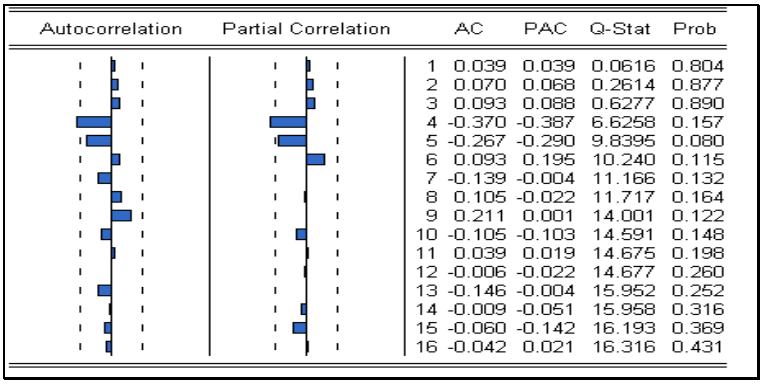
TABLE 2 : Results of Equation (4)

Dependent Variable: DBD_REAL		Sample (adjusted): 1968-2004		
Included observations: 37 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-82.78322	135.9543	-0.608905	0.5469
DBD_REAL(-1)	-0.263712	0.183926	-1.433799	0.1613
DTD_REAL(-1)	0.007264	0.067752	0.107218	0.9153
DTD_REAL(-2)	0.080552	0.064637	1.246207	0.2217
DTD_REAL(-3)	-0.023496	0.066998	-0.350706	0.7281
R-squared	0.119479			
Adjusted R-squared	0.009413	F-statistic		1.085525
Durbin-Watson stat	1.970702	Prob(F-statistic)		0.380171

Correlogram of the Residuals

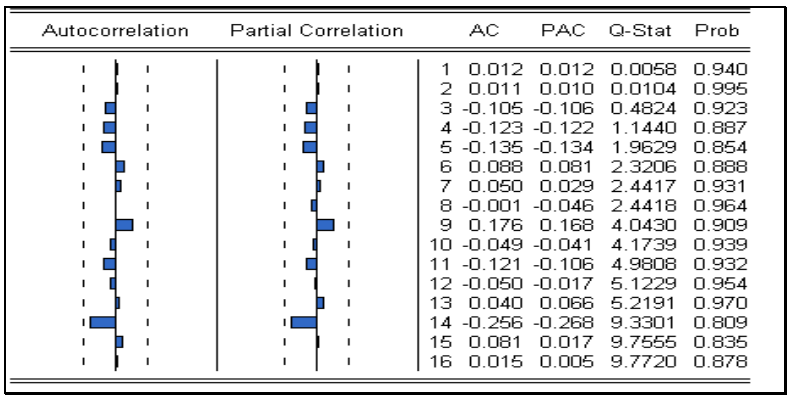
Correlograms of the residuals (RES_1 and RES_2) have been obtained for both Equations 3 and 4 designed for Granger Causality test. The autocorrelation (AC) and partial autocorrelation (PAC) plots of the respective models are presented in Figures 2 and 3 respectively.

FIGURE 2: Correlogram of Residual ($\hat{u}_t$) of Equation (3)



	AC	PAC	Q-Stat	Prob
1	0.039	0.039	0.0616	0.804
2	0.070	0.068	0.2614	0.877
3	0.093	0.088	0.6277	0.890
4	-0.370	-0.387	6.6258	0.157
5	-0.267	-0.290	9.8395	0.080
6	0.093	0.195	10.240	0.115
7	-0.139	-0.004	11.166	0.132
8	0.105	-0.022	11.717	0.164
9	0.211	0.001	14.001	0.122
10	-0.105	-0.103	14.591	0.148
11	0.039	0.019	14.675	0.198
12	-0.006	-0.022	14.677	0.260
13	-0.146	-0.004	15.952	0.252
14	-0.009	-0.051	15.958	0.316
15	-0.060	-0.142	16.193	0.369
16	-0.042	0.021	16.316	0.431

FIGURE- 3 : Correlogram of Residual ($\hat{w}_t$) of Equation (4)



	AC	PAC	Q-Stat	Prob
1	0.012	0.012	0.0058	0.940
2	0.011	0.010	0.0104	0.995
3	-0.105	-0.106	0.4824	0.923
4	-0.123	-0.122	1.1440	0.887
5	-0.135	-0.134	1.9629	0.854
6	0.088	0.081	2.3206	0.888
7	0.050	0.029	2.4417	0.931
8	-0.001	-0.046	2.4418	0.964
9	0.176	0.168	4.0430	0.909
10	-0.049	-0.041	4.1739	0.939
11	-0.121	-0.106	4.9808	0.932
12	-0.050	-0.017	5.1229	0.954
13	0.040	0.066	5.2191	0.970
14	-0.256	-0.268	9.3301	0.809
15	0.081	0.017	9.7555	0.835
16	0.015	0.005	9.7720	0.878

Findings of Test Results and Correlogram of the $\hat{u}_t$ and $\hat{w}_t$

Tables 1 and 2 and the correlograms (Figures 2 and 3) indicate the following. Firstly, the residual datasets for $\hat{u}_t$ and $\hat{w}_t$ display no significant spike in the corresponding ACF at the first lag. Secondly, the corresponding $PACF_s$ are free from any significant spike at the first lag for the residuals $\hat{u}_t$ and $\hat{w}_t$. These confirm to the stationarity of datasets for

$\hat{u}_t$ and $\hat{w}_t$ of Equations 3 and 4. Thirdly, in case of Equation 3, $\hat{\gamma}_1$ and $\hat{\gamma}_2$ and $\hat{\beta}_1$ are insignificant though the coefficient of ΔBD_{t-3} (i.e. value of $\hat{\gamma}_3$) is significant at 10% level of significance. It indicates that BD_t Granger causes TD_t. Finally, in case of Equation 4, $\hat{\beta}_2$, $\hat{\theta}_1$, $\hat{\theta}_2$, $\hat{\theta}_3$ are insignificant. These indicate that TD_t does not Granger cause BD_t.

Conventional Granger Causality Tests

Conventional Granger Causality test explains more about the causal relationships between trade deficit and budget deficit. Test results are reported in Table 3 below:

TABLE 3: Results of Conventional Granger Causality Tests

Null Hypothesis	Observations	lags	F-statistics	Probability
TD_t does not Granger Cause BD_t	40	1	2.12568	0.15329
BD_t does not Granger Cause TD_t			3.75896*	0.06018
TD_t does not Granger Cause BD_t	39	2	0.44748	0.64294
BD_t does not Granger Cause TD_t			2.35569	0.11012
TD_t does not Granger Cause BD_t	38	3	0.80406	0.50119
BD_t does not Granger Cause TD_t			2.20002	0.10791
TD_t does not Granger Cause BD_t	37	4	0.64129	0.63751
BD_t does not Granger Cause TD_t			4.88646***	0.00408
TD_t does not Granger Cause BD_t	36	5	0.35137	0.87647
BD_t does not Granger Cause TD_t			3.77817**	0.01099

*, **, *** indicates statistical significance at the 10%, 5% and 1% level respectively.

Conventional Granger Causality test above has derived: (a) the F-statistics and its corresponding value of probability suggest that the 'TD does not Granger Cause BD' hypothesis has been accepted in all lag values (up to 5 lags) for the real trade deficit (TD_t) and real budget deficit (BD_t) indicating real trade deficit does not Granger cause real budget deficit and, (b) F-statistics have been found significant at first, fourth and fifth lag values at the 10%, 1% and 5% level of significance respectively of real budget deficit indicating unidirectional causality from budget to trade deficit.

IV. VAR ANALYSIS

Selection of Lag Length

Appropriate lag-length can be selected through the 'Selection Criteria' like AIC, SIC, HQIC etc. Table 4 exhibits the statistics corresponding to different criteria across different lags.

TABLE 4: VAR Lag Order Selection Criteria

Endogenous variables: DTD_REAL DBD_REAL

Exogenous variables: C

Included observations: 33

Lag	LR	FPE	AIC	SIC	HQ
0	NA	2.81E+12*	34.34127	34.43196*	34.37178*
1	3.775914	3.16E+12	34.45783	34.72992	34.54938
2	2.219377	3.74E+12	34.62099	35.07447	34.77357
3	3.995056	4.12E+12	34.70976	35.34464	34.92337
4	3.748915	4.56E+12	34.79597	35.61225	35.07063
5	9.885715	3.80E+12	34.58905	35.58672	34.92473
6	9.918660*	3.06E+12	34.33554*	35.51461	34.73226
7	2.355808	3.61E+12	34.44709	35.80755	34.90484

* indicates lag order selected by the criterion

It is observed from Table 4 that (a) LR and AIC statistics for lag 6 are significant at 5% level, and (b) FPE, HQ and SIC statistics for lag 0 lag is significant at 5% level. Therefore 6 (six) lags are chosen for each endogenous variable in their autoregressive and distributed lag structures in the estimable VAR model.

Results of Estimation of the VAR Model

The results of estimation of the VAR model consisting of Equations 7 and 8 are given by Tables 5 and 6 below.

TABLE 5: Results of the Estimations of VAR Equation 7

Dependent Variable	Explanatory Variables	Coefficients	Standard errors	't' statistics
ΔTD_t	Constant	-521.777	445.089	-1.172
	ΔTD_{t-1}	-0.437	0.187	-2.329*
	ΔTD_{t-2}	0.043	0.179	0.240
	ΔTD_{t-3}	0.226	0.159	1.417
	ΔTD_{t-4}	-0.222	0.159	-1.393
	ΔTD_{t-5}	-0.343	0.166	-2.055*
	ΔTD_{t-6}	0.249	0.181	1.377
	ΔBD_{t-1}	-0.451	0.409	-1.102
	ΔBD_{t-2}	-0.434	0.477	-0.909
	ΔBD_{t-3}	-0.201	0.480	-0.418
	ΔBD_{t-4}	0.539	0.504	1.070
	ΔBD_{t-5}	1.199	0.524	2.285*
	ΔBD_{t-6}	1.549	0.517	2.995*

* indicate that the co-efficients are significant at 1% level.

TABLE 6: The Results of the Estimations of VAR Equation 8

Dependent variable	Explanatory Variables	Coefficients	Standard errors	't' statistics
ΔBD_t	Constant	-164.193	247.284	-0.663
	ΔTD_{t-1}	-0.002	0.104	-0.016
	ΔTD_{t-2}	0.007	0.099	0.072
	ΔTD_{t-3}	-0.073	0.088	-0.833
	ΔTD_{t-4}	0.032	0.088	0.365
	ΔTD_{t-5}	0.107	0.092	1.159
	ΔTD_{t-6}	-0.050	0.100	-0.502
	ΔBD_{t-1}	-0.266	0.227	-1.172
	ΔBD_{t-2}	0.034	0.265	0.129
	ΔBD_{t-3}	-0.185	0.267	-0.692
	ΔBD_{t-4}	-0.308	0.280	-1.100
	ΔBD_{t-5}	-0.092	0.291	-0.318
	ΔBD_{t-6}	0.144	0.287	0.501

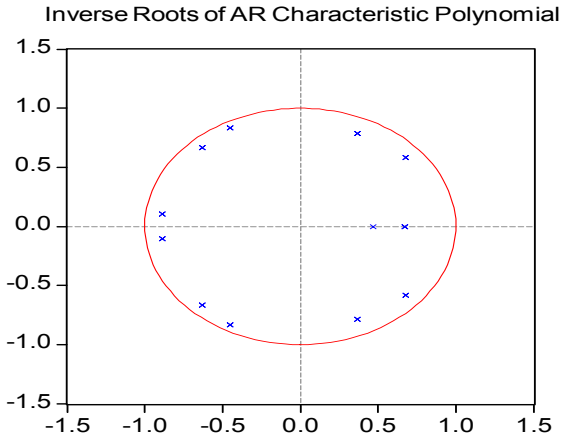
Stability of the Estimated VAR Model

The roots of the estimated Characteristic Polynomials A(L) and B(L) are given in Table 7 and Figure 4.

TABLE 7: VAR Stability Condition Roots of the Characteristic Polynomial A(L) and B(L)

Root	Modulus
-0.450493 - 0.832885i	0.946911
-0.450493 + 0.832885i	0.946911
-0.629951 - 0.668002i	0.918186
-0.629951 + 0.668002i	0.918186
0.676737 - 0.584385i	0.894136
0.676737 + 0.584385i	0.894136
-0.887032 - 0.105545i	0.893289
-0.887032 + 0.105545i	0.893289
0.367548 - 0.783496i	0.865423
0.367548 + 0.783496i	0.865423
0.670899	0.670899
0.471633	0.471633

FIGURE 4 : VAR Stability Condition



It is observed from Table 7 and Figure 4 that (a) values of the roots are less than unity (b) modulus values are also less than unity; and (c) the inverse roots of the AR Characteristic Polynomials lie within the Unit Circle (Figure 4). All these observations testify for the stability of the VAR model and thus, all these findings confirm that the estimated VAR model is stable.

Normality of the VAR Residuals ($\hat{u}_{1t}$ and $\hat{u}_{2t}$)

Table 8 presents the results of the VAR residual normality tests.

TABLE 8: Results of the VAR Residual Normality Tests

VAR Residual Normality Tests
H0: residuals are multivariate normal
Included observations: 34

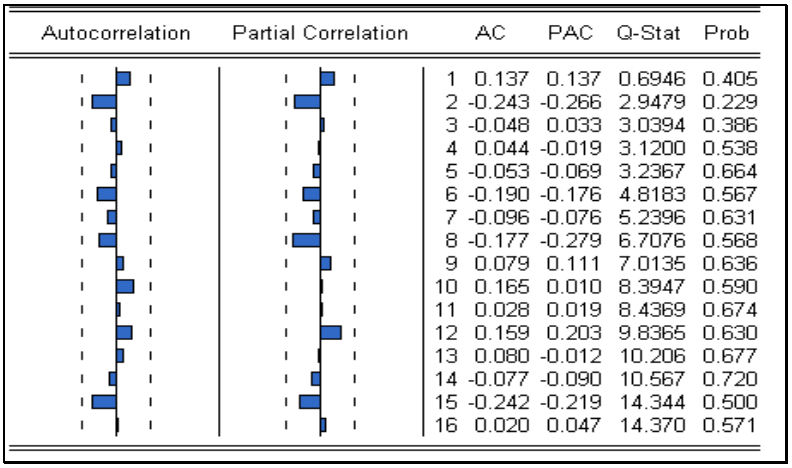
Component	Skewness	Chi-sq	df	Prob.
1	0.343032	0.666802	1	0.4142
2	-0.404313	0.926323	1	0.3358
Joint		1.593124	2	0.4509
Component	*Kurtosis*	Chi-sq	df	Prob.
1	1.451911	3.395155	1	0.0654
2	1.256838	4.304701	1	0.0380
Joint		7.699856	2	0.0213
Component	*Jarque-Bera*	df	Prob.	
1	4.061957	2	0.1312	
2	5.231024	2	0.0731	
Joint	9.292980	4	0.0542	

It is observed from Table 8 that the JB statistic for $\hat{u}_{1t}$ = 9.292980, indicating the null hypothesis (that $\hat{u}_{1t}$ and $\hat{u}_{2t}$ are multivariate normal) is accepted at 5% level which justifies for the normality of $\hat{u}_{1t}$ and $\hat{u}_{2t}$, the residuals in Equations 7 and 8 respectively.

Serial Independence for the VAR Residuals ($\hat{u}_{1t}$ and $\hat{u}_{2t}$)

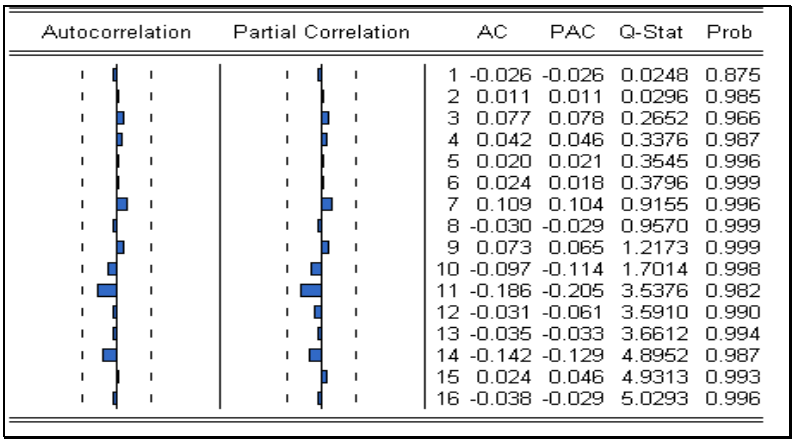
The residuals of the estimated VAR equations (7) and (8) are $\hat{u}_{1t}$ & $\hat{u}_{2t}$ respectively and ACF and PACF plots of these VAR residuals ($\hat{u}_{1t}$ and $\hat{u}_{2t}$) are presented in Figure 5 and 6.

FIGURE 5 : Correlogram for $\hat{u}_{1t}$



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.137	0.137	0.6946	0.405
		2	-0.243	-0.266	2.9479	0.229
		3	-0.048	0.033	3.0394	0.386
		4	0.044	-0.019	3.1200	0.538
		5	-0.053	-0.069	3.2367	0.664
		6	-0.190	-0.176	4.8183	0.567
		7	-0.096	-0.076	5.2396	0.631
		8	-0.177	-0.279	6.7076	0.568
		9	0.079	0.111	7.0135	0.636
		10	0.165	0.010	8.3947	0.590
		11	0.028	0.019	8.4369	0.674
		12	0.159	0.203	9.8365	0.630
		13	0.080	-0.012	10.206	0.677
		14	-0.077	-0.090	10.567	0.720
		15	-0.242	-0.219	14.344	0.500
		16	0.020	0.047	14.370	0.571

FIGURE 6 : Correlogram for $\hat{u}_{2t}$



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.026	-0.026	0.0248	0.875
		2	0.011	0.011	0.0296	0.985
		3	0.077	0.078	0.2652	0.966
		4	0.042	0.046	0.3376	0.987
		5	0.020	0.021	0.3545	0.996
		6	0.024	0.018	0.3796	0.999
		7	0.109	0.104	0.9155	0.996
		8	-0.030	-0.029	0.9570	0.999
		9	0.073	0.065	1.2173	0.999
		10	-0.097	-0.114	1.7014	0.998
		11	-0.186	-0.205	3.5376	0.982
		12	-0.031	-0.061	3.5910	0.990
		13	-0.035	-0.033	3.6612	0.994
		14	-0.142	-0.129	4.8952	0.987
		15	0.024	0.046	4.9313	0.993
		16	-0.038	-0.029	5.0293	0.996

It has been observed from the correlograms that (a) the corresponding ACFs are marked by the absence of any dying out pattern of spikes and (b) the corresponding PACFs are also free from any single significant spike at any lag. These observations testify the fact that $\hat{u}_{1t}$ and $\hat{u}_{2t}$ are free from autocorrelations of any order.

VAR Residual Portmanteau Test Results

The VAR Residual Portmanteau test for autocorrelations is done for further confirmation of serial independence for residuals. Tests results are presented in the Table 9.

TABLE 9: VAR Residual Portmanteau Test Results

VAR Residual Portmanteau Tests for Autocorrelations

H0: no residual autocorrelations up to lag h

Included observations: 34

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	1.201573	NA*	1.237984	NA*	NA*
2	5.022571	NA*	5.297795	NA*	NA*
3	6.845539	NA*	7.297179	NA*	NA*
4	7.205460	NA*	7.705089	NA*	NA*
5	8.190853	NA*	8.860378	NA*	NA*
6	12.40652	NA*	13.97940	NA*	NA*
7	14.28686	0.0064	16.34724	0.0026	4
8	21.70890	0.0055	26.05298	0.0010	8
9	23.52710	0.0236	28.52573	0.0046	12
10	25.72585	0.0580	31.64063	0.0111	16
11	27.49644	0.1219	34.25802	0.0244	20
12	31.20052	0.1481	39.98252	0.0215	24

*The test is valid only for lags larger than the VAR lag order.

df is degrees of freedom for (approximate) chi-square distribution

The adjusted Q-Statistics for the corresponding Chi-Square values, given the degrees of freedom, in Table 9 show that (a) the hypothesis of serial correlations have been rejected for up to the 8^{th} lag at 1% level, (b) the hypothesis of serial correlations have been rejected for the 9^{th} lag at 5% level, and (c) the hypothesis of serial correlation has been rejected at 10% level for the 10^{th} lag. Consequently, Portmanteau test testifies for the serial independence of the VAR residuals ($\hat{u}_{1t}$ and $\hat{u}_{2t}$).

VAR Residual Serial Correlation LM Test Results

The VAR residual serial correlation LM test is also conducted for further confirmation of serial independence of residuals. The results of the VAR residual serial correlation LM tests have been presented in the Table 10.

TABLE 10: VAR Residual LM Test Results

VAR Residual Serial Correlation LM Tests
H0: no serial correlation at lag order h
Included observations: 34

Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	1.837243	0.7657	7	2.570008	0.6321
2	8.320099	0.0805	8	10.70807	0.0300
3	3.155266	0.5322	9	3.087800	0.5432
4	1.621287	0.8050	10	4.123171	0.3896
5	2.103152	0.7168	11	7.758058	0.1009
6	9.951638	0.0413	12	7.505920	0.1114

Probs from chi-square with 4 df.

It is observed from Table10 that the marginal significance at LM statistics for autocorrelation at any lag h (h = 1, ...,11) is not large enough to reject the null hypothesis of 'no serial correlation.'

Homoscadasticity of the VAR Residuals ($\hat{u}_{1t}$ and $\hat{u}_{2t}$)

Time plots of the VAR residuals ($\hat{u}_{1t}$ and $\hat{u}_{2t}$) are illustrated in Figures 7 and 8 below.

FIGURE 7: Time Plot of VAR Residuals ($\hat{u}_{1t}$)

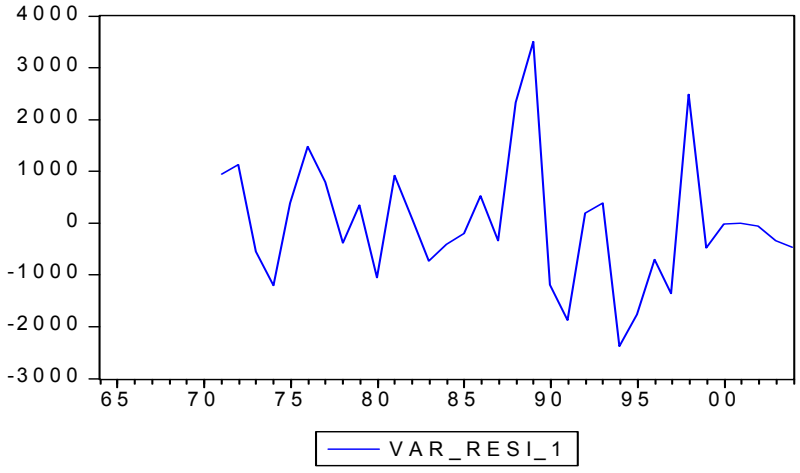
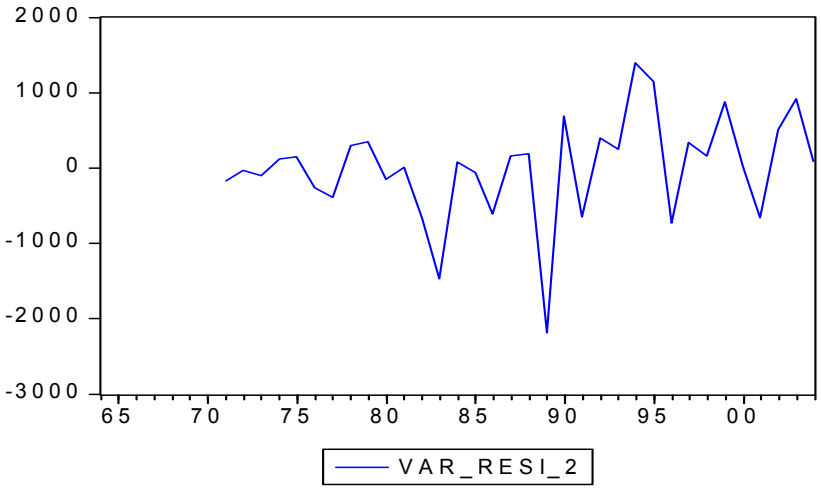


FIGURE 8: Time Plot of VAR Residuals ($\hat{u}_{2t}$)



Figures 7 and 8 show that (a) there exists no cluster in the time plot of $\hat{u}_{1t}$ and (b) the time plot of $\hat{u}_{2t}$ is also marked by the absence of any cluster. These observations testify for the 'homoscadasticity' of the residuals concerned.

Findings from Estimation of the VAR and Economic Interpretations

It is observed from Table 5 for the estimated Equation 7 that (a) $\sum_{i=1}^{6} \beta_{1i} < 1$ and $\sum_{i=1}^{6} \gamma_{1i} < 1$, which indicate that the auto-regressive and distributed lag structures in equation (7) are consistent; (b) $\hat{\gamma}_{15}$ and $\hat{\gamma}_{16}$ are significant at 1% level (c) $\hat{\gamma}_{15} > 1$ and $\hat{\gamma}_{16} > 0$ and (d) $\hat{\beta}_{11} < 0$ and $\hat{\beta}_{11}$ is significant at 1% level.

The economic significance of these findings are as follows: (a) $\hat{\gamma}_{15}$ *and* $\hat{\gamma}_{16}$ being significant indicate that BD_t significantly affected TD_t, even in the presence of TD_{t-I} *(i = 1, ……,6)* in the vector of regressors indicating that BD_t, the budget deficit Granger Caused trade deficit in the economy of Nepal over the period of study; (b) $\hat{\gamma}_{15}$ *and* $\hat{\gamma}_{16}$ being significant also indicate that variations in budget deficit did not lead to an immediate trade deficit and trade deficit, on the other hand, was affected by the variations in four and five period back deficits in the budgetary provision; (c) $\hat{\gamma}_{15} > 1$ and $\hat{\gamma}_{16} > 0$ indicate that variations in 4-period and 5-period back budget deficits led to more than proportionate variation in trade deficit in the economy of Nepal; and (d) $\hat{\beta}_{11} < 0$ indicates that trade deficit at any period reduces the volume of trade deficit in the next period. Thus, trade deficit at any period is negatively related to trade deficit in the previous period.

It is observed from Table - 6 for the estimated Equation 8 that (a) $\sum_{i=1}^{6} \beta_{2i} < 1$ and $\sum_{i=1}^{6} \gamma_{2i} < 1$, which indicate that the auto-regressive and distributed lag structures in Equation 8 are consistent (b) $\hat{\beta}_{2i}$ (i = 1, …, 6) are not significant even at 10% level and (c) $\hat{\gamma}_{2i}$ (i = 1, …, 6) is also not significant even at 10% level.

The economic significances of these findings are as follows: (a) $\hat{\gamma}_{2i}$ (i = 1, … …, 6) being insignificant (even at 10% level), in the presence of BD_t *(i = 1, ……,6)* in the vector of regressors for BD_t implies that trade deficit failed to Granger Cause the budget deficit in the economy of Nepal over the period of study and (b) $\hat{\beta}_{2i}$ (i = 1, … …, 6) being insignificant (even at 10% level) indicate that budget deficit at any period is not related significantly to budget deficits which occurred at any previous periods.

V. IMPULSE RESPONSE FUNCTION

Impulse Response Functions for Trade Deficit (TD_t)

The relevant impulse response functions of the estimated VAR model consisting of Equations 7 and 8 are presented in Figures 9 and 10. Corresponding numerical values of such responses, given Cholesky one S. D. innovations are also presented in Table 11. In Figures 9 and 10, the solid lines and their respective broken lines represent ΔTD real and ΔBD real respectively.

FIGURE 9: Response of DTD REAL to Cholesky One S.D. DTD REAL

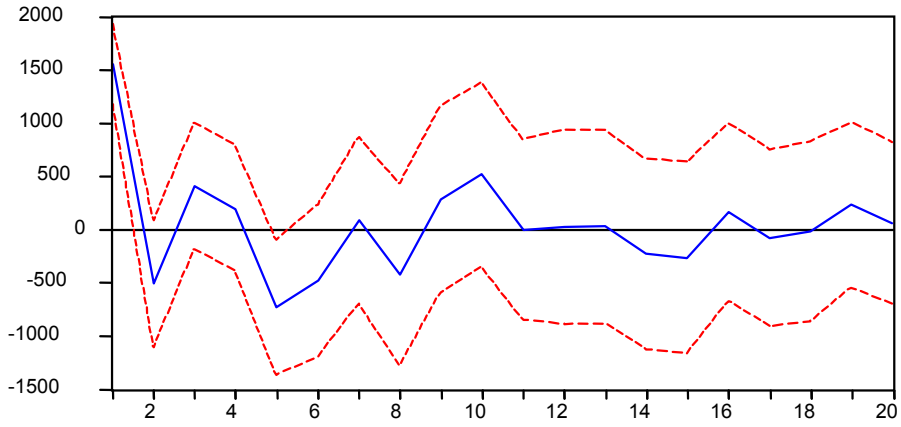


FIGURE 10: Response of DTD_REAL to Cholesky One S.D. DBD_REAL Innovation

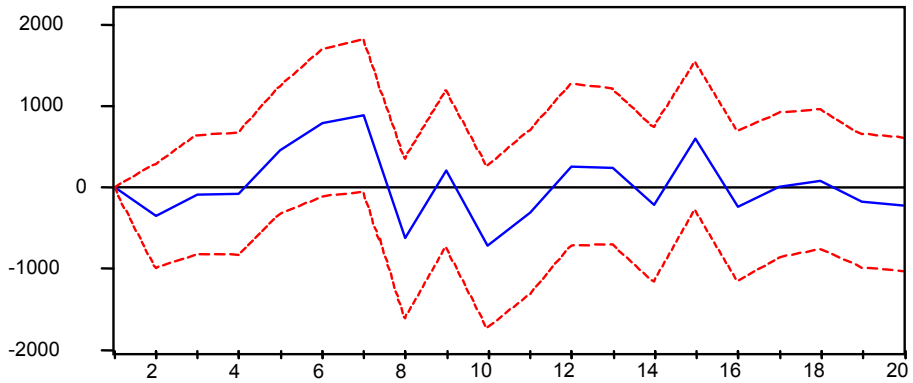


TABLE 11: Response of TD_t to Cholesky (d.f. adjusted) One SD Innovations

Response of DTD_REAL					
Periods	DTD_REAL	DBD_REAL	Periods	DTD_REAL	DBD_REAL
1	1557.167	0.000000	11	1.239855	-312.1763
	(188.834)	(0.00000)		(424.938)	(507.279)
2	-507.9100	-350.2065	12	25.32605	257.5842
	(296.979)	(320.420)		(457.898)	(507.352)
3	410.5063	-90.34934	13	32.08946	235.6596
	(295.832)	(366.411)		(455.811)	(488.073)
4	197.2944	-78.99740	14	-227.1050	-217.7563
	(295.795)	(375.904)		(449.192)	(479.307)
5	-727.5489	454.7184	15	-263.9144	597.2423
	(319.047)	(390.817)		(448.056)	(470.711)
6	-475.1972	790.2957	16	164.7680	-237.2051
	(356.259)	(449.452)		(417.465)	(465.638)
7	89.09157	885.9334	17	-80.05393	11.77264
	(391.944)	(468.999)		(415.719)	(451.793)
8	-418.2148	-624.7834	18	-18.11183	80.18549
	(427.511)	(487.505)		(422.391)	(439.567)
9	288.2315	205.0797	19	233.9000	-177.5751
	(438.803)	(490.805)		(389.352)	(417.833)
10	521.0436	-721.7626	20	61.08477	-222.9215
	(434.039)	(491.779)		(381.525)	(415.617)
Cholesky Ordering: DTD_REAL DBD_REAL					
Standard Errors: Analytic					

Findings from the Impulse Response Functions for Trade Deficit

It is observed from Figure 9 and Table 11 that the shocks transmitted through the channel of trade deficit: (a) responded immediately by rising above the long-run base at t = 1 (b) fell below the long-run base at t = 2, (c) exhibited sharp ups and down until t = 11,

(d) touched the base at t = 11 and remained so until t = 13 periods, and (e) exhibited damped oscillations around the base for $15 \leq t_2 < \infty$.

Similarly, Figure 9 and Table 11 show that the shocks, transmitted through the channel of budget deficit as trade deficit: (a) exhibited delayed response by falling below the base level t = 2, (b) registered a rise at t = 3, and continued such trend until t = 6 periods, (c) exhibited non-convergent oscillations around the base level for $7 \leq t \leq 20$ and (d) did not collapse on the base line for $t > 20$.

The overall findings on the nature of trade deficit responses are the following:

(i) The shocks, transmitted through the channel of trade deficit: (a) were short lived, (b) failed to change the long-run equilibrium base of trade deficit and (c) produced very damped oscillations in trade deficit around the long-run base.

(ii) The shocks, transmitted through the channel of budget deficit: (a) were not short-lived, (b) began to account for the significant part of the short-run variations in trade deficit for $6 \leq t \leq 8$ and (c) accounted for most of the short-run variations in trade deficit for $t > 20$.

Impulse Response Functions for Budget Deficit (BD_t)

The impulse response functions of budget deficit corresponding to Equation 8, for the VAR system and in response to impulses transmitted through the channels of budget deficit and trade deficits are presented in Figures 11 and 12 where the solid lines and their respective dotted lines represent ΔBD real and ΔTD real respectively.

The corresponding numerical values of these responses are shown in Table 12.

TABLE 12 : Response of BD_t to Cholesky (d.f. adjusted) One SD Innovations

Response of DBD_REAL					
Periods	DTD_REAL	DBD_REAL	Periods	DTD_REAL	DBD_REAL
1	-382.7484	775.8650	11	91.35727	102.5818
	(140.923)	(94.0875)		(138.218)	(173.554)
2	99.37480	-206.9425	12	-27.05567	-25.72795
	(162.310)	(178.225)		(143.983)	(183.453)
3	-27.52784	82.55465	13	-61.52379	-32.83696
	(155.159)	(197.148)		(140.494)	(170.885)
4	-37.97940	-175.1343	14	130.5823	49.05744
	(155.775)	(195.976)		(146.773)	(158.163)
5	199.4511	-125.8178	15	-28.54667	-148.2221
	(156.585)	(206.863)		(138.362)	(165.576)
6	78.74385	-1.975006	16	-18.17717	32.18566
	(155.263)	(212.699)		(116.236)	(163.306)
7	-202.0420	101.3539	17	32.63024	76.48848
	(158.419)	(204.220)		(119.350)	(131.414)
8	174.7026	-11.36037	18	-26.81906	-48.30445
	(153.207)	(193.924)		(125.206)	(128.888)
9	-116.6539	33.67000	19	-47.87831	47.49769
	(162.208)	(184.261)		(111.806)	(133.847)
10	-87.44434	-32.99330	20	26.70577	49.95589
	(144.390)	(180.239)		(109.381)	(127.405)

Cholesky Ordering: DTD_REAL DBD_REAL
Standard Errors: Analytic

FIGURE 11: Response of DBD_REAL to Cholesky one S.D. DBD_REAL Innovation

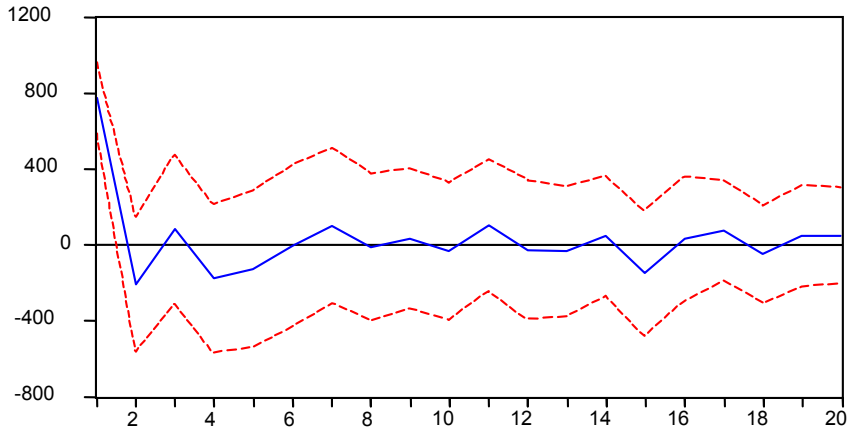
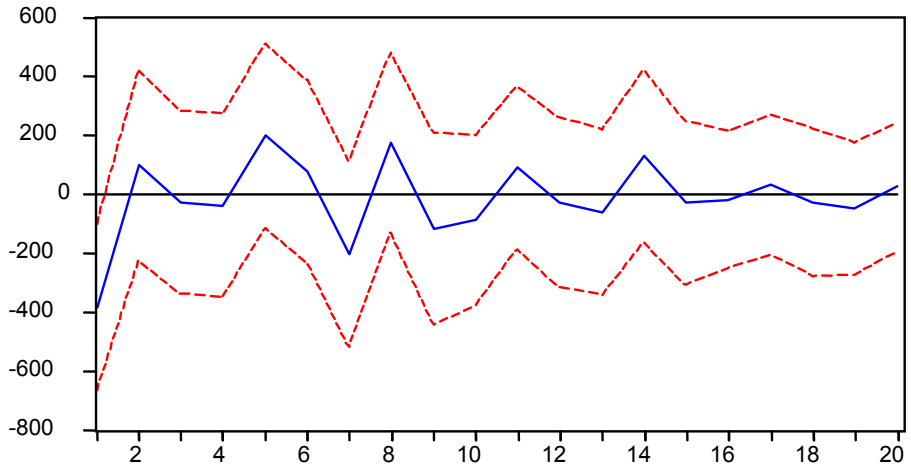


FIGURE 12: Response of DBD_REAL to Cholesky one S.D. DTD_REAL Innovation



Findings from the Impulse Response Function for Budget Deficit

Figure 11 shows that the shocks transmitted through the channel of budget deficit: (a) exhibited immediate rise above the base line at t = 1, (b) declined below the base line at t = 2, (c) established damped oscillations around the long run equilibrium level for $t \geq 8$ and (d) almost collapsed on the equilibrium base line for $t \geq 19$.

Similarly, Figure 12 demonstrates that the impulses transmitted through trade deficit channel as budget deficit (a) exhibited a sharp decline at t = 1; (b) registered a rise above the base level at t = 2; (c) remained below the base level at t = 3, 4 ; and (d) exhibited damped oscillations for $5 \leq t \leq 19$ and (e) almost collapsed on the base level for $t \geq 20$.

The joint analysis of Figures 11 and 12 indicates that (a) short-run variations in budget deficit were mainly due to impulses transmitted through the channel of budget deficit and (b) both types of shocks were short-lived since these failed to change the long-run equilibrium base of budget deficits.

It is, therefore, observed from the above analysis that (a) budgetary deficit shocks were the predominant cause behind the short-run variations in budget deficit; (b) budgetary deficit accounted for increasingly large part of short-run variations in trade deficit; (c) shocks, transmitted through budgetary deficit, changed the equilibrium base of trade deficit as a result of which budgetary shocks were not short-lived for trade deficit and (d) shocks, transmitted through the channels of budget deficit and trade deficit, failed to change the equilibrium base of budget deficit. Consequently, both of these shocks were short-lived for budget deficit.

VI. VARIANCE DECOMPOSITION

Variance Decomposition

It has been shown that how shocks to one endogenous variable may affect the other endogenous variables in the VAR model through impulse response functions. In this section, with the help of variance decomposition, efforts have been made to separate the variations in an endogenous variable into some component shocks. The forecast error variance decomposition tells us the proportion of the movement in a sequence due to its own shocks versus shocks of other variables.

Variance Decomposition for Trade Deficit

Variations in trade deficit under study were basically the effects of responses of trade deficit to shocks transmitted through both trade deficit and budget deficit channels. So, a part of total variation in trade deficit was due to trade deficit shocks and the other part of the variation was due to the budgetary deficit shocks. The break-up of the total variations in trade deficit into the two deficit parts across different periods (*t = 1, 2,……, 20*) constitute the variance decomposition of trade deficit. Such variance decomposition of

trade deficit (TD_t) is given in the Table 13. The graphical presentation of variance decomposition for TD_t is presented in the Figure 13.

TABLE 13: Variance Decomposition of Trade Deficit (TD_t)

Periods	S.E.	TD_t	BD_t	Periods	S.E.	TD_t	BD_t
1	865.1375	100.0000	0.000000	11	1013.290	59.86616	40.13384
2	895.0773	95.62824	4.371758	12	1013.977	59.30670	40.69330
3	899.2978	95.61352	4.386481	13	1016.373	58.84937	41.15063
4	916.9793	95.47282	4.527184	14	1025.900	58.75670	41.24330
5	946.8167	90.86401	9.135991	15	1036.946	56.38812	43.61188
6	950.0875	79.01070	20.98930	16	1037.604	56.13048	43.86952
7	976.6063	67.57134	32.42866	17	1040.931	56.16586	43.83414
8	992.1744	64.10422	35.89578	18	1042.397	56.12102	43.87898
9	999.5758	64.15113	35.84887	19	1044.576	56.20171	43.79829
10	1003.936	60.71300	39.28700	20	1046.111	55.86769	44.13231

Cholesky Ordering: DTD_REAL DBD_REAL

FIGURE 13: Variance Decomposition of DTD_REAL

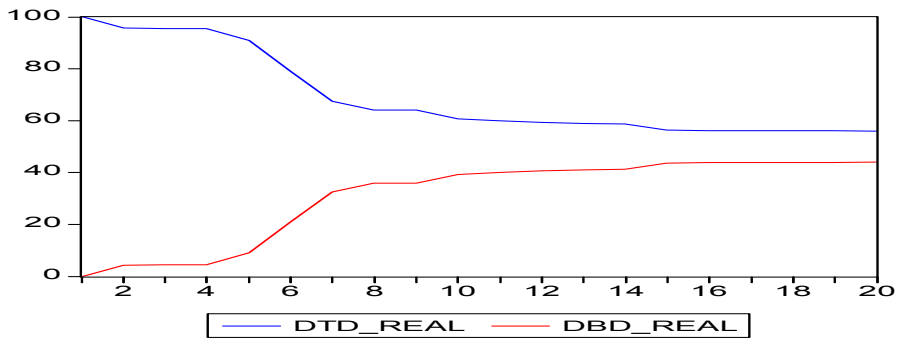


Table 13 and Figure 13 show that (a) variations in trade deficit were mainly due to trade deficit shocks in the very early part of projections periods ($t \leq 4$); (b) shocks, transmitted through budgetary deficit, assumed greater role in explaining variations in trade deficit since t > 4 periods; (c) budgetary shocks became the dominant factor behind short-run variations in trade deficit since t > 6 periods; and (d) for $t \to \infty$, the contribution of budgetary deficits shocks to total variations in budget deficit was about 44% while that of trade deficit was at about 56%.

Variance Decomposition for Budget Deficit

Variances in budget deficit over the periods of study were basically the results of budget deficit to the shocks transmitted through budget deficit and trade deficit. So a part of total variations in budget deficit was due to budget shocks and the other part was due

to trade deficit shocks. The break-up of variances in budget deficit into these two definite parts across different periods ($t = 1, 2, \ldots\ldots, 20$) constituted the 'variance decomposition' of budget deficit and is given in Table 14. The graphical presentation of the variance decomposition presented in Figure 14.

FIGURE 14: Variance Decomposition of DBD_REAL

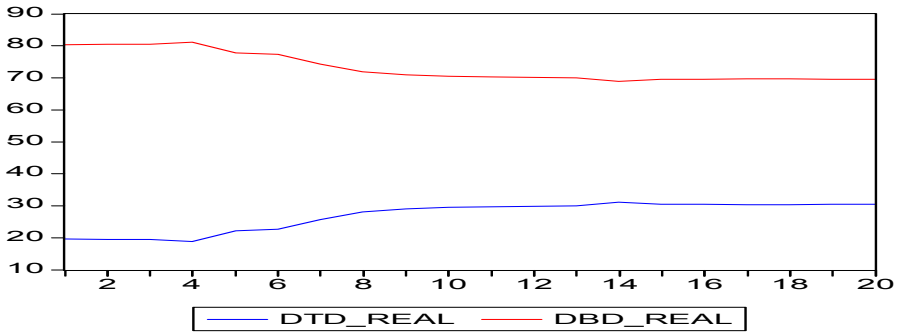


TABLE 14: Variance Decomposition of Budget Deficit

Periods	S.E.	TD_t	BD_t	Periods	S.E.	TD_t	BD_t
1	865.1375	19.57296	80.42704	11	1013.290	29.75352	70.24648
2	895.0773	19.51808	80.48192	12	1013.977	29.78438	70.21562
3	899.2978	19.42901	80.57099	13	1016.373	30.01057	69.98943
4	916.9793	18.85850	81.14150	14	1025.900	31.07589	68.92411
5	946.8167	22.12617	77.87383	15	1036.946	30.49318	69.50682
6	950.0875	22.66100	77.33900	16	1037.604	30.48517	69.51483
7	976.6063	25.72704	74.27296	17	1040.931	30.38887	69.61113
8	992.1744	28.02646	71.97354	18	1042.397	30.36970	69.63030
9	999.5758	28.97491	71.02509	19	1044.576	30.45319	69.54681
10	1003.936	29.48246	70.51754	20	1046.111	30.42907	69.57093

Cholesky Ordering: DTD_REAL DBD_REAL

Table 14 and Figure 14 indicate that, (a) budget deficit shocks dominated the trade deficit shocks in generating short-run variations in expenditure. For example, for $1 < t \leq 4$, at least 81% of the short-run variations were due to budgetary deficit shocks while trade deficit shocks accounted for at most 19% of such variations; (b) budget deficit shocks took the dominant role in constituting the long-run equilibrium level for the budget deficit profile; for example, budget deficit shocks constituted about 70% of the long-run equilibrium level of the budget deficit profile while trade deficit shocks, on the other hand, contributed at most 30% to their account; and (c) at $t = 1$, the total budget deficit variations was mainly due to budget deficit shocks. So, at $t \to \infty$, the contribution of

budgetary shocks to total variations never fell short of 70% level. On the other hand, contributions of trade deficit shocks to this account never exceeded 30% level.

Findings on Variance Decomposition

The foregoing observations show that: (a) shocks transmitted through the budget deficit took a significant role in constituting the long-run equilibrium levels for both budget deficits and trade deficit profiles; and (b) shocks transmitted through the budget deficit channel dominated over the trade deficit channel in generating short-run variations in short-run in both budget deficit and trade deficit profiles.

All of these findings, therefore, confirm that causality running from 'trade deficit' to 'budget deficit' is 'weak'. On the other hand, 'budget deficit' shocks contributed significantly to the constitution of trade deficit profile. Consequently, causation running from' budget deficit' to 'trade deficit' was 'stronger' and dominant.' Therefore, the direction of causality (BD_t Granger Caused TD_t) has been reinforced trough the VAR modeling and intervention analysis also.

VII. Conclusions and Policy Implications

The initial objective of this study was to analyze whether the twin deficit hypothesis (TDH) is supported or 'otherwise' in Nepal. The findings derived from the study are summarized as follows: (i) trade deficit was found to be Granger Caused by budget deficit; (ii) change in budget deficit Granger Caused more than proportionate change in trade deficit; (iii) budget deficit has been 'exogenous' to the VAR (2, n) system; (iv) budget deficit, being 'exogenous' to the system, implies that other considerations of fiscal and socio-economic policies took the leading role in establishing revenue-expenditure schedules as a result of which budget deficit has been the outcome of the other socio-economic-political considerations and exercises in the economy of Nepal; and (v) since the trade deficit has been 'Granger Caused' by budget deficit, rational economic measures are needed for containing trade deficit and budget deficit.

There is a continuous rise in budget deficit in Nepal as well as in trade deficit, too. Prevalence of continued budget deficit would nullify any measures taken such as import substitution, export promotion, or deficit control efforts as such reform measures may not always be workable for containing the trade deficit. The straightforward suggestion for containing budget deficit would be a measure of reducing budget deficit through bridging the gap between expenditure and revenue. However, one may argue that such attempt of reducing budget deficit would have no meaningful impact in solving the twin deficit problem in view of the fact that fiscal policy measures under globalization and flexible exchange rate regime would produce only little perceptible impact on economic growth. In such situation, other supporting policies such as monetary policies and financial sector policies need to be revamped for solving such a twin deficit dilemma.

REFERENCES

Abel, A.B. and S. Bernanke. 2003. *Macroeconomics*. Pearson Education Inc.

Alkswani, M. 2000. "The Twin Deficits Phenomenon in Petroleum Economy: Evidence from Saudi Arabia." King Saud University, Saudi Arabia.

Akbostanici, E. and G.I. Tunc. 2002. "Turkish Twin Deficits: An Error Correction Model of Trade Balance". Middle East Technical University, Turkey.

Chang, S. 2004. "Budget Balance and Trade Balance: Kin or Strangers – A Case Study of Taiwan." *Research Paper 893*. University of Melbourne.

Dickey, D.A. and W.A Fuller. 1979. "Distribution of the Estimators for Auto-regressive Time Series with a Unit Root." *Journal of American Statistical Association* 74: 427-431.

Dickey, D.A., D.W. Jansen and D.L. Thornton. 1991. "A Primer on Cointegration with an application to Money and Income." *Federal Reserve Bank of St. Louis* March-April: 58-78.

Durlauf, S.N. and P.C.B. Phillips. 1988. "Trends Versus Random Walks in Time Series Analysis." *Econometrica* 56(6): 1333-1354.

Eichenbaum, M. 1992. "Comments: Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy." *European Economic Review*, 36(5): 1001-11.

Enders, W. 2004. *Applied Econometric Time Series*. New York: John Wiley & Sons, Inc.

Engle, R.F. 1982. "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of UK inflation." *Econometrica,* 50: 987-1008.

Estrella, A. and J.C. Fuhrer. 1999. "Are 'Deep' Parameters Stable? The Lucas Critique as an Empirical Hypothesis." *Working Paper.* Federal Reserve Bank of Boston.

Fuller, W.A. 1976. *Introduction to Statistical Time Series*. New York: John Wiley and Sons. .

Gujarati, D. N. 2003. *Basic Econometrics*. Delhi: Mc Graw Hill.

Harvy, A. 1990. *The Econometric Analysis of Time Series*. Cambridge: MIT Press.

Hatem, J. A. and G. Shukur. 1999. "The Causal Nexus of Government Spending & Revenue in Finland: A Bootstrap Approach." *Applied Economics Letters*.

Jackson, G. 1996. "Twin Deficit Bogey Returns." *The Australian*, 10: 21-27, October.

Johnston, J. and J. Dinardo. 1997. *Econometric Methods*. McGraw Hill International Edition.

Kanel, N.R. 2003. *Guidelines to Format Thesis and Dissertation: A Quick Reference*. Kathmandu: New Hira Books Enterprises.

Karras, G. and F. Song. 1994. "Government Spending and the Current Account: Some Evidence." *International Economic Journal* 9 (4): 45-56.

Kasa, K. 1994. "Finite Horizons and the Twin Deficits." *Economic Review*. Federal Reserve Bank of San Francisco.

Konishi, T, V. A. Ramey and C.W.J. Granger. 1993. "Stochastic Trends and Short-run Relationships between Financial Variables and Real Activity." *NBER Working Paper Series No. 4275.*

Kothari, C.R. 1998. *Research Methodology, Methods and Techniques*, India: Wishwa Prakashan.

Kouassi, E. *et al.* 2005. "Lag Length Selection and Test of Granger Causality between Twin Deficits." West Virginia University.

McNelis, P.D and B. Siddiqui. 1994. "Debt and Deficit Dynamics in New Zealand: Did Financial Liberalization Matter?" *International Economic Journal* 8 (3), Autumn.

Masahiro, K. and M. J. Louis. 1995. "Twin Deficits versus Unpleasant Fiscal Arithmetic in a Small Open Economy." *Journal of Money, Credit and Banking* 27: 639-58.

McLean, A. 2001. "On the Nature of Hypothesis Tests." *Working Paper* 4/2001. Monash University, Australia.

Maddala, G. S. 2002. *Introduction to Econometrics*. West Sussex: John Wiley & Sons.

Marinheiro, C. F. 2001. "Ricardian Equivalence: An Empirical Application to the Portuguese Economy." University of Coimbria and Katholieke Universiteit Leuven, Portugal.

Miller, S. M. 1991. "Monetary Dynamics: An Application of Co-integration and Error-Correction Modeling." *Journal of Money, Credit and Banking* 23(2): 139-154.

Miller, S. M. and F.S. Russek. 1990. "Co-integration and Error Correction Models: Temporal Causality between Government Taxes and Spending." *Southern Economic Journal* 57: 221-229.

Ministry of Finance. *Economic Survey*. Various Issues. Katmandu: Ministry of Finance.

Musgrave, R. A and P. B. Musgrave. 1989. *Theory of Public Finance.* McGraw Hill International Edition. .

Nepal Rastra Bank. 2002. *WTO and Nepal*. Kathmandu: Nepal Rastra Bank. 2002.

Nepal Rastra Bank. 1996. *40 Years of the Nepal Rastra Bank*. Kathmandu: Nepal Rastra Bank.

Noland, D. 2002. "Ominous Return of the Twin Deficits." *The Credit Bubble Bulletin*. June 21.

Normandian, M. 1994. "Budget Deficit Persistence and the Twin Deficits Hypothesis." *Working Paper 31*. University of Quebec December.

Palley, T. I. 2001. "The Case Against Budget Surpluses: Why Government Debt is Good and Moderate Budget Deficits Are Needed in a Growing Economy. Public Policy?" *AFL-CIO*, Washington DC.

Oxley, L. and G. Greas. 1998. "Vector Autoregression, Cointegration and Causality: Testing for Causes of the British Industrial Revolution." *Applied Economics*, 1387-1397.

Pakko, M. R. 1999. "The U.S. Trade Deficits and the New Economy" *Review*, Federal Reserve Bank of St. Louis, September-October.

Patterson, K. 2002. *An Introduction to Applied Econometrics: A Time Series Approach*. New York: Palgrave.

Perron, P. 1997. "Further Evidence on Breaking Trend Functions in Macroeconomic Variables." *Journal of Econometrics* 80: 355-385.

Phillips, P.C.B. 1985. "Understanding Spurious Regressions in Econometrics." *Cowles Foundation Paper*, 757.

Pindyck, R.S. and D.L. Rubinfeld. 1997. *Econometric Models and Econometric Forecasts.* McGraw-Hill International Book Company.

Saleh, A.S. 2003. "The Budget Deficit and Economic Performance: A Survey." *Working Paper*. University of Wollongong.

Salvatore, D and D. Regle 2005. *Statistics and Econometrics*. New Delhi: Tata McGraw Hill Edition.

Shrestha M.B. and K. Chaudhary. 2005. "A Sequential Procedure for Testing Unit Roots in the Presence of Structural Break in Time Series Data." *Working Paper*. University of Wollongong.

Vyshnyank, O. 2000. "Twin Deficit Hypothesis: The Case of Ukraine." National University, Ukraine.

Zengin A. "The Twin Deficits Hypothesis (The Turkish Case)." Zonguldak Karaelmas University, Zonguldak, Turkey,

Zivo, E, and D.W. Andrews. 1992. "Further Evidence on the Great Crash, the Oil-Price Shock and the Unit- Root Hypothesis." *Journal of Business and Economic Statistics* 10: 251-270.

ANNEX 1: Trade Deficit and Budget Deficit Time Series (Rs. in million)

Year	Trade Deficit	Budget Deficit	GDP Deflator (1985=100)	TD Real	BD Real
1964	-419	-3	20.6	-2034	-15
1965	-384	25	22.4	-1714	112
1966	-184	-36	25.8	-713	-140
1967	-85	-40	24.3	-350	-165
1968	-74	22	27	-274	81
1969	-307	62	28.8	-1066	215
1970	-334	24	30.8	-1084	78
1971	-373	-39	31.8	-1173	-123
1972	-275	-126	35.7	-770	-353
1973	-427	-223	34.5	-1238	-646
1974	-721	-248	41.7	-1729	-595
1975	-788	-236	47.5	-1659	-497
1976	-806	-422	53.5	-1507	-789
1977	-1097	-576	51.6	-2126	-1116
1978	-1577	-582	56.4	-2796	-1032
1979	-1747	-588	62	-2818	-948
1980	-3143	-705	66.8	-4705	-1055
1981	-2818	-728	72.1	-3908	-1010
1982	-4076	-1591	78.8	-5173	-2019
1983	-5385	-2954	88.5	-6085	-3338
1984	-4738	-2985	94.1	-5035	-3172
1985	-5352	-3380	100	-5352	-3380
1986	-6746	-3637	108.9	-6195	-3340
1987	-9154	-3902	123	-7442	-3172
1988	-11388	-4280	133.3	-8543	-3211
1989	-11468	-8014	145.9	-7860	-5493
1990	-13733	-7013	159.7	-8599	-4391
1991	-17602	-9915	174.5	-10085	-5681
1992	-17451	-10054	208.4	-8376	-4825
1993	-24591	-10359	231.2	-10638	-4481
1994	-39176	-7463	250.7	-15628	-2977
1995	-51133	-7894	274.9	-18603	-2872
1996	-57417	-10976	295.2	-19449	-3718
1997	-74419	-10908	317.8	-23421	-3433
1998	-50613	-13846	329.6	-15357	-4201
1999	-55969	-13349	357.6	-15651	-3733
2000	-54569	-12545	374.1	-14587	-3353
2001	-55141	-18498	386.8	-14255	-4782
2002	-66368	-16506	398.8	-16642	-4139
2003	-83089	-11391	418.2	-19866	-2724
2004	-82001	-15828	439.6	-18655	-3601

Source: *International Financial Statistics*.

ANNEX 2: Summary of Literature Survey on Twin Deficit Hypothesis

Authors	Sample Countries	Results/Findings
Darrat (1988)	USA	Bi-directional causality between TD & BD.
Bahmani-Oskooee (1989)	USA	Unidirectional causality from BD to current account deficit (CAD).
Latif-Zaman & DaCosta (1990)	USA	Unidirectional causality from BD to CAD.
Enders & Lee (1990)	USA	Positive innovation of government debt to consumption spending and in the CAD.
Zietz & Pemberton (1990)	USA	BD was transmitted to the TD primarily through the impact on imports.
Bachman (1992)	USA	Unidirectional causality from BD to CAD.
Mohammadi & Skaggs (1996)	USA	Maximum effect of an innovation in the budget surplus (BS) on the TD is relatively modest. So, shocks in the BS are not the major factors in determining the behavior of TD.
Laney (1984)	58 countries	Causality form BD to CAD in developing countries. Amongst world's largest economies, Canada & Italy only demonstrate a statistically significant positive relationship between BD and CAD.
Bernheim (1988)	6 countries	$ 1.00 increase in the BD is associated with roughly a $ 0.30 decline in CA surplus for USA, UK, Canada, and West Germany but $ 0.85 decline in CA for Mexico. No effect on CA for Japan.
Kearney & Monadjemi (1990)	8 countries	Causality from CAD to BD in USA. No causality in Australia and France.
Vamvoukas (1997)	Greece	One-way causality from BD to TD.
Khalid & Guan (1999)	10 countries	Unidirectional causality from BD to CAD in USA, France and Canada. No causality between BD & CAD in UK and Australia. Weaker support for bidirectional causality too in Canada. Two-way causality for India. Causality from CAD to BD in Pakistan and Indonesia. Unidirectional causality from BD to CAD for Egypt and Mexico.
Olga Vyshnyak (2001)	Ukraine	Unidirectional causality from BD to CAD
Elif Akbostanci and Gul Ipec Tunk (2002)	Turkey	Unidirectional causality from BD to CAD
Mamdouh Alkswani (2000)	Saudi Arabia	Unidirectional causality from TD to BD
Michel Normandin (1999)	Canada	TDH supported

Development of the Nepalese Financial System: Need for the Formulation of a Master Plan

Nephil Matangi Maskay, Ph.D.[*] and Satyendra Raj Subedi[**]

The paper examines the development of Nepalese financial system which is categorized into three different phases: the first phase is the pre-NRB period; the second phase starts with NRB Act of 1955, which is further disaggregated into two sub-periods at 1984, the start of domestic financial liberalization; and the third and ongoing phase starts after enactment of current NRB Act of 2002. After analyzing period aggregate data on the financial system, the paper concludes that despite significant financial deepening in the context of financial liberalization and integration with the external economy, there is still scope for geographically balanced financial development. For addressing these challenges in a comprehensive manner, the study proposes initiating the development of a Financial Sector Master Plan.

I. BACKGROUND

A healthy financial sector is essential to facilitate sustainable economic growth. Theoretically, the channel by which financial development supports economic growth is via enhancing financial intermediation, for example, moving funds from savers to investors in a cost-effective manner which motivates individuals towards more efficient resource allocation decisions .[Greenwood and Jovanovic (1989), Levine and Zervos (1998)]. In the literature, there are four channels by which financial development affects economic growth: (1) by improving the screening of funds-seeking investors and their subsequent monitoring, and thereby channeling the allocation of resources for its most profitable investments; (2) by encouraging the mobilization of savings by means of providing diverse instruments that match the differing preferences of savers; (3) by lowering the transaction, screening, and monitoring costs through economies of scale; and

[*] Director, Research Department, Nepal Rastra Bank
[**] Assistant Director, Research Department, Nepal Rastra Bank
Remarks: We would like to acknowledge the valuable comments and suggestions from Keshav Prasad Acharya, Tula Raj Basyal, Bhubanesh Pant, Ramesh Kumar Pokharel, Danda Pani Poudel and Govinda Bahadur Thapa; but any error which fall out of the paper are the sole responsibility of the authors. Also, the views expressed in the paper by the authors are personal and in no way are to be construed as reflecting the stance of the Nepal Rastra Bank.
Corresponding Author: Satyendra Raj Subedi, E-mail: srsubedi@nrb.org.np

(4) by enhancing various options of risk and liquidity management. Each of these four financial functions influences savings and investment decisions of economic agents and ultimately results in higher economic growth.

Does this theoretically important relationship between the financial sector and economic growth hold true for Nepal? There is no clear cut answer. Recent publications by Bhetuwal (2007) and Poudel (2006) find that financial development (FD) contributes positively to domestic economic growth. On the other hand, Shrestha (2005) did not find any significant relationship between economic growth and FD. A recent study by Nepal Rastra Bank suggests that domestic economic growth is found to be somewhat supported by FD; but, the effect is noticeable with a one-year lag, but not at a contemporaneous level (NRB, 2009). In this context of mixed results, the appropriate development of Nepalese financial sector is essential so that it can play a critical and positive role in the economic growth of the nation.

The goal of this paper is to provide both an overview of the developments in the domestic financial system and a recommendation for reaping the maximum benefit from domestic FD. In this regard, the paper assesses the Nepalese FD system, provides some observation and analysis leading to recommendations on the next steps to be taken by policy makers. The paper is structured into five sections. In the next section, stylized facts are provided on the Nepalese financial system. This will be followed by some performance measurements of the domestic financial system. The fourth section provides some discussion and observation highlighting three issues, which is followed by a recommendation for initiating the formulation of a Financial Sector Master Plan (FSMP) with the last section providing summary and a concluding remark.

II. STYLIZED FACTS OF THE NEPALESE FINANCIAL SYSTEM

Definition of Financial System

There are many descriptions of the financial system. Despite these variations, there is a consensus on its basic function: to efficiently and effectively allocate resources. In this regard, there are three main actors: (1) banks and financial institutions; (2) insurance companies; and (3) capital markets. These three actors are not independent but are interdependent and given the present innovation of technology, the separating lines, at times, are blurred.[1] For this paper, the domestic financial sector takes a narrow focus that is confined within the perspective of the Nepal Rastra Bank, given its longer history and the availability of data compared to others.

History of Domestic Financial Sector Development

The Nepalese financial system development has a very recent history, starting just from the early twentieth century. The full period, from initiation to the present, can be broken down into three distinct phases. The shifts in these phases are determined by different milestones: the first milestone is the establishment of the Nepal Rastra Bank

[1] The World Trade Organization has classified Financial Services Sector into two sub-sectors: (1) Insurance and Insurance Related Services and (2) Banking and Other Financial Services.

(NRB), the Central Bank of Nepal, in 1956 - this determines the shift from the first to the second phase; similarly the second milestone is the promulgation of the current NRB Act 2002 - this determines the shift from the second phase to the ongoing third phase.

The first phase: This phase corresponds with the initiation of formal domestic banking system in Nepal till the establishment of NRB in 1956. Nepal's formal financial system had a late start and began less than one and a half centuries ago. The establishment of *Tejarath Adda* in 1880 can be conceived as the beginning of the process of credit mobilization in Nepal. However, this institution, although formally established, was not allowed to take public deposit and provide credit to public – the fund had been provided by the government for credit to their staff and landlords only. Therefore, it was not a bank per se. Even the urban people in need of the financial support had to rely on *Shahus* (merchants) and landlords because of the limited activities of *Tejarath Adda* (Pant, 1964). It was only with the establishment of Nepal Bank Limited (NBL) in 1937 that the financial services were made available to the general public. In this regard, the establishment of NBL was the epoch-making since it signified commencement of formal banking system in Nepal.

The second phase: This phase commences with the establishment of NRB in 1956 under the NRB Act 1955, and completes with the promulgation of the current NRB Act 2002. With the establishment of NRB in 1956, the process was made easier for establishment of banks and financial institutions in the country. However, this phase can be further subdivided into two sub-periods: The first sub-period (or second phase A), was a period of restriction where the Nepalese payment system was characterized as "predominantly a cash-economy" (NRB, 1965);[2] but, this period took a different turn with the establishment of Nepal Arab Bank Limited as the first joint-venture bank in 1984, under the Government's liberalized policy. The first sub-period saw more directed role of NRB in terms of credit control (including directed credit programs) and control of different categories of interest rates. In this sub-period, three institutions of diverse nature were established under the full ownership of the Government of Nepal (GON). They were (i) Nepal Industrial Development Corporation (NIDC in 1959)[3]; (ii) Rastriya Banijya Bank (RBB in 1966)[4]; and (iii) Agriculture Development Bank, Nepal (in 1968)[5]. The second sub-period (or second phase B) witnessed greater financial liberalization that practically started from 1984 until the enactment of new NRB Act in 2002. This sub-period corresponds with the overall economic liberalization policy of GON after the nation underwent sustained balance of payment crisis in the early 1980s. This later sub-

[2] Some comparative ratios of Nepal, UK and India demonstrate the level of financial development at that time. Nepal had 400,000 persons per bank branch while it was 4,000 and 70,000 for UK and India respectively. Additionally, the per capita deposit at that time in Nepal was Nrs. 8, or less than a dollar, compared to 367 dollars for UK and 9 dollars for India (NRB, 1961).

[3] This was established under Nepal Industrial Development Cooperation Act, 1959 with the objectives of mobilizing capital to industrial sector and facilitating industrial development in private sector

[4] This was established under Rastriya Banijya Bank Act, 1965 with the objective of providing banking services throughout Nepal and contributing to the socio economic development of the country

[5] This was established under Agriculture Development Bank Act, 1967 with the objective of providing credit to agriculture sector throughout the country

period saw major shifts in the policy measures such as: from a controlled to a deregulated framework of interest rate; from direct to indirect methods of monetary control, emphasizing open market operations as the main policy tool; and permitting market-determined exchange rate of the Nepalese currency against convertible currencies and full convertibility of the Nepalese currency in the current account (NRB, 1996). During this sub-period, Nepal Indosuez Bank (later named as Nepal Investment Bank) and Nepal Grindlays Bank (now Standard Chartered Bank Nepal) were established in 1986 and 1987 respectively as the second and third joint-venture banks. However, no fully owned domestic-funded banks were established during this period. The entry of other development banks, finance companies, micro-credit development banks, savings and credit cooperatives and Non-government organizations (NGOs) for limited banking transactions started after 1992 under three major acts namely Finance Company Act 1985, Company Act 1964 and Development Bank Act 1996.

The third phase: The current NRB Act of 2002 marks the initiation of the currently undergoing third phase. This act replaced the NRB Act 1955 and allowed NRB to be more autonomous in exercising decisions relating to formulation of monetary and foreign exchange policy as well as monitoring and regulating banks and financial institutions across the nation. However, it was felt that the existing situation of multiple numbers of acts under banking and financial institution sector made the process of regulation and monitoring system very cumbersome. As a result and as a process of financial sector reform program (see Box 1 below for short background), all those diversified acts were grouped together under the 'Bank and Financial Institution Act (BAFIA), 2006.'[6] This Act, also known as *Umbrella Act*, categorized all the banks and financial institutions under four heads on the basis responsibility differences: Group A as commercial bank; Group B as development bank; Group C as finance company; and Group D as micro-credit development banks. The other two forms of institutions, namely saving and credit cooperatives and Non-Government Organizations (NGOs), both allowed by NRB for limited banking transactions, are however not put in any of those groups and are being operated under specific directives and rules.

[6] This Act was already being effective in the form of an ordinance from 2003

BOX 1: Short Background of the Most Recent Financial Sector Reform Program

There were prior episodes of financial sector reform which was initiated from 1984. The most recent program was motivated by the indication (from evaluation of both financial indicators and process) that the system was weak, vulnerable and risky up to recent past.[7] Therefore, a reform strategy was initiated which was consistent with the joint report of World Bank and International Monetary Fund (IMF). As a result, Financial Sector Strategy Paper (FSSP) which was approved by cabinet on October 3, 2000 and announced publicly on November 22 of that year was developed with the technical assistance from the World Bank. FSSP, which is also known as the financial sector strategy statement of GON, had the goal of making the financial system well diversified, competitive, sound, and supportive to the attainment of development objectives of the economy. The strategy paper assigned an important and enhanced role, responsibility and accountability to the NRB which launched this program in two phases: Phase I as Financial Sector Technical Assistance Project (FSTAP); and Phase II as Financial Sector Restructuring Project (FSRP). The focus of this program is on: 1) reengineering of NRB (2) reform of two large ailing commercial banks namely RBB and NBL; and (3) support for capacity building in financial sector. These reform programs have resulted in a significant progress in terms of making regulatory and supervisory aspects more strengthened via implementation of different norms such as that of Basel core principle.

Source: www.nrb.org.np

Current Status: Presently, as of March 1, 2009, the number of banks and financial institutions (BFI) licensed by NRB are: 25 commercial banks under Group A; 60 development banks under Group B; 78 finance companies under Group C; and 13 micro-credit development banks under Group D. Similarly, there are 16 savings and credit co-operatives and 45 non-government organizations (NGOs), both being allowed by NRB for undertaking limited banking transactions. The historical development of the number of BFIs is summarized in Table 1 below.

[7] The reports of Commercial Banks Problem Analysis and Strategy Study (CBPASS) which was initiated in FY 1989/90, had pointed out the above mentioned problems and also identified NBL and RBB. Accordingly in 1991 the government had initiated a re-capitalization plan[0] in view of strengthening and improving the performance of these banks (Dhungana, 2005). Amid the report of financial sector assessment program (FSAP) in 1999, which was jointly conducted by World Bank and IMF, it was realized that the indicators of the domestic financial sector had shown Nepalese financial system to be very weak, vulnerable and very risky – e.g. Nepal was only compliant to one core principle and largely compliant to 7 core principles and norms, out of 25 core principles and 30 norms of Basel Accord 1988 (quoted by Dhungana, 2005). With these backgrounds and supported by the reports from "Reconciliation Project" carried out by Nepalese auditors, a study of NBL and RBB was conducted in 2000 by KPMG. The report of this group also highlighted serious shortfalls in all aspects of their governance, management, and operations.

TABLE 1: Quantitative Growth of Financial Intermediaries

Category of Financial Institution	First Phase (1937-1956)	Number at Period End: Second Phase (1957-2002) Sub-period A (1984)	Second Phase (1957-2002) Sub-period B (2002)	Third Phase (2003 - current: March 1, 2009)
Commercial Banks	1	4	18	25
Development Banks	-	1	9	60
Finance Companies	-	-	51	78
Micro-credit Development Banks	-	-	11	13
Savings and Credit Cooperatives (Licensed by NRB)	-	-	16	16
NGOs (Licensed by NRB for Limited Banking Transactions)	-	-	35	45
Total	1	5	140	237

Source: www.nrb.org.np
Note: Agriculture Development Bank Nepal is also put under commercial banks.

Table 1 shows that the numbers of banks and financial institutions have experienced an accelerated quantitative growth after the end of first phase. Till 1956, there was only one commercial bank, NBL, with the number of all other financial institutions being zero. At the end of the first sub-period of the second phase (second phase A), three more commercial banks and one development bank were established. The number drastically increased in the end of the later sub-period of the second phase (second phase B): there were altogether 140 banks and financial institutions (18 commercial banks, 9 development banks, and 51 finance companies with the establishment of savings and credit cooperatives and NGOs). The growth scenario in terms of number has reached 237 banks and financial institutions with 25 commercial banks, 60 development banks and 71 finance companies with the establishment of savings and credit cooperatives and NGOs, as shown in Table 1, as on first March 2009. The accelerated growth of financial institutions in second phase B and the current third phase is purely from the private and/or joint-venture sector with no participation of the GoN; this has resulted from greater reform initiatives.[8] With these quantitative developments in the financial sector, NRB has changed its role from simply focusing on the provisioning of financial services to regulation and supervision aspects in an open and liberalized environment (Bhattarai, 2005).

III. PERFORMANCE MEASUREMENT OF THE FINANCIAL SYSTEM

The quantitative development of the Nepalese financial system is examined from three perspectives: (1) financial deepening as measured by broad money supply (M2) to GDP ratio; credit to deposit ratio; and both per-capita credit and per-capita deposit structure; (2) status of non-performing assets (NPA); and (3) regional distribution pattern

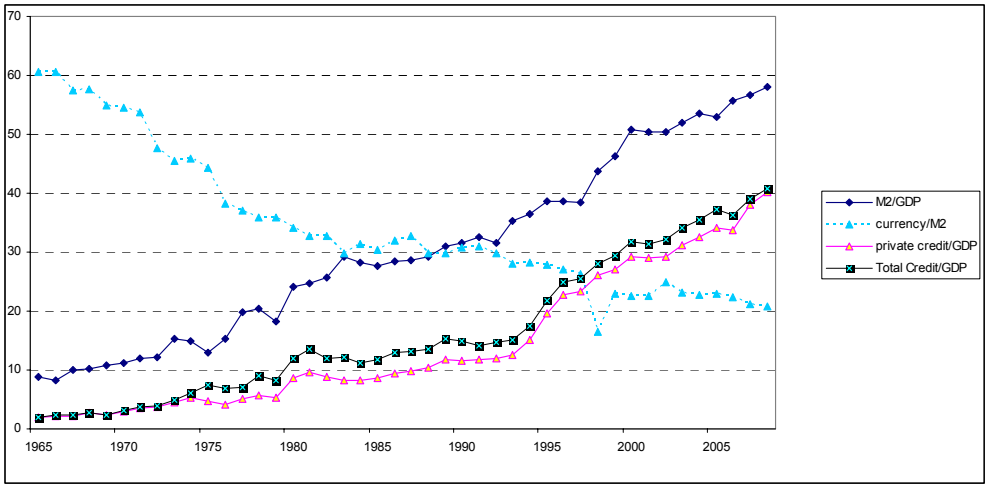
[8] These include the ease of licensing policies, statutory requirements, foreign exchange exposure, and cash reserve ratios; liberalization of the interest rates; full convertibility of current account; and other prudential rules and regulatory reforms

of commercial bank branches. However, due to lack of time series data for financial institutions under group B, C, and D as defined by BAFIA Act, such analysis is carried out by the data from commercial banks (group A) only and hence do not capture the broader financial institutions - a major limitation of the study.

Financial Deepening

The standard measures to assess the extent of financial deepening are ratios of: M2 to GDP; currency to M2; and credit to GDP. In Figure 1 below, the trends of these ratios are shown. The span of the ratios is taken from 1965 onward, due to non-availability of data and hence exclude phase I scenario and includes only a portion of phase II.

FIGURE 1: Some Selected Proxies of Financial Deepening Indicators



Source: NRB and authors' calculations.

Eyeballing the above-time series it is observed that all have distinct growth trends. This is more carefully explored in Table 2 below which demonstrates the summary statistics of these ratios during the different phases and sub-periods. Table 2 shows that from phase II to phase III, M2 to GDP ratio more than doubled; private sector credit to GDP ratio more than tripled; and total credit to GDP ratio increased by more than 250 percent. Similarly, the currency to M2 ratio had decreased from 36.4 percent in phase II to 27.6 percent in phase III.[9] All these ratios have sharp diversion from the second period of phase II.

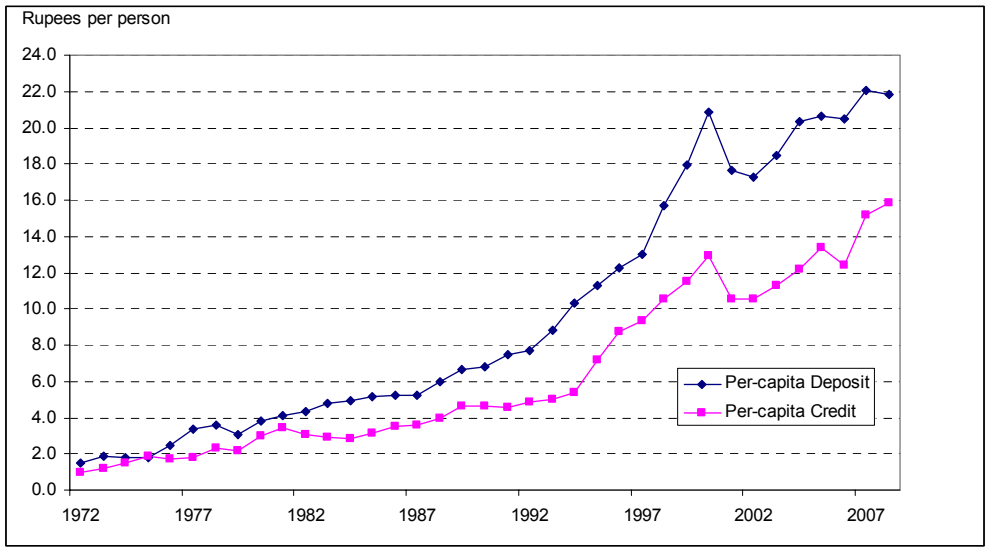
[9] This figure may not give a true picture of the magnitude of currency in circulation due to the presence of Indian currency in Nepal.

TABLE 2: Phase-wise Summary of Financial Deepening Indicator

	M2/GDP	Currency/M2	Private Credit/GDP	Total Credit/GDP
Phase I	-	-	-	-
Phase II	26.4	36.4	11.0	13.2
Sub-period A	16.6	44.5	5.0	6.6
Sub-period B	36.7	27.6	17.3	19.9
Phase III	54.2	22.6	34.2	36.4

Similarly, Figure 2 below portrays the overall per-capita deposit and credit amount in Nepalese Rupees in real terms. However, because of data limitation, such ratios are taken from 1975 onward. These ratios show a clear impact of the financial liberalization process initiated in the mid 1980s - both ratios show remarkable shift after 1990s. However, looking at the graph, a distinct "bump" in the trend can be seen around 2001 for both the ratios - the per-capita deposit slightly decreased from Rs. 20.9 in 2000 to Rs.17.6 in 2001; and per-capita credit ratio also fell from 13 in 2000 to 10.6 in 2001. The performance may reflect a response to a period of complicated political situation with acceleration of internal conflict since 2001(Acharya, 2005).

FIGURE 2: Real Per-capita Deposit and Credit (at 1984/85 prices) in Rs.



Source: Authors' calculation by using i) population data from IMF, *International Financial Statistics 2002 Year Book*; ii) deposit and credit data from Nepal Rastra Bank, *Quarterly Economic Bulletin*; and iii) GDP deflators at 1984/85 prices calculated from nominal and real GDP figures that were taken from Ministry of Finance, *Economic Survey,* various issues, GoN.

Looking at the phase-wise analysis, the average per-capita deposit and credit in phase II was Rs. 7.6 and 4.9 respectively, with remarkable shifts from the first sub-period to the second sub-period - per-capita deposit and that of credit in the second phase B are about 3.2 and 3 times faster than in the second phase A. The financial liberalization process that started in mid 1980s and developed more rapidly after 1990s has been the basis of such development in these ratios. These ratios on average in phase III further jumped to the level of Rs. 20.2 and Rs. 13 respectively.

TABLE 3: Real Per-capita Deposit and Credit Structure (in Rs.) During Different Phases

	Phase I	Phase II			Phase III
Period		Sub-period A	Sub-period B	Total	
Per-capita Deposit	–	3.2	10.5	7.6	20.2
Per-capita Credit	–	2.2	6.7	4.9	13.0

Note: the figures are the annual average figures of the period concerned
Sources: Real GDP from Ministry of Finance, *Economic Survey*, population from IMF, *International Financial Statistics*; deposit and credit from NRB, *Quarterly Economic Bulletin*.

The above indicators of FD suggest that there has been a significant financial deepening as we move from second phase to third phase: both per-capita deposit and credit increased by more than two hundred percent between the second phase and the third phase. This process is more apparent after the second phase B and is continuing unabatedly in the present and ongoing third phase.

Status of Non-Performing Assets (NPA)

As had been mentioned in Box 1 earlier, Nepal is in midst of FSRP. An indicator of trouble in the financial sector is the level of NPA's, which are the outstanding loan and advances of the banks and financial institutions (BFI) classified under categories other than 'pass or good' loan. While it is suggested that there was significant levels of NPA in the end part of second phase B, it was only in 2003 that it was identified that NBL and RBB each had more than sixty percent NPA level that had pulled total NPA level of domestic commercial banks at 28.8 percent. However, with the implementation of FSRP there has been substantial progress in reducing the NPA level of the overall commercial banking sector[10]: it has decreased significantly from the above-mentioned level to 6.08 percent in mid-July 2008, although there is still scope to reduce this amount to the international level of below 5 percent.[11] This suggests that despite the deepening of the

[10] It is to be noted that although such heavy decline in NPA level of commercial banks as a whole is due to progress made by NBL and RBB, there are significant level of shares of write-off of bad loans in these two banks in this period.

[11] Looking at the share of NBL and RBB, both banks had about 60 percent NPA in 2003 and both showed similar progress till 2005. However, after 2005, NBL managed to lower NPA level from 49.64 percent in 2005 to 18.18 percent in 2006 whereas RBB was just able to lower from 50 to 37 percent. The existing 14 percent and 27 percent NPA of NBL and RBB is still the source of problem since these two banks combined together occupy about 25 percent of total deposit and 15

financial sector and greater participation of private sector in asset ownership, the existence of significant NPA levels prior to the FSRP program pointed to fragility in the domestic financial system. The reduction in NPA levels of NBL and RBB as well as the commercial banking sector as a whole can be taken as one of the success measures of FSRP process among others such as formulation of different acts, strengthening regulation and supervision of financial institutions at NRB, and movement towards compliance of Basel II Capital Accord, among others.

TABLE 4: NPA as Percent of Total Gross Loan of Commercial Banks (mid-July)

Year	NBL	RBB	Industry Average
2003	60.47	60.15	28.80
2004	53.74	57.64	22.80
2005	49.64	50.7	18.94
2006	18.18	34.83	14.22
2007	13.49	27.65	9.65
2008	8.95	21.65	6.08

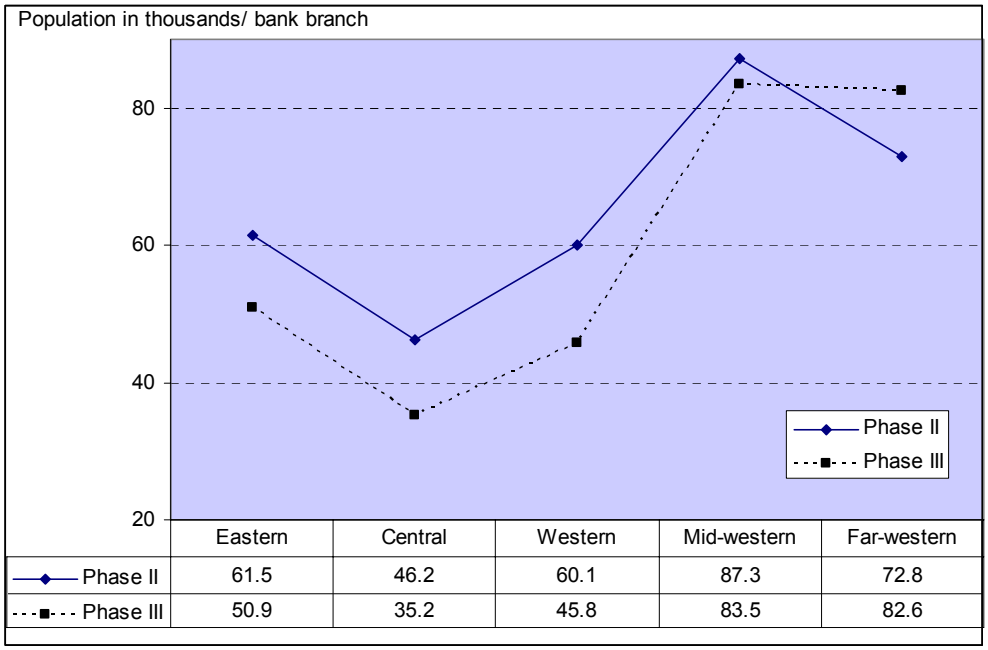
Source: NRB. 2008. *Banking and Financial Statistics*, No. 51, mid-July, pp. 8, 20.

Regional Distribution Pattern of Commercial Bank Branches

This measures imbalances, of the growth of financial system among different developmental regions within the nation. It also gives an indicative picture of access to financial services via its concentration in a particular region. The proxy used in this regard is the region-wise population per bank branch. The lower the value, the higher is the expected gain from financial institutions to the public and may suggest stronger competition among the financial institutions.

percent of total credit facilities of commercial banks and their branches cover all 75 districts of the country

FIGURE 3: Region-wise Distribution of Population per Branch of Commercial Banks



	Eastern	Central	Western	Mid-western	Far-western
Phase II	61.5	46.2	60.1	87.3	72.8
Phase III	50.9	35.2	45.8	83.5	82.6

Source: Authors' calculation based on data from : i) *Quarterly Economic Bulletin* of NRB for bank branches; ii) and *Statistical Pocket Book* of CBS for population.

As shown in the above figure, the distribution of the bank branches across the nation's five regions is skewed towards Eastern, Central, and Western regions in both the phases. The population per bank-branch in eastern, central and western region significantly decreased from 61.5, 46.2 and 60.1 thousand per commercial bank branch in the end of the second phase to 50.9, 35.2 and 45.8 thousands respectively in the end of the third phase – this represents a growth of 20.8, 31.3 and 31.2 percent respectively. From Figure 3, one can say that there is remarkable progress in Eastern, Central and Western regions of the country. However, there is an insignificant progress in Mid-western region (4.6 percent) and further worsening condition in Far-western region (-11.9 percent). The sudden closure of bank branches in far Far-western region during the period accounted for such decline in the progress in that region.

The average number of population per bank branch in phase II is 65.6 thousands which have come down to 59.6 thousands in phase III. This reflects the overall progress of phase III over phase II. However, the overall progress in phase III compared to phase II has hidden an important fact that the inequality in terms of population per bank branch has widened while moving from phase II to phase III. The extent of inequality, measured from the coefficient of variation, has further worsened while moving from phase II to phase III: the coefficient of variation of population per bank branch in phase II is 21 percent and that in phase III is 33.2 percent.

The examination suggests that there has been improvement in those development regions which have comparatively easier geography and road connectivity, and hence

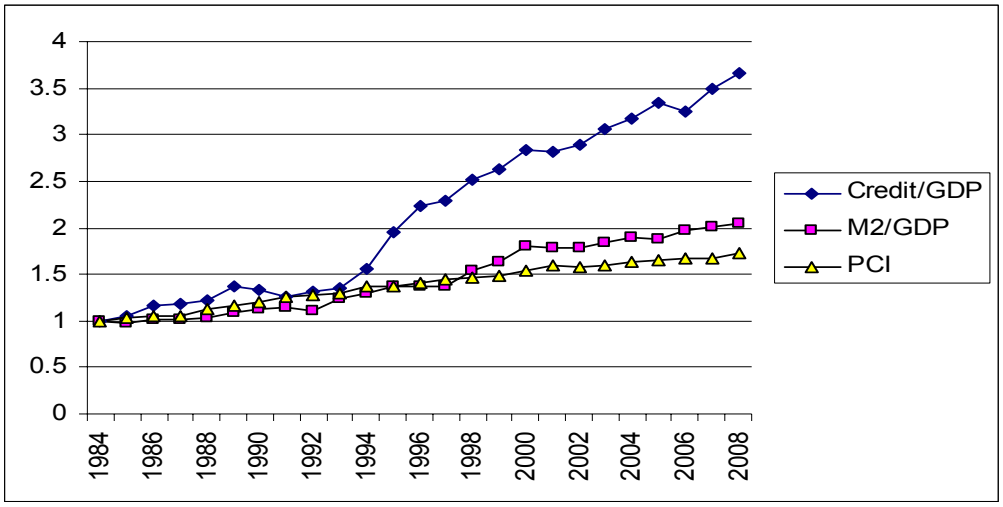
occupy more urban areas. This is consistent with the various studies such as Pradhan (2005) and World Bank (2008). From the above analysis, it is suggested that the growing number of commercial bank branches is not geographically balanced.

IV. DISCUSSION, OBSERVATIONS AND RECOMMENDATIONS

Discussion

The information provided by the previous sections suggests that there is steady numerical growth of the financial sector as measured by different indicators of commercial banks which is quite apparent in the second phase. However growing levels of NPA in the later part of the second phase B pointed to weakness in the domestic financial system which necessitated the initiation of the FSRP. With its introduction, the upward trend of FD continued in the third phase backed up by the reducing level of NPAs of the financial system. However, simply looking at FD does not convey a picture of the whole economy - it is important to examine FD, in this case proxied by M2/GDP and credit/GDP, to the measure of economic well being, proxied by per-capita income (PCI). These are shown in Figure 4 below where the indicators are normalized from 1984, the start of the second phase B, the period of financial liberalization.[12] The normalization of the indicators has a benefit that the value of particular indicator at particular point of time can be easily compared with the value of normalizing year.

FIGURE 4: Trends of Some Ratios



Source: Annex 1.

[12] Although phase II started from 1956, data on PCI and other FD indicators are only available for initial period of phase II. Therefore, for ease of analysis, the examination is confined to the period after 1984 - the start of the period of phase II B.

Observations

Three observations are made regarding the above trends.

First, during the above-examined period of financial liberalization, measures of both PCI and FD in Nepal have an upward trend. This observation comes out from eye-balling the above trends which show a relatively smooth upward trend. The trends are subject to smoothening via HP filter and they maintain their upward motion[13]. A quick regression analysis of time trend of these financial ratios and PCI in the normalized form also supported the above-mentioned facts that the ratios are moving upwards, reflected by positive and significant (at 1%) level of coefficients of each of the regression equations.[14] While it is hard to draw any firm conclusions at this time, the positive trend of FD suggests that despite fragility in the domestic financial sector, reflected in high levels of NPA, the ongoing process of FSR has been successful in strengthening the domestic financial system. This may have contributed to the larger trend coefficient of FD vis-à-vis PCI, Thus, the process of building up the domestic financial system should continue which includes enhancing the capacity of both financial regulators and supervisors.

Secondly, that the trend of FD has also been accompanied by a process of growing economic integration with the world economy. Trade integration is seen by growing contribution of national income from external transactions - this is generally taken as the ratio of the sum of export and import to GDP. But, this process of trade integration has intensified in the current third phase with Nepal's 2004 WTO membership[15] and Financial Services Commitment, for example the possible entry of foreign wholesale bank branches in 2010, and the possibility of having fuller convertibility in the capital account (Maskay, 2006). This increase in external contribution potentially makes the domestic financial system more susceptible to crisis from external shocks (Maskay, 2006), as is happening to many economies from the present global financial and economic crisis. Integration suggests more possibility of greater exposure to external shocks, with those being

---

[13] The trend is computed by using the Hodrick and Prescott (HP) filter. The HP filter defines a trend τ for z as the solution to the problem: $\min \sum_{t=1}^{T} (Z_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t=1} - \tau_t) - (\tau_t - \tau_t)]^2$ where the parameter λ represents the choice between smoothness of the trend $(\lambda = \infty)$, that is, a linear trend versus perfect fit of the trend $(\lambda = 0)$, that is, the trend replicates the series. As suggested by Hodrick and Prescott, the benchmark value in the case of annual data for λ is 100. The HP graphs can be provided upon request.

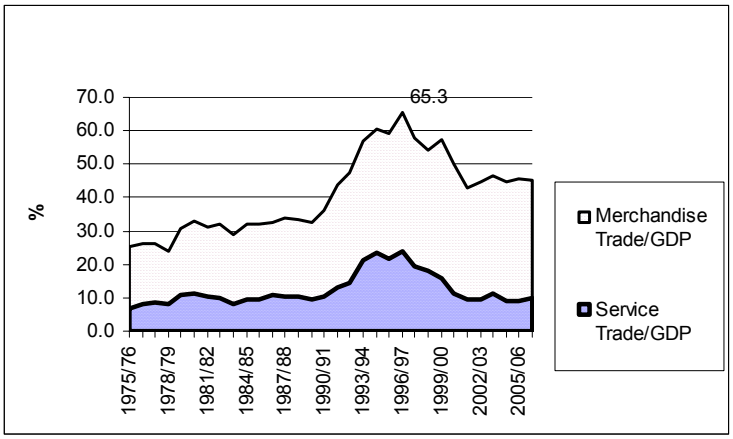
[14] The regression results are provided below:

NPCI = 0.03 * TREND - 60.01
NM2 = 0.05 * TREND - 98.33
NCREDIT = 0.12 * TREND - 237.23, where N stands for normalized value at 1984.

[15] In addition be becoming a WTO member, Nepal also became a member of the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) as well as having agreed to a framework for a South Asian Free Trade Agreement (SAFTA), all in 2004.

transmitted to the domestic economy. Thus the external sector should be more frequently included in any analysis of domestic financial stability.

FIGURE 5: Nepal's Total Trade to GDP (Disaggregated into Service Trade and Merchandise Trade) (1975/76 - 2006/2007)



Source*:* Ministry of Finance, *Economic Survey* & Nepal Rastra Bank
Note: 1. Merchandise Trade is DOT which excludes re-exports, from Nepal Rastra Bank. 2. Services is from BOP data published by Nepal Rastra Bank. 3. GDP is from Central Bureau of Statistics, GON. 4. Services data from 2000/01 onwards is based on new format of BOP (IMF's *BPM5*). 5. GDP data from 2000/01 onwards is based on new format (*SNA 1993*)

Lastly that FD and domestic economic growth, while moving together in the early period, soon start to diverge. This conclusion falls out from simple eye-balling the above three trends where there appears to be a point of structural break – prior to this point the level of ratios of PCI and FD move similarly but after this point there is divergence.[16] Examining the average difference of both ratios as a percentage of PCI, from the perspective of both the second phase B and the third phase as provided in Table 5 below, the statistics for M2/GDP-PCI is an insignificant -0.11 percent in phase II B vis-à-vis a difference of 17.16 percent in phase III. Similarly, examining the statistics of Credit/GDP-PCI in the second phase B, the statistic is 37.44 percent in phase II B that jumps to 101.20 percent in the third phase. It is noted that while both trends exhibit a structural break in the same direction, the timing of this break differs – it is quicker for Credit/GDP vis-à-vis M2/GDP ratio – and suggests that there is a lagged effect of financial liberalization on financial development.[17] While the year varies, 1994 vis-à-vis

[16] This is consistent with NRB (2009) which found a break in 1991, coinciding with the period of economic liberalization, after controlling for variability.
[17] For the ratio of M2 to GDP the break seems to be in 1998 when the level of financial development is slightly lower than that of per-capita income growth, however, after this period the financial system saw a period of consistent divergence in per-capita income from FD indicator. A similar observation falls out examining the ratio of credit to GDP where after 1994 where a consistent divergence is seen vis-à-vis per-capita income levels.

1998, the direction of divergence is the same – positive and growing[18]! This is shown in the following summary statistics:

TABLE 5: Measure of Divergence of FD Indicators vis-à-vis Per-capita Income

		(M2/GDP-PCI)/PCI	(Credit/GDP – PCI)/PCI
Second phase B:	1984 - 2002	-0.11%	37.44%
Third phase:	2003 - 2008	17.16%	101.20%
	1984-1994		7.65%
	1995-2008		84.00%
	1984-1997	-5.36%	
	1998-2008	14.73%	

Source: Authors' calculations from the source provided in Annex 2.

These observations are consistent with GON, NPC (2008, p.52) which states: " In the past, economic growth did not increase satisfactorily, however, the financial sector expanded considerably." The direction of the break in FD is surprising since this occurs during the period of People's War which had a reducing effect on the upward trajectory of PCI (Acharya, 2005). The aggregate figures of FD hide many complexities and movements such as concentration within each grouping between rural versus urban areas. The earlier analysis has provided an indication of this from at a regional level but still there was no clear analysis regarding differences in bank branches concentrations between urban and rural/remote areas[19]. It is natural for concentration to occur, and may have started with financial liberalization in the second phase B when it is financially more viable to establish a bank branch in an urban area vis-à-vis a rural, remote area; but this motivation may have changed in the later part of the second phase B and in the current third phase where concentration in these areas appears to be a "flee to safety" syndrome with security forces concentrated in the above mentioned areas.

While there is no comprehensively disaggregated analysis, for example between urban and rural, remote areas as mentioned above, the above regional analysis in 3.3 suggests that growth of FD may have fueled inequality in access to financial services[20] (as reflected by Figure 3 above). In this regard, it is worth mentioning a recent study report by World Bank entitled *Access to Financial Services in Nepal*. According to this study report, the access to and use of financial services in Nepal remain very limited: only 26

[18] This is also examined via regression analysis of each of the series of ratios in normalized form with the inclusion of a dummy variable for capturing structural change. The results are:

NM2 = 0.04*TREND + 0.22*DUM1997 - 72.44
NCREDIT = 0.09*TREND + 0.43*DUM1994 - 186.17

[19] This lack of analysis is due to lack of clear and scientific definitions of rural and urban areas where banks have their branches.

[20] This inequality of access at this broad level is suggested in the growing inequality levels from a Gini coefficient of 34.2 in *National Living Standard Survey 1995/96* to 41.4 in *National Living Standard Survey 2003/04* (World Bank, DFID and ADB, 2006). This may be reflecting rising inequality to services on the whole.

percent of households have a bank account, and 45 percent of these households prefer to save at home—while 53 percent prefer to borrow from the informal sector (World Bank, 2008). This study reiterated that "the banks have not been in easy access to rural or urban population at lower echelons of income distribution" (Acharya, 2003). Thus, the examination suggests that there is scope for geographically balanced FD growth.

Recommendation

The above observations touch on many aspects of the developing domestic financial sector. To address those issues and guide the development of the domestic financial sector, many countries have initiated a financial sector master plan (FSMP) - this document provides a vision of the growth path of financial sector development with necessary direction to stabilize expectations in the financial market. This has been the case in South East Asia where respective Central Banks have initiated a FSMP (for example, such exist in the cases of both Malaysia and Thailand as shown in Box 2 below). The FSMP in these countries had interlinked the major players in the domestic

BOX 2 : Financial Sector Master Plan of Malaysia and Thailand

In Malaysia, the FSMP was developed in 2001 by its Central Bank, the Bank Negara Malaysia (BNM), through a joint team involving a number of departments in BNM. The Plan came out at the time when the East Asian Economies had just faced a huge financial crisis which had badly affected the Malaysian economy. The objective of the FSMP, as stated in the document was '…to develop a more resilient, competitive and dynamic financial system with best practices, that supports and contributes positively to the growth of the economy throughout the economic cycle, and has a core of strong and forward looking domestic financial institutions that are more technology driven and ready to face the challenges of liberalization and globalization'. The plan was meant to determine the direction and define the financial structure that was most appropriate to the requirements of Malaysian economy while moving into next stage of development.

The FSMP had identified the key elements and building blocks necessary to form the foundation on which future development could be built. The FSMP had made a number of recommendations to be implemented over the plan period of next eight to ten years in three phases: the first phase of developing domestic capacity of financial system; the second phase of increasing domestic competition; and the third phase of increasing competition in the international market.

In Thailand, the FSMP was developed in 2003 as the medium-term development plan for financial institutions under the supervision of the Bank of Thailand (BoT), the Central Bank of Thailand. It was developed by the joint effort between BoT and Ministry of Finance. The main thrust of the FSMP entailed the re-engineering of the financial institution landscape through the promotion of competency driven by consolidation and modification of relevant prudential guidelines. These developments in turn were intended to provide commercial banks with more flexibility to position themselves that best leveraged their expertise and strategic preference. As a roadmap for development, the FSMP provided a framework to facilitate the evolution of financial services and future increases in competition.

The Plan focused on the development of public access to financial services, general efficiency in the financial sector, and consumer protection. Among its suggested adjustments, the Plan proposed renovating regulations that govern licensing, foreign institutions, and internal efficiency.

Sources: www.bnm.gov.my and www.bot.or.th/Thai/FinancialInstitutions/Highlights/MasterPlan/Documents/FSMP.pdf

financial system - i.e. banks and financial institutions, insurance companies, and stock markets in a comprehensive manner - to enhance their contribution to economic growth in today's technology-driven dynamic environment; this would largely be through enhanced regulatory and supervisory efficiency and effectiveness. In consonance with other countries, it is important for such a guiding document to be produced in Nepal, to provide vision and direction to the developing domestic financial sector.

In this connection, NRB's Strategic Action Plan 2006-2010 has also acknowledged the importance of having a FSMP for banking and financial sector under the part "Financial Sector Management" and has stated:

> "The financial services industry has grown by leaps and bounds without a long-term financial sector master plan. NRB will take initiatives in this regard and formulate the Financial Sector Master Plan. In this context, it will review the implications of such financial sector master plans of the South East Asian Central Banks and formulate the appropriate plan in the Nepalese context with the collaboration of financial services industry and all other stakeholders" (NRB 2006, p.12).

Our recommendation is thus to develop a FSMP as highlighted above, tailored to the Nepal context by involving all related stakeholders in its development. The major components of this FSMP, among others, may include: (1) vision of the direction of the Nepalese FD; (2) enhancing its efficiency; (3) awareness and possible safeguards to external shocks; (4) geographically balanced growth of FD.

An example of this process is the *Project Approach* used by Bank Negara Malaysia (BNM). BNM developed their FSMP through a joint team involving a number of departments.[21] To facilitate consultations with the financial industry on specific issues, an Industry Advisory Group was set up comprising Chief Executive Officers and Managing Directors of selected institutions. A number of consultations and discussions were also held with relevant ministries and Government agencies, industry players and other key stakeholders on the specific recommendations in the FSMP. The approach was to determine the most viable options in achieving the strategic direction and objectives with an emphasis on an iterative, consultative and collaborative process. The process was pursued through a series of workshops/meetings/interviews with industry players on related issues.[22] The same had occurred at Bank of Thailand (BOT) where a FSMP Committee was set up in February 2002; the committee comprised of representative from "government sector, regulatory agencies (i.e., the BOT, the Office of the Securities and Exchange Commission, and the Department of Insurance), financial sector, consumer groups, the general public and a number of recognized experts. The Committee was charged with the task of setting the vision and framework for the development of Thailand financial sector" (BOT website).

Similarly for Nepal, such a process can be emulated. A high level committee can be set up of stakeholders - this can be limited to those directly under the NRB and thus under

---

[21] An internal steering committee chaired by Dr. Zeti Akhtar Aziz (then Deputy Governor) and comprising the Assistant Governors and Directors of the relevant departments was set up to oversee the work of the team.

[22] This involved analyzing industry trends through external and internal interviews, cross country comparison of alternative financial structures and liberalization paths, identifying the critical gaps in the financial system, defining key success factors in financial market development and formulating alternative end games for the Malaysian financial system.

the Bank's leadership. Alternatively and consistent with the broader understanding of the financial sector, this can also include the capital market and insurance markets. As these do not fall within the purview of the NRB, it is suggested that perhaps a path such as followed by Zambia be taken. That is, the NRB, as the economic advisor to GON, can coordinate the drafting of the FSMP with the role of GON being to ensure its appropriate implementation.

V. SUMMARY AND A CLOSING REMARK

The Nepalese financial system witnessed a large jump in terms of number of financial institutions after financial liberalization in 1984; this has translated into an increasing trend of FD. The paper observes that (1) FD has taken place in an environment of growing integration with the global economy, which is making the domestic economy more prone to external shocks and (2) FD has not been geographically balanced, which is suggested to have resulted in growing inequality in terms of access to financial services. With these observations, the paper recommends that the process be initiated for developing a FSMP to address these challenges in an integrated and comprehensive manner. This framework is observed to be of much urgent considering the present global financial crisis. In the end, a closing remark is provided on the viability of this recommendation for initiating a FSMP, given the current circumstance where Nepal is moving into uncharted waters of state restructuring and a federal structure. We feel that the present situation provides a unique opportunity to implement this recommendation for providing guidance to FD in the New Nepal

REFERENCES

Acharya, Keshav. 2005. "An Assessment of Economic Cost of The Ongoing Armed Conflict in Nepal: An empirical examination of the period 1990 – 2005". *The Telegraph* October 26. Available at http://www.nepalnews.com.np/contents/englishweekly/telegraph/2005/oct/oct26/national.php

Acharya, Meena. 2003. "Development of the Financial System and its Impact on Poverty Alleviation in Nepal." *Economic Review* 15.

Bank Negara Malaysia. "Financial Sector Master Plan". Available at http://www.bnm.gov.my/index.php?ch=20

Bank of Thailand. "Financial Sector Master Plan". Available at

http://www.bot.or.th/bothomepage/BankAtWork/FinInstitute/FISystemDevPlan/ENGVer/pdffile/eng.pdf

Bank of Zambia. 2004. "Implementation Structure of the Financial Sector Development Plan" Available at: www.boz.zm/FSDP/FSDP_ImplementationStructure.pdf

Bhattarai, Bijay Nath. 2005. "Nepal Rastra Bank: A Journey of Fifty Years". In NRB, *Fifty Years of Nepal Rastra Bank, Milestones*. Kathmandu: NRB. Available at www.nrb.org.np

Bhetuwal, Khem Raj. 2007. "Financial liberalization and Financial Development in Nepal." *Economic Review*, 19.

Central Bureau of Statistics 2002. *Statistical Pocket Book Nepal, 2002*. Kathmandu: Central Bureau of Statistics (CBS)

Greenwood, J and B. Jovanovic. 1989. "Financial Development, Growth and the Distribution of Income". *NBER Working Paper Sseries No. 3189*. Available at www.nber.org

Levine, Ross and Sara Zervos. 1998. "Stock Markets, Banks, and Economic Growth." *American Economic Review* 88:537–558

Maskay, Nephil Matangi. 2006. "Capital Account Convertibility for Nepal: A Cautionary Thought" *Arthic Sangalo. Nepal*. (2063 Baisakh) 75 – 77.

Nepal Rastra Bank. 2009. "Financial Sector Development and Economic Growth in Nepal: FY 1975 - FY 2007." Forthcoming.

____. 2006. *NRB Strategic Action Plan 2006-2010 (2006)*. Available at www.nrb.org.np

____. 2002. *Nepal Rastra Bank Act, 2002*. Kathmandu: NRB.

____ . 1996. "Forty Years of Nepal Rastra Bank 1956 - 1996". Kathmandu: NRB.

____. 1961. Report of the Board of Directors to His Majesty's Government for the Fiscal Years: 1957-58, 1958-59, 1959-60 and 1960-61.

____. 1965. Report of the Board of Directors to His Majesty's Government for the Fiscal Years; 1961-62, 1962-63, 1963-64 and 1964-65.

Pant, Pushkar Nath. 1964. "The Dual Currency System in Nepal." Unpublished Dissertation. Vanderbilt University.

Paudel, Narayan Prasad. 2005. "Financial System and Economic Development." In NRB, *Nepal Rastra Bank in Fifty Years*. Kathmandu: NRB. Available at: www.nrb.org.np

Pradhan, Krishna Kumar. 2005. "Development Finance." In NRB, *Nepal Rastra Bank in Fifty Years*. Kathmandu: NRB. NRB. Available at: www.nrb.org.np

Shrestha, Min Bahadur. 2005. "Financial Liberalization in Nepal." *Ph.D. Dissertation submitted to University of Wollongon*, Australia.

World Bank. 2008. "Access to Financial Services in Nepal." Available at:www.worldbank.org/Nepal

World Bank, DFID and ADB. 2006. *Nepal Resilience Amidst Conflict: An Assessment of Poverty in Nepal, 1995–96 and 2003–04*. Report No. 34834-NP. Kathmandu: The World Bank Nepal Office.

World Trade Organization. 1998. "Financial Services: Background Note by the Secretariat." S/C/W/72. December 2.

ANNEX 1: Raw Data (in Rs. million, except for GDP deflator and population)

Year	Currency	M2	NGDP	RGDP*	Total Credit	Total Deposit	Population (in million)	GDP Deflator at 1984/85 Prices
1960	109.5	200.6			32.30	72.20		
1961	142	235.6			45.60	75.30		
1962	156.2	279.7			57.50	79.30		
1963	161.7	304.1			59.30	100.70		
1964	235.3	405.3			88.50	112.40		
1965	296.3	489.7	5602	25052.4	107.00	128.90		22.40
1966	345.8	570.7	6909	26815.6	162.20	125.00		25.80
1967	368.6	641.4	6411	26394.5	146.80	181.80		24.30
1968	419.1	727.1	7172	26573.2	198.70	222.50		27.00
1969	470.2	857.2	7985	27753.6	195.60	319.50		28.80
1970	531.4	975.3	8768	28605.1	279.30	405.00		30.70
1971	576.1	1072.1	8938	28134.9	334.40	475.50		31.80
1972	601.2	1261.8	10369	29011.3	399.40	623.00	11.81	35.70
1973	694.7	1529.2	9969	28870.5	492.30	770.50	12.06	34.50
1974	878.6	1911	12808	30701.5	766.90	941.30	12.32	41.70
1975	916.5	2064.4	15966	31148.3	1194.50	1174.00	12.59	51.30
1976	963.5	2524	16589	32518.6	1145.20	1605.20	12.86	51.00
1977	1193.2	3223	16255	33499.8	1157.80	2146.80	13.14	48.50
1978	1351.9	3772.1	18421	34975.3	1647.30	2528.50	13.42	52.70
1979	1615.2	4511.4	24692	35804.3	2025.80	2920.90	13.71	69.00
1980	1799.3	5285.3	21886	34973.4	2626.90	3351.60	14.01	62.60
1981	2065.7	6307.7	25466	37890.7	3440.90	4160.20	15.02	67.20
1982	2436.7	7458	29037	39323.0	3469.60	4935.40	15.42	73.80
1983	2752	9222.4	31644	38152.0	3848.10	6308.40	15.83	82.90
1984	3273.4	10455.2	37004	41845.6	4124.40	7091.20	16.25	88.40
1985	3737.3	12296.6	44441	44440.0	5191.20	8560.10	16.69	100.00
1986	4842.9	15159	53215	46511.0	6910.00	10315.40	17.13	114.40
1987	5746.1	17498.2	61140	47428.0	8083.90	11900.50	17.56	128.90
1988	6374.6	21422.6	73170	50762.0	9964.10	14996.20	17.37	144.10
1989	7946.6	26605.1	85831	53518.0	13152.70	19008.60	17.74	160.40
1990	9718.2	31552.4	99702	56151.0	14782.10	21942.50	18.11	177.60
1991	11654.5	37712.5	116127	59767.0	16383.80	26804.90	18.49	194.30
1992	13639.7	45670.5	144933	62531.0	21348.80	33686.10	18.94	231.80
1993	16313	58322.5	165350	64584.0	24884.60	43777.90	19.39	256.00
1994	19659.7	69777.1	191596	69686.0	33311.50	52304.80	19.86	274.90
1995	22493.9	80984.7	209974	71685.0	45627.90	61164.10	20.34	292.90
1996	25046.4	92652.2	239388	75773.0	59644.80	71346.20	20.83	315.90
1997	27333.7	103720.6	269570	79388.0	68702.80	81660.60	21.33	339.60
1998	20893.2	126462.6	289798	82039.6	81251.00	102543.60	21.84	353.20
1999	34984.3	152800.2	330018	85764.2	96896.20	127062.90	22.37	384.80
2000	42143	186120.8	366251	90987.2	116027.40	154940.80	22.9	402.50
2001	48295.1	214454.2	425454	95418.3	133642.80	181674.90	23.15	445.90
2002	55658.3	223988.3	444052	95857.2	142848.90	184331.10	23.67	463.20
2003	56885.2	245911.2	473545	99164.3	161177.60	203296.90	24.2	477.50
2004	63218.9	277310.1	517993	104251.4	183383.50	233292.80	24.74	496.90
2005	68784.1	300440	566579	107347.7	211263.80	251008.00	25.3	527.80
2006	77780.4	346824.1	623083	110879.4	225902.70	290557.90	25.86	562.60
2007	83515.5	395320.6	696989	113651.4	271522.00	336792.70	26.44	604.30
2008	95731.7	459799.5	792130	120015.9	323854.60	389851.80	27.00	650.30

Sources: a) *Quarterly Economic Bulletin* for currency, M2, total deposit and total credit; b) *Economic Survey* for NGDP and RGDP; c) *International Financial Statistics* of IMF for population.

** This is real GDP at factor cost (basic price now) at constant prices of 1984/85 and hence is the adjusted figure for various changes in base year in Economic survey data*

ANNEX 2: Data of Some Ratios Before and After Normalization

	Ratios				Normalized Value		
Year	Credit/GDP	M2/GDP	PCI	Year	Credit/GDP	M2/GDP	PCI
1984	11.146	28.254	2575.114	1984	1	1	1
1985	11.681	27.669	2662.672	1985	1.048	0.979	1.034
1986	12.985	28.486	2715.178	1986	1.165	1.008	1.054
1987	13.222	28.620	2700.911	1987	1.186	1.013	1.049
1988	13.618	29.278	2922.395	1988	1.222	1.036	1.135
1989	15.324	30.997	3016.798	1989	1.375	1.097	1.172
1990	14.826	31.647	3100.552	1990	1.330	1.120	1.204
1991	14.109	32.475	3232.396	1991	1.266	1.149	1.255
1992	14.730	31.511	3301.531	1992	1.322	1.115	1.282
1993	15.050	35.272	3330.789	1993	1.350	1.248	1.293
1994	17.386	36.419	3508.862	1994	1.560	1.289	1.363
1995	21.730	38.569	3524.336	1995	1.950	1.365	1.369
1996	24.916	38.704	3637.686	1996	2.235	1.370	1.413
1997	25.486	38.476	3721.894	1997	2.287	1.362	1.445
1998	28.037	43.638	3756.392	1998	2.515	1.544	1.459
1999	29.361	46.301	3833.894	1999	2.634	1.639	1.489
2000	31.680	50.818	3973.240	2000	2.842	1.799	1.543
2001	31.412	50.406	4121.741	2001	2.818	1.784	1.601
2002	32.169	50.442	4049.734	2002	2.886	1.785	1.573
2003	34.036	51.930	4097.698	2003	3.054	1.838	1.591
2004	35.403	53.535	4213.880	2004	3.176	1.895	1.636
2005	37.288	53.027	4242.992	2005	3.345	1.877	1.648
2006	36.256	55.663	4287.680	2006	3.253	1.970	1.665
2007	38.956	56.718	4298.464	2007	3.495	2.007	1.669
2008	40.884	58.046	4445.817	2008	3.668	2.054	1.726

Sources: As in Annex 1.

Export Diversification and Competitiveness: Nepal's Experiences

Bhubanesh Pant, Ph.D.* and Rajan Krishna Panta♣

Nepal's policy regime has not been very instrumental in improving trade competitiveness. Although policy measures have been announced from time to time to identify new exportable products and encourage diversification of export markets, these have hardly been executed. The challenge for Nepal is complicated by the legacy of the past. Against this perspective, this paper a) examines the export scenario of Nepal and reviews the past studies on the country's export potential; b) illustrates Nepal's competitiveness of the export sector; and c) suggests measures for promoting export diversification and competitiveness. Based on the estimation of the real effective exchange rate (REER), this paper shows that the country is gradually losing its competitiveness. Although various studies have demonstrated that Nepal possesses competitive advantage in herbal products, woollen carpets, tea, garments and pashmina, among others, a comprehensive case-by-case analysis of home and host countries trading environment, supply and demand conditions, cost of production, capacity to innovate, as well as its forward and backward linkages should be conducted to translate the export potential to the actual trading opportunities.

I. BACKGROUND

Trade policymakers in developing countries have for several decades been confronted with a serious dilemma. On the one hand, classical trade models show that countries should specialize in and export goods in which they have comparative advantages (Bhagwati and Srinivasan, 1983). The notion is that by being more specialized in production and exports, resource allocation will be more efficient and each country will increase its welfare and growth. On the other hand, by specializing and exporting a relatively narrow range of products, countries increase their degree of vulnerability to external shocks. Consequently, policymakers have to find ways to respond to this important trade-off between efficiency and vulnerability.

The prediction of classical trade models that specialization is efficient relies partly on the assumption that there is no uncertainty. Several authors have shown that in the

* Deputy Director, Research Department, Nepal Rastra Bank, E-mail: bppant@nrb.org.np

♣ Assistant Manager, Nepal Rastra Bank, Nepalganj, E-mail: rajanpanta@nrb.org.np. The authors are grateful to Biggyan Subedi for providing valuable inputs.

presence of uncertainty and risk aversion, diversification may be a better policy option than specialization according to comparative advantage (Turnovsky, 1974; Ruffin, 1974). In rural economies characterized by these market imperfections and no social safety nets, diversification provides a mechanism to protect agents against income fluctuations. As a result, though there are good theoretical arguments for specialization based on comparative advantage, in practice policymakers in developing countries are interested in diversifying their production and export structure to reduce vulnerability to external shocks.

Trade in general, and export diversification and competitiveness in particular, is important for least-developed countries (LDCs) such as Nepal for a number of reasons. Firstly, it is basically the major principal mechanism for achieving the benefits of globalization. Two, the continuing reallocation of manufacturing activities from industrial to developing and LDCs such as Nepal provides many opportunities for expanding trade both in goods and in services. Three, the growth of trade is firmly supported by regional trading arrangements, such as the South Asia Free Trade Agreement (SAFTA) and the Bay of Bengal Initiative for Multisectoral Technical and Economic Cooperation (BIMSTEC) and multilateral trading arrangement such as the World Trading Organization (WTO) in the Nepalese context.

With the initiation of market-oriented economic reforms in the early 1990s, Nepal increased its integration into the world economy. The principal components of the reform programs included liberalization of trade and industrial policies and rationalization of the foreign exchange regime. The core elements were reduction and restructuring of import duties and introduction of full convertibility for current account transactions.

Even though Nepal is one of South Asia's most open and trade dependent economies, it has not been able to fully exploit the potential for export growth since its exports are focused in a few products (such as readymade garments, carpets and pashmina to overseas countries) and markets (with India's share in Nepal's total exports being about 64 percent in 2007/08). Though trade is considered to be an engine of growth for economic development, market and product concentrations of exports have led to volatile export growth in Nepal. It is against this background that this research is conducted. Section II provides a review of literature on export competitiveness and diversification while Section III highlights the export performance of Nepal and also reviews the studies on Nepal's export potential. While Section IV examines Nepal's export competitiveness, Section V deals with trade potential at the bilateral level. The last part of this paper prescribes some policy measures for promoting export diversification and boosting competitiveness.

II. LITERATURE REVIEW

Export diversification is generally taken to be a positive trade objective in sustaining economic growth. Diversification makes countries less vulnerable to adverse terms of trade shocks by stabilizing export revenues, makes it simpler to channel positive terms of trade shocks into growth, and generates learning opportunities that lead to new forms of comparative advantage (Ghosh and Ostry, 1994).

Three developments frame diversification opportunities in the new global economy: (a) the increasing spread and importance of global production chains; (b) rapid growth of

new sources of demand in large emerging economies, such as Brazil, China and India; and (c) the growing importance of trade in services driven by rising incomes and the outsourcing of more and more services activities (Brenton *et. al*, 2007).

Hence, export diversification has often been proposed in the literature and in the policy debate as a key development strategy for developing countries. Most of the contributions, however, acknowledge that giving factual content to this diversification strategy is not easy (Piazza and Sdralevich, 2004). Weak trade capacity, defined as the institutional capacity to compete in, and gain access to, foreign markets, is acknowledged by many researchers and policy-makers as one of the obstacles to the diversification efforts of the poor countries towards nontraditional goods (as opposed to traditional, often primary, exports). Trade capacity is the aspect of non-price external competitiveness that is directly related to trade: it describes the availability of trade-oriented infrastructure, institutions, know-how, necessary to export competitively on foreign markets, and the ability to gain access to those markets through bilateral and multilateral negotiations and participation in multilateral trade organization. Paucity of trade capacity has been singled out by the international community as one of the major hurdles to development, as illustrated by the emphasis of the Doha ministerial declaration on the role of trade-related technical assistance and capacity building. The guidelines on trade capacity devised by the Development Assistance Committee of the Organization for Economic Cooperation and Development (OECD) stress that efforts should be directed towards strengthening the capabilities of developing countries' policy making in three areas: a) formulation and implementation of a trade strategy, b) strengthening policies and institutions devoted to export performance, and c) effective participation in rule making shaping international trade (Bonaglia and Fukasaku, 2003).

Diversification can be attained through various ways. It could take the form of a movement into the production of higher value-added activities in existing export sectors. It could also be achieved by moving into the production of new export activities. Furthermore, it often occurs through the development of new export markets. The choice of diversification method and strategy will depend on each country's structure as well as an assessment of which of these methods will provide maximum benefits to the economy.

With respect to services, they are the fastest-growing component of international trade. In recent years, technology advances have had a significant impact on this sector since many services can now be marketed and delivered online. Yet, the service sector is diverse and fragmented and, thus, difficult to reach. Promoting trade in services proffers developing countries the opportunity to diversify trade and contributes to employment generation and economic development. Developments in information and communication technologies are growingly allowing cross-border services trade, transforming services exports into a more and more important component in the balance of payment (BoP) and a principal source of economic growth. For some countries—especially small, landlocked countries and island economies with limited opportunities for agricultural or industrial diversification—the service sector is one of the few development options.

With regard to competitiveness, it can be defined as a firm's ability to stay in business and attain some desired goal with respect to profit, price, rate of return, or quality of its products; and to have the capacity to exploit the existing market opportunities and create new markets (ADB, 2003). There has been considerable interest during the last decade in pinpointing the factors that can improve competitiveness, which

is thought by many to be an important piece of the growth and development puzzle. There is a complex interaction among a number of factors—or the "drivers of change"—that are globalization, technology, and competition. These factors are raising a whole spectrum of new challenges and opportunities in an irreversible process of rapid change. The Asian financial crisis that started in 1997 has added more variables to the equation. Though it led to disruption to the region, it demonstrated the need for an improvement in corporate and banking governance.

Governments and policy makers are especially interested in the issue of competitiveness, particularly the policies that can improve it. Governments have established councils and competitiveness committees, have written white papers, and have hosted conferences on the subject. As a result, the idea of national competitiveness has become one of the key themes in the current debate about national economic performance. The key variable for the economic analysis of competitiveness is the growth of labor productivity since this, ultimately, is the main determinant in raising living standards.[1]

"A firm is competitive if it can produce products and services of superior quality and lower costs than its domestic and international competitors. Competitiveness is synonymous with a firm's long-run profit performance and its ability to compensate its employees and provide superior returns to its owners" (Buckley *et al.* 1988, p.176). The ability to compete consists in doing better than comparable firms (i.e., rivals) with respect to sales, market share, and profitability, and is achieved through strategic behavior, defined as the set of actions taken to influence the market environment so as to increase a firm's profits, as well as by other marketing tools. It is also attained through product quality improvement and product innovation—both very important aspects of the competitive process.

Firms compete for markets and resources, measure competitiveness by looking at relative market shares, sales, or profitability, and use different strategies to ameliorate their performance (Lall, 2001). Competitiveness is the essence of a well-functioning market system, and being competitive denotes succeeding in an environment where firms try to stay ahead of each other by reducing prices, by increasing the quality of their current products and services, and by creating new ones. A firm's competitiveness is a function of many factors such as a) its own resources (e.g., the human capital, its physical capital, and the level of technology); b) its market power; c) its behavior toward rivals and other economic agents; d) its capability to adapt to changing circumstances; e) its capability to create new markets; and f) the institutional environment, to a large part provided by the government, including physical infrastructure and the quality of government policies.

National competitiveness has been defined as the "ability of a country to produce goods and services that meet the test of international markets and simultaneously to maintain and expand the real income of its citizens." Again, "National competitiveness denotes a country's ability to create, produce, distribute and/or service products in international trade while earning rising returns on its resources" (Buckley *et al*. 1988, p.177). These definitions are consistent with the term "international competitiveness,"

[1] The different measures of competitiveness are examined at length in Section IV.

which brings to mind the idea that each nation is viewed "like a big corporation competing in the global market place" (Krugman, 1996, p.4).

It was in 2004 that the World Economic Forum introduced the Global Competitiveness Index (GCI), a very detailed index for computing national competitiveness, taking into consideration the microeconomic and macroeconomic foundations of national competitiveness. Here, competitiveness is defined as "the set of institutions, policies and factors that determine the level of productivity of country. The level of productivity, in turn, sets the sustainable level of prosperity that can be earned by an economy" (WEF, 2007, p.3).

The GCI provides a weighted average of a host of different components, each of which demonstrates one aspect of competitiveness. These components are categorized in 12 different pillars. These pillars of competitiveness include: 1) institutions, 2) infrastructure, 3) macroeconomy, 4) health & primary education, 5) higher education & training, 6) goods market efficiency, 7) labor market efficiency, 8) financial market sophistication, 9) technological readiness, 10) market size, 11) business sophistication and 12) innovation.

The 12 pillars of competitiveness are not only related to each other, but they tend to reinforce each other. For instance, innovation (12^{th} pillar) is not possible in a world without institutions (1^{st} pillar) that guarantee intellectual property rights, cannot be undertaken in countries with a poorly educated and poorly trained labor force (5^{th} pillar), and will never happen in countries with inefficient markets (6^{th}, 7^{th} and 8^{th} pillars) or without extensive and efficient infrastructure (2^{nd} pillar).

According to the *Global Competitiveness Report 2007-08*, the United States tops the overall ranking while Switzerland is in second position followed by Denmark, Sweden, Germany, Finland and Singapore, respectively. While India and Bangladesh are ranked 48^{th} and 107^{th} respectively, Nepal's position is at 114^{th}. [2]

III. TRADE LIBERALIZATION AND NEPAL'S EXPORT POTENTIAL

After the introduction of the structural adjustment and stabilization programmes in mid-1980s, trade reforms in Nepal focused on shifting the development strategy from an inward looking import -substitution to export promotion. A host of trade facilitation measures and incentives were introduced, such as introduction of duty drawback and bonded warehouse systems, restructuring and reduction of import duties, abolition of quantitative restrictions and import licensing systems for almost all products and rendering full convertibility of current account transactions.

Moreover, the Trade Policy of 1992 and the Foreign Investment Policy of 1992 put greater emphasis on deregulation, competition and increased reliance on market forces.

---

[2] The rankings are calculated from both publicly available data and the Executive Opinion Survey, a comprehensive annual survey conducted by the World Economic Forum together with its network of Partner Institutes (leading research institutes and business organizations) in the countries covered by the Report.

Moving along the long-term vision of developing trade as one of the pillars of the economy, the Tenth Plan's Poverty Reduction Strategy Paper (PRSP) (2002-2007) aimed for Nepal's integration in globalization process and increased participation of the private sector in open competitive and market-oriented trade regime. Subsequently, a number of policy initiatives were planned, such as establishing linkages of imports to industrial development for transformation of domestic trade into market based system, promotion of export through identification of products of competitive and comparative advantages, diversification of export, and improvement in the quality of exportable goods. Further, facilitation of trade by developing and improving required infrastructure, institutional capacity and business services was part of the reform process. These policy initiatives and reforms were all the more demanding in the light of Nepal becoming a member of WTO and two regional trading arrangements—SAFTA and BIMSTEC.

After the implementation of some of these policies, the export sector in Nepal initially grew quite rapidly. However, in recent years the rate of export growth has slowed somewhat or even declined slightly due to an array of factors. Trade remains highly concentrated and Nepal's share of exports in world markets is still very low. Manufactured goods account for close to 80 percent of total merchandize exports. Nonetheless, Nepal remains dependent on a few exports and markets, making it vulnerable to external demand and policy shocks. Three exports—garments, pashmina, and carpets—account for 48 percent of exports outside India in 2007/08. Reliance on a few markets has been growing with the United States, Indian, and German markets comprising 75 percent of its exports in 2007/08. Moreover, despite doubling over the 1990s, Nepal's share of world exports is less than 0.01 percent.

The geographical and commodity concentrations of exports are quite high. The country has not been successful to create backward and forward linkages of international trade that is necessary for self-sustained economic growth. While attempts have been made to address legal/policy discrepancies *vis-à-vis* WTO commitments, structural weaknesses and inadequate levels of resources—financial, human and technological—have undermined Nepal's productive capacities and competitiveness for effective integration into the global trading regimes. Hence, Nepal's economy still remains the least competitive of all the major South Asian economies (Adams and Adhikari, 2005).

Trends in Export Trade

Since a long time Nepal's foreign trade has largely been confined to India primarily owing to close proximity, similar socio-economic condition and availability of transport facilities. The volume of Nepal's foreign trade with India in terms of both exports and imports has been rising due to the increasing demand of different types of industrial raw materials, machinery and petroleum products in order to undertake various types of developmental works and consumer goods to meet the requirements of the growing population. While the share of India in Nepal's total exports and total imports was 58.8 percent and 52.7 percent, respectively, in 2001/02, the corresponding share was 63.5 percent and 63.9 percent in 2007/08. Consequently, India's share in Nepal's total trade moved up to 63.8 percent in 2007/08 from 54.8 percent in 2001/02.

Nepal's trade policies are inextricably related with those of India. This is observed not only from the huge amount of trade with India, but also from the quantity of Nepali

goods exported through the Port of Kolkata. This dependence is considerably greater than that associated with other landlocked countries as the majority of landlocked countries rely on more than one transit country to seek access to port facilities. In Nepal's case, alternative routes to the sea through Bangladesh or Tibet Autonomous Region of the People's Republic of China do not seem viable for large freight movement, though they may be feasible for smaller quantities of specialized freight.

Export Diversification: Countries and Commodities

The leading export partners of Nepal have been India, USA, Germany, People's Republic of China, United Kingdom, France, Italy, Canada, Japan and Bangladesh. This is illustrated in Table 1 which depicts that India, the US and Germany constituted about three-fourths of Nepal's total exports in 2007/08.

TABLE 1: Major Export Trade Partners of Nepal

	(Rs. in million)							Percent Change	
Countries	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08P	2006/07	2007/08
India	27956.2	26430.0	30777.1	38916.9	40714.7	41728.8	38626.4	2.5	-7.4
Bangladesh*	237.2	411.3	421.3	290.9	234.3	521.5	4664.4	122.6	794.4
U.S.A	9377.8	12686.5	9696.0	7570.7	6993.4	5571.3	4598.9	-20.3	-17.5
Germany	4043.2	3555.3	3567.0	3121.8	2843.8	2573.7	2332.1	-9.5	-9.4
U.K	808.8	1070.7	1677.1	1050.0	1184.1	998.7	1066.3	-15.7	6.8
France	473.5	454.0	581.8	617.8	1297.5	904.0	1001.2	-30.3	10.8
China P.R**	1101.4	1717.7	2425.2	2017.9	1004.4	1202.8	944.5	19.8	-21.5
Canada	306.0	383.7	546.4	528.7	644.6	593.7	713.7	-7.9	20.2
Italy	566.6	530.9	589.4	582.8	712.3	684.3	583.8	-3.9	-14.7
Japan	492.8	474.2	525.6	535.0	572.1	559.5	488.1	-2.2	-12.8
Sub-total	45363.4	47714.4	50806.8	55232.6	56201.2	55338.2	55019.3	-1.5	-0.6
Others	1581.4	2216.2	3103.9	3473.1	4032.9	4044.9	5768.2	0.3	42.6
Total	46944.8	49930.6	53910.7	58705.7	60234.1	59383.1	60787.5	-1.4	2.4

P= provisional.
* The significant rise in exports to Bangladesh in 2007/08 is attributed to the upsurge in exports of wheat.
** Includes Overland trade with Tibet, an Autonomous Region (TAR), Hong Kong and Macau.
Sources: Nepal Rastra Bank and Trade and Export Promotion Centre.

A glimpse of Nepal's total exports from 2001/02 to 2007/08 reveals a mixed picture. Exports have been steadily growing except for 2006/07 when exports fell by 1.4 percent in comparison to the previous year. In terms of country-wise diversification of exports, it is only in the case of India where exports have been consistently growing, except for in 2007/08 when exports declined by 7.4 percent in comparison to the previous year.[3]

[3] In 2007/08, the dismal performance in the exports to India was attributed to the decline in the exports of vegetable ghee, textiles, chemicals, rosin and readymade garments.

Excluding India, exports to other countries (on an individual country basis) have shown a fluctuating trend. The rise in exports to India in the previous years could be ascribed to the long open border, the preferential trade treaty and special payments regime between the two countries and slowdown in exports to other key destinations, among others (Karmarcharya, 2005).

Nepal's exportable products to India include zinc sheet, threat, polyester yarn, jute goods, vegetable ghee and textiles, among others (Table 2). Manufactured exports are concentrated in garments, carpets, and *pashmina* that have constituted the bulk of exports to other countries (Table 3).[4] The other major commodities exported overseas include pulses, Nepalese paper & paper products and silverware & jewelleries.

TABLE 2: Exports of Major Commodities to India

	Rs. in million							Percent Change	
	2001/02	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08P**	**2006/07**	**2007/08**
A. Major Items	**12356.9**	**10821.3**	**14718.0**	**20426.4**	**20746.0**	**24827.3**	**22638.4**	**19.7**	**-8.8**
Zinc sheet	13.3	970.6	2785.3	1663.2	2409.0	3579.9	4416.9	48.6	23.4
Thread	846.9	1235.2	1637.4	2213.7	1898.3	4055.9	4134.5	113.7	1.9
Polyester Yarn	1070.4	656.9	1114.5	1896.3	3476.3	2241.0	2617.7	-35.5	16.8
Jute Goods	1630.1	1899.0	1882.6	2693.5	2636.8	2756.8	2582.5	4.6	-6.3
Ghee (Vegetable)	7081.4	3812.3	2959.0	4635.9	3861.7	4136.5	2133.2	7.1	-48.4
Textiles	562.5	878.2	1780.5	2996.6	2154.6	3056.9	2113.9	41.9	-30.8
Juice	452.9	600.1	786.8	1091.3	1139.6	1591.3	1836.4	39.6	15.4
Wire	252.2	150.9	710.9	1221.4	1504.1	1610.7	1546.7	7.1	-4.0
Cardamom	359.9	469.6	451.0	607.0	608.1	848.1	1034.8	39.5	22.0
Chemicals	87.3	148.5	610.0	1407.5	1057.5	950.2	221.8	-10.1	-76.7
B. Others	**15599.3**	**15608.7**	**16059.1**	**18490.5**	**19968.7**	**17047.5**	**15988.0**	**-14.6**	**-6.2**
Total (A+B)	**27956.2**	**26430.0**	**30777.1**	**38916.9**	**40714.7**	**41874.8**	**38626.4**	**2.8**	**-7.8**

P=provisional
Source: Nepal Rastra Bank.

[4] However, in recent years, the phasing out of quota-based trade in textiles from the beginning of 2005 has adversely affected garment exports which were concentrated in the U.S. market. Production has switched to the more competitive economies of China and India. Similarly, the carpet industry, which is another mainstay of the manufacturing sector, has lost over half its market in recent years due to declining demand, price controls, long order cycles, and greater competition.

TABLE 3: Exports of Major Commodities to Other Countries

	Rs. in million							Percent Change	
	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08P	2006/07	2007/08
A. Major Items	**16761.9**	**19849.3**	**18300.4**	**14769.5**	**15215.0**	**13438.2**	**13015.5**	**-11.7**	**-3.1**
Woolen Carpet	6212.5	5320.0	5677.5	5868.7	5838.7	5600.2	5046.8	-4.1	-9.9
Readymade Garments	7833.0	11890.1	9550.0	6124.6	6204.1	5205.5	4746.2	-16.1	-8.8
Pulses	216.0	214.9	280.7	106.5	191.7	488.1	1458.4	154.6	198.8
Pashmina	1245.0	1157.6	1064.2	1049.8	1577.8	931.0	643.4	-41.0	-30.9
Nepalese Paper & Paper Products	200.5	262.0	279.6	239.8	257.0	190.6	346.1	-25.8	81.6
Silverware and Jewelleries	274.1	347.7	368.7	363.2	282.4	325.4	269.4	15.2	-17.2
Tanned Skin	464.7	227.3	309.0	235.8	310.4	275.5	248.4	-11.2	-9.8
Handicraft (Metal and Wooden)	233.8	352.1	626.4	644.2	430.9	196.1	178.2	-54.5	-9.1
Tea	25.9	44.5	113.7	106.7	107.6	114.7	55.8	6.6	-51.4
Readymade Leather Goods	56.4	33.1	30.6	30.2	14.4	111.1	22.8	671.5	-79.5
B. Others	**2226.7**	**3651.3**	**4833.2**	**5019.3**	**4304.4**	**4216.1**	**9145.6**	**-2.1**	**116.9**
Total (A+B)	**18988.6**	**23500.6**	**23133.6**	**19788.8**	**19519.4**	**17654.3**	**22161.1**	**-9.6**	**25.5**

P=provisional.
Source: Nepal Rastra Bank

Export Policy of 1992 and the Three-Year Interim Plan

The Trade Policy of 1992 focused on promoting sustainable trade to enhance the national economy by undertaking open and liberal policies, and by allowing wider participation of the private sector. It also accorded priority to new product development, trade diversification, reduction in imbalances and coordination with other sectors of the economy. These objectives highlighted outward orientation with particular stress on export development. The role and importance of the private sector were also clearly recognized. The salient features of the policy were: (a) minimal role of public sector; (b) undertaking of liberal and dynamic trade policy and procedures; (c) stress on production and export of quality goods and services, (d) simplification of tax procedures, and (e) strengthening of institutional development.

The export policy recognized the need for a conducive formulation of macro–economic policies. The strategies included, among others, the following: (a) making the Nepalese currency partially convertible, ultimately leading to its full convertibility; (b) delicensing of exports except those banned or under quantitative restriction (QR); (c) implementation of duty drawback system by devising suitable mechanisms; (d) setting up of the EPZ; (e) exemption from all charges and income tax on exports; (f) simplification of procedures; and (g) strengthening of export capability through proper development of infrastructure, backward and forward linkages, and institutional and manpower development, and improvement in product marketing and promotion activities.

However, despite many measures undertaken (such as reforms in foreign exchange rules and regulations, simplification in the export process, construction of dry ports, and setting up of specialized committees for promotion of major export items, among others), these efforts were inadequate as adumbrated in the Three-Year Interim Plan (2007/8-

2009/10). The Three-Year Plan acknowledges that export trade of Nepal has been unable to make a contribution to the economy to the desired extent due a host of factors such as the inability to carry out legal and institutional reforms to the desired extent, incapability to integrate export–oriented industries with other sectors of the economy such as agriculture, forestry and tourism, among others, the reduction in the competitive capacity of Nepal's readymade garments after the expiry of the Multi-fiber Agreement, deterioration in the quality of major exportable products (such as carpet and pashmina) and lack of diversification in the products (NPC, 2007).

The four-fold objectives of the trade sector as delineated in the Three-Year Interim Plan include the following: a) to help alleviate poverty by ensuring that the gains from trade gets to the people through the maximum utilization of domestic physical and human resources; b) to mobilize trade for attaining the goal of economic development through the development and promotion of goods with competitive advantage and pinpointing areas of comparative advantages with the involvement of the private sector; c) to help alleviate poverty by taking advantage from the opening of the service sector under the WTO agreement; and d) to reform and build up commercial, physical, institutional infrastructure to reap the benefits emanating from the changes in the bilateral, regional and multilateral trade and transit system. Time will only tell whether these objectives will be attained or not.

Nepal's Export Potential: Review of Past Studies

A number of studies have analysed Nepal's comparative advantage horizons based on various indicators. In the first place, Karmacharya (2000) estimated the revealed comparative advantage (RCA) indices for various products based on aggregated SITC 6 digit levels. The top products arranged in ascending order of their RCA values were: hand-knotted woolen carpets, large cardamom, lentils, bran of rice, men's or boy's cotton shirts (knitted or crocheted), niger seeds, women's or girls' blouses, cotton and men's or boys' cotton shirts (not knitted).

The *Nepal Trade and Competitiveness Study* pinpointed the following as the "areas of opportunity": (a) lentils; (b) spices (cardamom and ginger; (c) leather and leather products (hides, skins, blue chromes); (d) hand-knotted wool carpets; (e) polyester yarns; (f) garments and pashmina; (g) niger seeds; (h) stone-carved Buddhas; (i) specialty teas; and (j) fragrant grasses and oils (Ministry of Industry, Commerce and Supplies, 2004).

Another report prepared by UNIDO (2002) accorded more priority to industry rather than export advantages, although the two are interlinked. According to this report, Nepal has revealed comparative advantage in the following areas: (a) lentils, spices, seeds; (b) leather and leather products; (c) fibers, yarn and textiles; (d) apparel and clothing; (e) cardamom and ginger; (f) niger seeds, (g) hides, skins and wet blue chromes, (h) carpets; and (i) pashmina.

Adams (2005) examined export screens that demonstrated, in different time periods, which of Nepal's exports were talking an upward trend and which were faltering. The export screens identified seven high productivity export categories based on export promotion industries: (a) garments and textiles; (b) carpets; (c) wood and paper products; (d) value-added agriculture; (e) handicrafts and leather products; (f) technology-based products and service exports; and (g) other emerging exports.

Another research suggested five sectors for export diversification based on the criteria of RCA (SAWTEE, 2007). These include tea, herbs, leather, tourism and information and communication technology (ICT).

A study undertaken by the IMF concluded that Nepal's comparative advantage rested on labor and resource intensive industries such as hydropower, tourism, carpets, some yarns and textiles, paper products, and agro-processing (vegetables, spices and herbs, tea, honey, flower and leather products) (IMF, 2006). Opportunities also existed in educational and health services, information technology, and financial services such as those being outsourced to India.

Finally, a recent study assessed the potential for future export growth of fourteen sectors in Nepal (ITC/TEPC, 2007).[5] Among the 14 sectors considered, the export potential was highest for cardamom, tea, pulses, silk and pashmina products and cut flower, followed by gems and jewellery, hand-made paper, leather, ginger, coffee and medicinal plants and essential oils. Honey, wooden handicraft, and mandarin oranges possessed the lowest export potential. These are all depicted in Table 4.

TABLE 4: Assessment of Export Potential

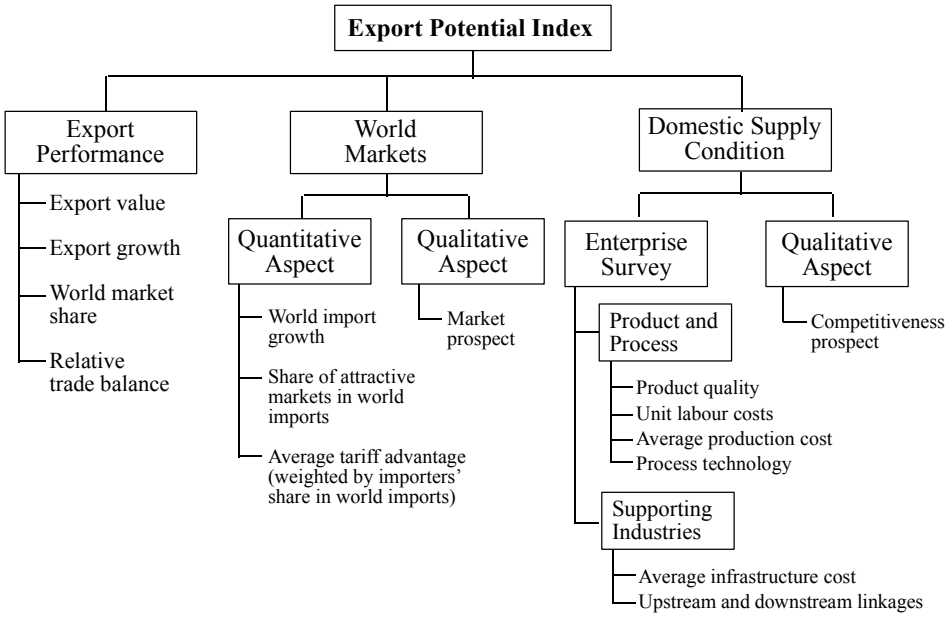
Sector		Export Potential					
		Export Value (US$ 1,000)	Index 1: Export Performance	Index 2: World Market	Index 3: Domestic Supply Conditions	Average 3 Indices	Assess-ment
1.	Cardamom	11,694	4.2 (H)	3.2 (H)	3.8 (H)	3.7	High
2.	Pulses	11477	2.8 (H)	3.9 (H)	3.1 (M)	3.3	High
3.	Tea	5,169	3.5 (H)	3.0 (H)	3.4 (H)	3.3	High
4.	Cut Flowers	211	2.9 (H)	3.5 (H)	3.1 (M)	3.2	High
5.	Silk & Pashmina Products	22,131	3.1 (H)	2.9 (M)	3.5 (H)	3.2	High
6.	Gems and Jewellery	7,393	2.9 (H)	3.4 (H)	3.1 (M)	3.1	Medium
7.	Hand-made Paper	944	3.2 (H)	3.3 (H)	2.6 (L)	3.0	Medium
8.	Coffee	169	2.3 (L)	2.7 (M)	3.6 (H)	2.9	Medium
9.	Ginger	2,518	3.3 (H)	2.4 (L)	3.0 (M)	2.9	Medium
10.	Leather	5,697	2.9 (M)	3.2 (H)	2.5 (L)	2.9	Medium
11.	Medicinal Plants & Essential Oils	1,979	2.3 (L)	3.0 (M)	2.9 (M)	2.7	Medium
12.	Honey	49	1.5 (L)	3.0 (M)	3.2 (H)	2.6	Low
13.	Wooden Handicrafts	350	2.2 (L)	2.3 (L)	3.0 (M)	2.5	Low
14.	Mandarin Oranges	0	1.2 (L)	2.7 (M)	3.2 (H)	2.3	Low

Note: Indices range between 1 (lowest ranking) and 5 (highest ranking). By convention, they are considered high (H: 3.2 points or more), medium (M: between 3.1 and 2.7 points), or low (L: 2.6 points or less).
Source: ITC and TEPC (2007), p. 29.

[5] This study compared and ranked those sectors on the basis of three main dimensions: a) the country's current export performance; b) the global markets (especially the international demand and the market access conditions) and its prospects, and c) the domestic supply conditions of the sectors and its competitiveness prospects. The study also made detailed analysis of the individual industries, together with an evaluation of strengths, weaknesses, opportunities and threats (SWOT) and identified the possible target markets for diversification for each industry.

In the aforementioned study, each industry was evaluated along with three main economic dimensions. Nepal's export performance (Index 1) was estimated by taking into consideration some indicators such as the export value in 2004, the world market share, the relative trade balance and the export growth between 2000 and 2004. The features of world markets (Index 2) included indicators such as the dynamism of international demand (growth of world imports between 2000 and 2004) and Nepal's relative access conditions to international markets.[6] Finally, the domestic supply conditions (Index 3) looked into indicators such as the quality of products, the productivity and cost of production factors, and the efficiency of domestic supporting industries. In other words, the competitiveness prospect was also evaluated. These three dimensions (Index 1 to Index 3) were taken together for the overall measure of export potential (Figure 1).[7]

FIGURE 1: Priority for Export Potential: Underlying Dimensions



Source: ITC/TEPC, 2007.

[6] The ITC/TEPC Study, for instance, points out that new markets for pashmina and silk products are Korea, Hong Kong, Hungary, Turkey and Greece. The new markets for cardamom have been identified as Syria, Qatar, Canada and Bangladesh. Likewise, for pulses, the attractive markets would be Spain, Pakistan, United States, Colombia, Sri Lanka, Bangladesh, Netherlands, Israel, Pakistan and Maldives. The new markets for tea would be Russia, United States, United Kingdom, Syria Sri Lanka, Australia, France and Canada. Attractive destinations for cut-flowers would be United Kingdom, Netherlands, Germany, Canada, China, Belgium, France and India.

[7] It should be noted that this study also includes another index (Index 4) comprising of the employment impact which evaluates the significance of industries for direct employment.

With regard to export potential in the services sector, a recent study by SAWTEE (2008) indicated that Nepal had comparative advantage for educational services exports, health service exports and high-end retail services exports.

Constraints to Export Diversification and Boosting Competitiveness

There are certain constraints that have inhibited the country from promoting export diversification and boosting competitiveness. Some of them are presented below.

- The gains from trade and global integration of a country are based basically on the competitiveness of the country's economy, that is, how efficiently it can produce goods and services. While Nepal's lower wage costs are an important competitive advantage, this is offset by the country's lower labor productivity.
- Limitations in infrastructure impede both the production and the distribution of goods and services. Weaknesses in the basic national infrastructure (transport, utilities, telecommunications) are major constraints on investment and operations.
- Nepal faces high transport costs. Lack of investment and inadequate maintenance of facilities, as well as poor administration, characterize the transport system in Nepal. Transit times at Indian ports are also long. High costs and the unreliability of electricity provision are also endemic. Again, administrative procedures are typically very complex and cumbersome, providing opportunities for rent-seeking but discouraging investment.
- Developing productive capacities is the key to export diversification and sustained economic growth. However, building productive capacities poses enormous challenges to Nepal, primarily owing to lack of adequate development finance, low savings and investment rates, low levels of technological development, insufficient managerial skills and lack of skilled manpower, the confluence of which undermines their international competitiveness.
- With a narrow range of goods and destinations to export, Nepal encounters a serious threat of vulnerability in the international market. For instance, the abolishment of textiles quota after the WTO's Agreement on Textiles and Clothing (ATC) expired in December 2004 has not only negatively impacted the garment exports but also the people employed in this sector.
- Acquiring new technology is important to make export qualitative and competitive. Technology transfer mechanisms are weak among the Nepalese exporting firms. Insufficient access to the latest technology in the export promotion activities, costs involved in access to licensing agreements and lack of in-house training program are the broad reasons for weaker technology.
- Although the three-year customs modernization plan effected some improvements in the adoption of transactions values and computerization of some functions, problems remain. These include poor infrastructure and facilities, complicated procedures and excessive documentation which are poorly harmonized with neighboring economies, and weak governance and human resource management. The capacity of the Customs Department is still weak and informal payments are still widespread.

IV. Analysis of Export Competitiveness

Measures of Competitiveness

The concept of competitiveness encompasses various qualitative factors that do not lend themselves readily to quantification. Capacity for technological innovation, degree of product specialization, the quality of the products involved, or the value of after-sales service are factors that may influence a country's trade performance favorably (Durand and Giorno, 1987). However, different quantitative indicators of competitiveness have been developed to measure competitiveness and also to facilitate international comparison.

There are generally two approaches for measuring competitiveness. One method is to employ the large-scale models that are often costly and time-consuming. Moreover, in the case of Nepal, it does not possess the necessary data to construct such models. The other more often used approach is the index number indicator approach designed to measure some change over time or comparison across industries (Esterhuizen, 2006). Further, the indices are employed to either measure the competitiveness of the overall economy or the specific sectors or industries.

Another way of examining national competitiveness is based on the construction of composite indices. For example, the *Global Competitiveness Report* produces two indices, the growth competitiveness index (GCI) and the current competitiveness index (CCI). The GCI aims to measure the capacity of the national economy to achieve sustained economic growth over the medium term. It looks at the macroeconomic sources of GDP per capita growth and generates predictions of the ability of a country to improve its per capita income over time. Analogously, the *Doing Business 2008* presents quantitative indicators on business regulations and the protection of property rights that can be compared across different economies. Regulations affecting 10 stages of a business's life are measured: starting a business, dealing with licenses, employing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts and closing a business. Based on the above indicators, Nepal was ranked 111 out of 178 economies, ahead of India that was placed at the 120th position.

Economists also employ other indices to measure national competitiveness. These include indicators pertaining to labor productivity and price competitiveness. The most widely used and well-known measures are the REER and unit labor cost (ULC). For empirical purposes, calculating the ULC is a difficult and arduous task since procuring reliable data on wages and productivity is not easy (ADB, 2003).

Another widely used indicator is Balassa's index of revealed comparative advantage (RCA) defined as the share of a commodity group in the economy's total exports divided by that commodity's share of world exports. The higher the ratio is above (below) unity, the stronger (weaker) that economy's comparative advantage in that commodity group, provided that government policies have not grossly distorted the composition of exports.

Real Effective Exchange Rate

Real effective exchange rate (REER) is often considered as one of the indicators of the export competitiveness of the economy. The REER is the nominal effective exchange rate (NEER) deflated by a similarly weighted average of relative prices or costs. The NEER, on the other hand, refers to a weighted average of several bilateral nominal exchange rates. Both indices are usually calculated as an index number relative to the base year.

The REER is calculated using the following formula:

$$REER = 100 * \prod (S^*_{it} / P^*_{it})^{w^*_i}, \qquad (1)$$

where S^*_{it} = nominal exchange rate index number for currency of country i, P^*_{it} = ratio of the price index of country i to the price index of the home country, with the same base year or that used to calculate the nominal exchange rate index number and w^*_i = normalized weight of country i (Guajardo, 2006).

The calculation of the REER involves the selection of different currency baskets, appropriate weights, a base year and averaging techniques. Two currencies, the US dollar and the Indian rupee, have been chosen. Likewise, the shares of India and other countries in Nepal's total trade have been taken as the weights. The NEER is then deflated by the consumer price index for the rest of the world proxied by the world inflation and Indian CPI.[8] The geometric mean method is employed to take the weighted average as this conceptually yields better results while considering the average of the percentage increase or decrease. In the absence of the export price index for Nepal, real exports (Real X) is obtained by the nominal exports deflated by the Nepalese CPI. The data utilized for computing the REER is provided in Annex 1.

Taking 2000/2001 as the base year, the REER has appreciated by around 6.10 percent in 2006/07. This suggests that the Nepalese economy is gradually losing its competitiveness. It should be noted that the share of trade with India in Nepal's total trade has been steadily rising from about 27 percent in 1993 to about 62 percent in 2006/07. The share of both exports to India and imports from India in Nepal's total exports and total imports, respectively, had sharply risen following the Trade and Transit Treaty with India in 1996, which allowed duty free access to Nepalese exports. Due to the high trade concentration with India and the pegged exchange rate, the Nepalese inflation rate has remained similar to that of India over the years. As a result, the real exchange rate of the Nepali rupee *vis-à-vis* the Indian rupee has not fluctuated much.

However, a note of caution is called for as the estimate of the REER is sensitive to the choice of weights and the base year which might produce quite different results; thus, the result should be taken as only indicative. For example, taking 1998/99 or 1999/2000 as the base years produce opposite results i.e. the real depreciation the Nepalese rupee.

[8] Data for world inflation is taken from IMF (2007).

Thus, in order to ascertain the possible misalignment of the exchange rate of the Nepalese rupee, the REER should be supplemented by other macroeconomic indicators.[9]

It is often argued that in order to benefit from competitiveness, exchange rate could be a useful instrument. But the purchasing power parity debate demonstrates that a policy of real undervaluation attained through competitive depreciation may not work in the long run as the misalignment would be corrected automatically over time depending upon the degree of openness of an economy.

FIGURE 2: REER and Exports

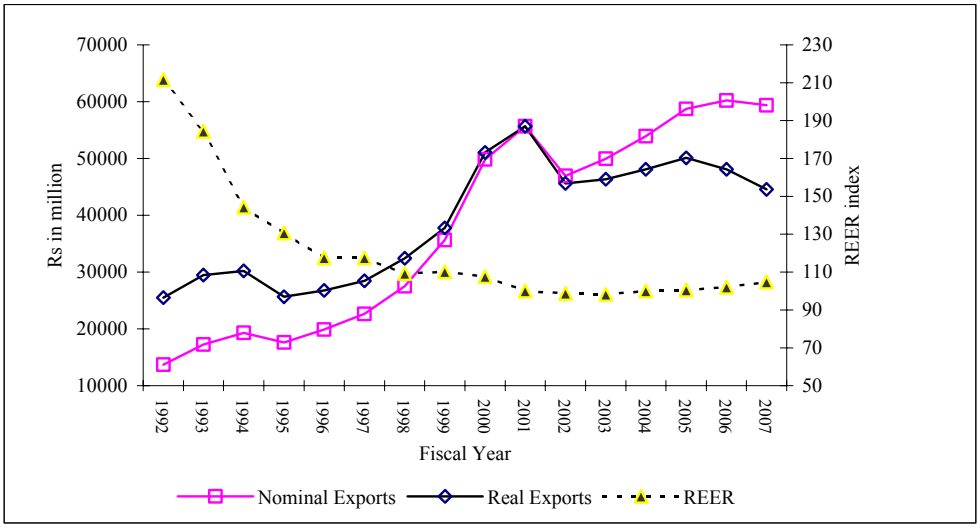


Figure 2 reveals that there is no clear relationship between the real exports (Real X), nominal exports, and REER. The graph reveals that REER may not be a major factor in the determination of the performance of exports in Nepal. A formal test of the stationarity using the Augmented Dickey Fuller test reveals that the logarithm of Real X is non-stationary, while the logarithm of REER is stationary (Ramanathan, 2002). Hence, there is no long term relationship between the REER and export performance in Nepal.[10]

[9] Though the calculation of the REER is ideally done based on a monthly data series spanning several years, in the Nepalese context, the index has been computed on an annual basis due to paucity of data.

[10] The stationarity test reveals that log of Real X is integrated of order 1 i.e. I(1) while that of the log REER is stationary or I(0). Thus, the Granger Causality Test cannot be applied to test the causal relationship between the Real X and REER. The different orders of integration mean that there is no cointegrating relationship between the REER and Real X and hence the error correction model would not be appropriate. It should be noted that for a regression analysis to be robust, ideally the number of observations should be greater than 30. Less than this would result in the so-called small sample bias. For details, see Enders (2004).

Revealed Comparative Advantage

The terms comparative advantage and competitiveness are often meant to describe resource use by different entities such as the firm, industry or a country. Both comparative advantage and competitive advantage (or simply competitiveness) contain two general categories of use: a production context and a trade context. With respect to international trade, comparative advantage denotes a comparative cost advantage in producing commodities and describes observed trade patterns based on country differences in resource endowments, investment patterns, technology, human capital and managerial expertise, infrastructure and government policies.[11] From an *ex post* sense, comparative advantage denotes country specialization in the production and sale of commodities over time and across countries/regions.

In theoretical models, comparative advantage is expressed with respect to relative values evaluated in the absence of trade. Since these are not observed, in practice comparative advantage is measured indirectly. Revealed comparative advantage (RCA) indices utilize the trade pattern to identify the sectors in which an economy possesses a comparative advantage by comparing the trade profile of the country of interests with the world average (Mikic *et. al*, 2007).

Balassa was the first to build a measure of RCA. His analysis demonstrated that observed trade patterns produce estimates of RCA. Balassa's index of RCA can be written as follows (Esterhuizen, 2006; Karmarcharya, 2000):

$$RCA = \frac{X_k^i / X_k^w}{X_t^i / X_t^w} \qquad (2)$$

where X_k^i = country i' s export of good K;

X_k^w = world exports of good K;

X_t^w = country i' s export's of all good (and t denotes total exports); and

X_t^i = world export's of all good

Equation 2 can be rearranged as follows:

$$RCA = \frac{X_k^i / X_t^i}{X_k^w / X_t^w} \qquad (3)$$

Thus, the RCA is the ratio of two shares: the numerator is the ratio of country's total exports of the commodity *i* in its total exports while the denominator is the share of world export of the same commodity in total world exports. The value of RCA ranges from 0 to ∞. A Balassa RCA index with value greater than unity would denote a comparative advantage in that commodity by country i.

In Nepal's case, various studies have identified the export potential/competitive products based on the high RCA and other indicators as discussed at length in Section III.

[11] When applied to the empirical world, however, comparative advantage often becomes somewhat elusive due to the problem in defining undistorted pre-trade relative prices, sorting country differences based on these factors and the presumed absence of government intervention.

This paper has computed the RCA indices for some major exports of top exporting items in Nepal for 2006 using the data from the *TradeMap*. The results are depicted in Table 5.[12]

TABLE 5: RCA Index for Major Exports in 2006

HS Code	Product	Nepal's exports (in thousand dollars)	World's export (in thousand dollars)	RCA
570110	Carpets of wool or fine animal hair, knotted	98217	1428194	13.91
151620	Vegetable fats & oils & fractions hydrogenated, inter/re-esterifid,etc, refined/not	38594	2960234	2.63
330610	Dentifrices	16656	1984195	1.69
220290	Non-alcoholic beverages nes, excluding fruit/vegetable juices of heading No 20.09	16444	4324675	0.76
620342	Men/boys trousers and shorts, of cotton, not knitted	16224	19025790	0.17
550921	Yarn,>/=85% of polyester staple fibres, single, not put up	14040	380346	7.47
392690	Articles of plastics or of other materials of Nos 39.01 to 39.14 nes	11050	32653800	0.06
621420	Shawls, scarves, veils & the like, of wool or fine animal hair ,not knitted	10584	361729	5.92
380610	Rosin	10424	596958	3.53
620462	Women's/girls trousers and shorts, of cotton, not knitted	10421	19338990	0.10
721041	Flat rolled prod,i/nas,pltd or ctd w zinc,corrugated,>/=600m wide,nes	10310	230873	9.03
291739	Aromatic polycarboxylic acids and their derivatives, nes	8968	1116037	1.62
760410	Bars, rods and profiles, aluminum, not alloyed	8355	1817563	0.93
620630	Women's/girls blouses and shirts, of cotton, not knitted	7215	5132238	0.28
531010	Woven fabrics of jute or of other textile bast fibres, unbleached	6670	117910	11.44
611020	Pullovers, cardigans and similar articles of cotton, knitted	6432	16722620	0.07
711311	Articles of jewellery & pts therof of silver w/n platd/clad w/o prec met	6377	3304965	0.39
611010	Pullovers, cardigans & similar article of wool or fine animal hair, knitted	6239	5571009	0.22
620452	Women's/girls skirts, of cotton, not knitted	5320	3712053	0.29

Source: Calculations based on the data from www.trademap.org

Table 5 exhibits that HS 570110 (knotted carpets) possesses the highest RCA index. Similarly, other major exports with greater than unity RCA values imply that Nepal has comparative advantage in these commodities. This is in confirmation with earlier studies.

[12] As mirror data is employed under 'TradeMap' where data is taken from the figures of the partner country, they do not tally with the official figures.

Although the results suggest that Nepal has comparative advantage in a number of products, the actual data shows a real decline in the exports of these commodities over the years. It should be emphasized that these indices are only relative measures and that the measurement of these concepts need to be treated with caution. Their limitations, that they only serve as *ex post* measures and are static in nature, should be understood. Moreover, competitiveness is a dynamic concept and the values of RCA may change over time.

V. TRADE POTENTIAL AT THE BILATERAL LEVEL

The preceding analysis has identified various products in which Nepal has competitive advantage. This section provides a framework for the preliminary analysis about the actual trade and the type of competition faced by some specific products possessing competitive advantage by analyzing the trade flows at the commodity level. Specifically, it looks at the four major exportable items to the US market (which is the second largest export destination for Nepal) and then calculates the "Indicative Trade Potential Index" (ITP) and "Relative Indicative Trade Potential" (RITP). The analysis is based on the methodology proposed by the ITC in assessing the bilateral trade potential at the commodity level (Helmers and Pasteels, 2006).

Table 6 lists the basic indicators derived from the *TradeMap* for 2006.[13] The actual trade of specific commodities between the US and Nepal in Column A shows that there is potential for increased trade. Column F gives the ITP which is a purely mechanical indicator that is used to identify the products for which there is the highest trade complementarity between the exports of a country and the imports of the target country. The trade potential indicator assumes that the importing country could, in principle, absorb perfectly all imports from the exporter. With such a strong underlying substitution assumption, the resulting figures are only indicative but can nevertheless be used in order to rank the products.

TABLE 6: Trade Flows at the Commodity Level

		Nepal's export to the US (in '000 dollars)	Nepal's exports to the world (in '000 dollars)	Share of US in Nepal's export, in %	US imports from the world (in '000 dollars)	Market share of Nepal in US's import, in %	Indicative trade potential	Relative indicative trade potential in %	Overall assessment
HS code	Product description	A	B	C=A/B	D	E=A/D	F= min (B,D) -A	G=F/B	H
570110	Carpets of wool or fine animal hair, knotted	34343	98217	34.97	562420	6.11	**63874**	65.03	Relatively high ITP and RITP/large market size
620342	Men's/boys' trousers and shorts, of cotton not knitted	14419	16224	88.87	5550775	0.26	**1805**	11.13	high ITP/small current trade/large import market
611020	Pullovers, cardigans and similar articles of cotton, knitted	5756	6432	89.49	8638658	0.07	**676**	10.51	high ITP/large market size
711411	Articles of gold/silversmith and part of silver w/n paltd/clad w/o prec met	55	90	61.11	41892	0.13	**35**	38.89	low ITP/relatively small import market

Source: Calculations based on the data from www.trademap.org

[13] The latest data was available for 2006 only.

Indicators in columns C, E and G in Table 6 express trade values in relative terms, as a percentage of exports of the country and help to complement the assessment of the trade potential. The RITP expresses the ITP in relative terms with respect to the exports which assists in evaluating whether the trade potential is high or low, based on the size of the respective markets. The RITP gives a different result compared to the ITP. The closer the RITP value is to 0, the more Nepal depends for that product on the US economy. From Table 6, it can be concluded that Nepal's exports of pullovers, cardigans and similar articles of cotton (HS Code 611020) depend relatively strongly on the US market than other products. Finally, column H gives the overall assessment of the specific products based on the preceding indicators. The first product presented in Table 6 under HS-570110 is an example of a comparatively successful market for Nepal since more than 6 percent of US's imports are sourced from Nepal. In this context, the trade potential in the short run lies, to some extent, in the stability and growth of the US market. In this respect, the analysis of the historical trends of Nepalese exports over the recent years and future prospects for the Nepalese market are critical.[14]

The small shares of the other products in the US market and the large market size suggest that the emphasis should be given more to the supply side. The existence of a high ITP is a necessary condition for trade to take place between the two countries in the short run. In the medium term, however, a low ITP is not necessarily an indication that no trade potential exists, since the commodity might have been produced in the country but not yet exported. Other indicators, such as average annual growth rates, which reveal important trends in export and import performance, as well as unit values, can also be used for a better analysis.

It is also important to examine Nepal's major competitors with regard to the export target market with additional information on the main competitors. Box 1 exhibits such information that provides the prospects for market diversification for the product 'carpets of wool or fine animal hair, knotted' (HS 570110) based on the *TradeMap* data for 2006.

BOX 1: Prospects for Diversification for Exports of Carpets of Wool or Fine Animal Hair, Knotted (HS 570110)

- Major importers in the world: US, Germany, Italy, Turkey, United Arab Emirates, United Kingdom and Canada.
- Major exporters to the world: Iran, India, Pakistan, China, Nepal and Turkey
- Nepal's exports represents 6.88 percent of world exports; its ranking in world exports is 5
- US import growth from the world< Nepal export growth to the US; US imports represents 38.97 % of world imports for this product; its ranking in world import is 1.
- Major exporters to the US: Iran, India, Pakistan, China, Nepal and Turkey.
- Share of US in Nepal's exports: 34.97%.
- Annual growth of US imports: 3%.

Source: www.trademap.org

[14] The recent decline in the export of carpets shows that current trade regime should also be taken into consideration while analyzing the trade flows. Nevertheless, the example illustrates the concept involved in analyzing the trade potential at a commodity level.

Box 1 depicts that Nepal faces competition, both at the global and more importantly at the regional level, especially for the US market, which is the largest importer for the above-mentioned product. However, the export of this product is vulnerable to the negative shocks in the US as a large part of the export of this product is concentrated in that country.

Box 1 suggests that Nepal would do well in terms of diversifying the markets for this product in other major destinations such as Italy, Turkey, and the United Arab Emirates, among others. This type of analysis provides a starting point for the prospects of export diversification, both product-wise and destination-wise, primarily from the demand side. These indicators should be supplemented by looking at other indicators such as trade costs like tariffs, transport costs, regulatory export restrictions, trade policy as well as production efficiency, product quality, consumer preferences, marketability and inward FDI. A similar analysis can be undertaken for different products at the disaggregated level that would provide a preliminary idea about the potential market for diversification.

VI. CONCLUSIONS

Despite economic liberalization and growth of trade in the 1990s, the competitiveness of Nepal's economy is rather low and labor productivity is one of the lowest among its neighboring and competitor countries. There are three factors that are largely responsible for the low price competitiveness and productivity in the economy: a) insufficient mechanisms and incentives for firms to procure new and modern technology, b) poor infrastructure, and c) an unfriendly investment climate. Weak infrastructure, transport and transactions delays, and an unpredictable regulatory framework further weaken price competitiveness. Again, the physical handicap (landlockedness) and the high transit-transport cost associated with it have further compounded the ability of Nepal to produce and trade on the regional and international markets, thus undermining its international competitiveness.

While export diversification broadens the scope for employment creation and poverty reduction, it also increases a country's economic resilience to external shocks, subsequently making income more stable and predictable. It can also promote technological advance and efficiency, and boost labor productivity and incomes. Moreover, successful export diversification is both indicative of and conducive to technological upgrading and knowledge acquisition.

A few suggestions are provided below for incorporation in the export diversification strategy of Nepal together with some measures for boosting export competitiveness.

- Nepal needs to use WTO membership to lock in past trade reforms, improve the domestic trade policymaking process, help exporters contest foreign trade barriers, and supplement the preferential market access it enjoys in key foreign markets. These benefits will help the country better integrate itself into the world economy.
- Export growth, including diversification of markets and higher-valued products, should be a major thrust of trade policy. Trade and industrial policies need to be aimed at promoting structural reforms to improve Nepal's efficiency and international competitiveness and reduce its vulnerability to external shocks that may arise from globalization.

- The improvement in Nepal's trade competitiveness calls for faster, more efficient movement of goods into, out of, and throughout the country. Streamlined cargo-customs procedures, including transit, are important in reducing transaction costs for traders.
- More focus has to be given to the creation of sound monetary and financial conditions that fosters high rates of domestic investment to accelerate growth, without impairing the international competitiveness of firms. Trade, fiscal and competition policies should be employed in an integrated and well-sequenced way to help augment profitability and investment in core industries and increase domestic value-added content of their exports.
- An export-friendly enabling environment should be generated which comprises sound domestic policies and export strategies, adequate infrastructure, provision of effective trade support services and targeted firm-level support. These aspects are, of course, interrelated. At the policy level, the enabling factors include a stable macroeconomic environment, outward-oriented trade and industrial rules, a proactive foreign investment strategy, sustained investment in human capital, comprehensive technology support for small and medium-sized enterprises (SMEs), and an efficient and cost-competitive infrastructure encompassing everything from cargo services to Internet access.
- Since Nepal is primarily a rural-oriented economy, a separate Agricultural Export Diversification Program should be formulated whose aim should be to augment the country's export growth rate and reduce its volatility. The program could consist of the following: a) promotion of private sector entrepreneurship in agribusiness; b) improving agribusiness export and facilitation services; c) strengthening agricultural health and food safety services; and d) rehabilitation of drainage and irrigation systems.
- Any serious "business plan" for trade promotion and export diversification must be based on a realistic assessment of a country's position in the international division of labor, complemented by an analysis of how to develop new areas of competitive advantage. This can be carried out with an assessment of:
    - External opportunities and constraints: how is world demand evolving? What are the most dynamic products? What are the entry conditions for these products in international markets? How are these products to be placed into global commodity chains?
    - Internal opportunities and constraints: what are the strengths and the weaknesses of the private sector? How are government policies affecting the private sector's ability to trade? How is the country placed in terms of producing the most dynamic export products and meeting the market entry conditions? Which interest groups are likely to consider themselves affected by a specific policy?
- Although studies undertaken in the past have revealed that Nepal possesses competitive advantage in herbal products, woollen carpets, tea, garments and pashmina, among others, a comprehensive case-by-case analysis of home and host countries trading environment, supply and demand conditions, cost of production, capacity to innovate, as well as its forward and backward linkages

should be analysed to translate the export potential to actual trading opportunities.

Finally, export diversification has long been a stated policy goal for Nepal. However, no considerable shift has been witnessed in patterns of exports in recent years which implies policy failures in directing new product categories in the export markets. Product diversification efforts must go hand in hand with efforts to secure markets for new products for long-term sustainable economic development.

REFERENCES

Adams, John. 2005. "Private Sector in Nepal's Drive for Export Success", in Maskay, Bishwa and John Adams (eds)., *Developing Nepal's Trade Advantage in Competitive Markets.* Kathmandu: Centre for Development & Governance.

Adams, John and Sushil Adhikari. 2005. "Nepal's Economy and International Trade" in Maskay, Bishwa and John Adams (eds.), *Developing Nepal's Trade Advantage in Competitive Markets.* Kathmandu: Centre for Development & Governance.

Asian Development Bank. 2003. *Asian Development Outlook*. Manila: ADB.

Bhagwati, J. and T. N. Srinivasan. 1983. "Trade Policy and Development" in Dornbush, R. and J. A. Frenkel (eds.), *International Economic Policy Theory and Evidence*, Baltimore: John Hopkins University Press.

Bhatt, Shiv Raj. 2006. "Nepal's WTO Membership: Benefits and Challenges." *South Asian Journal*, 12, April-June.

Bonaglia, Federico and Kiichiro Fukasaku. 2003. "Export Diversification in Low-Income Countries: An International Challenges after Doha." *Technical Papers No.209*, OECD, June. Available in http://129.3.20.41/eps/dev/papers/0307/0307001.pdf

Brenton, Paul, Richard Newfarmer and Peter Walkenhorst. 2007. "Export Diversification: A Policy Portfolio Approach." Paper Presented to the Growth Commission Conference on Development, Yale University, September.

Buckley, Peter J., Christopher L. Pass, and Kate Prescott. 1988. "Measures of International Competitiveness: A Critical Survey." *Journal of Market Management* 4 (2): 175-200.

Durand, Martin and Claude Giorno. 1987. "Indicators of International Competitiveness: Conceptual Aspects and Evaluation. *OECD Economic Studies No. 9*.

Economic and Social Commission for Asia and the Pacific (ESCAP) 2001. "Export Competitiveness and Sustained Economic Recovery." *Studies in Trade and Investment No. 46.* Trade and Investment Division. Available in: http://www.unescap.org/ publications/detail.asp?id=1173

Enders, Walter. 2004. *Applied Econometric Time Series*. Second Edition. Wiley Student Edition.

Esterhuizen, Dirk. 2006. "An Evaluation of the Competitiveness of the South African Agribusiness Sector." A dissertation submitted in partial fulfilment of the requirements for the degree of Ph.D. in the Department of Agriculture Economics, University of Pretoria.

Ghosh, Atish R. and Jonathan Ostry. 1994. "Export Instability and the External Balance in Developing Countries." *IMF Working Paper No. 94/8*, IMF.

Guajardo, Jaime. 2006. "Technical Aspects of Exchange Rate Analysis." IMF Institute.

Helmers, Christian and Jean-Michel Pasteels. 2006. "Assessing the Bilateral Trade Potential at the Commodity Level: An Operational Approach." *ITC Working Paper*, November.

International Monetary Fund. 2007. *World Economic Outlook 2007*. Washington, D.C: World Bank.

International Trade Centre (ITC) and Trade and Export Promotion Centre (TEPC). 2007. "Export Potential Assessment of Nepal."

Karmacharya, B. 2005. *South Asian Free Trade Area: Opportunities and Challenges*, Kathmandu: USAID

Karmacharya, B. K. 2000. *Export Potentials for Nepal: Comparative and Competitive Advantage Analysis*. Report prepared for National Planning Commission and the Asian Development Bank.

Krugman, Paul. 1996. *Pop Internationalism*. The MIT Press.

Lall, Sanjaya. 2001. "Competitiveness Indices and Developing Countries: An Economic Evaluation of the Global Competitiveness Report." *World Development* 29 (9): 1501-1525.

Leung, Ping Sun and Junning Cai. 2005. "A Review of Comparative Advantage Assessment Approaches in Relation to Aquaculture Development." University of Hawaii at Manoa.

Mikic, Mia and John Gilbert. 2007. *Trade Statistics in Policy Making: A Handbook of Commonly Used Indicators and Indices*. Bangkok: Economic and Social Commission for Asia and the Pacific.

Ministry of Industry, Commerce and Supplies. 2004. *Nepal: Trade and Competitiveness Study*. Kathmandu: MOICS.

National Planning Commission. 2007. *Three Year Interim Plan (2007/8-2009/10)*. December. Kathmandu: NPC.

National Planning Commission/UNDP. 2005. *Nepal Millennium Development Goals*: *Progress Report 2005*. Kathmandu: UNDP.

Nepal Rastra Bank. *Quarterly Economic Bulletin*. Various Issues. Kathmandu.

Piazza, Matteo and Carlo Sdralevich. 2004. "Does Trade Capacity Matter for Export Diversification in SSA Countries? An Analysis with Bilateral and Sectoral Data." Available in: http://www.csae.ox.ac.uk/conferences/2004-GPRaHDIA/papers

Prasad, Uma Shankar. 2007. "Nepal's Regional and Bilateral Trade Agreements: Performance and Prospects." Report submitted to Ministry of Industry, Commerce and Supplies, Government of Nepal under Project entitled "Enhancing Nepal's Trade-Related Capacity" (ENTReC), December.

Ramanathan, Ramu. 2002. *Introductory Econometrics with Applications*. Fifth edition. Harcourt College Publishers.

Ruffin, R. J. 1974. "Comparative Advantage under Uncertainty." *Journal of International Economics*, 4: 261-274.

Salvatore, Dominick and Derrick Reagle. 2002. *Statistics and Econometrics*. Tata McGraw-Hill.

Singer, Hans W. 1950. "The Distribution of Gains between Investing and Borrowing Countries." *American Economic Review, Papers and Proceedings*, 40: 473-485.

South Asia Watch on Trade, Economics & Environment (SAWTEE). 2008. *Nepal's Export Potential in Services*. Kathmandu: SAWTEE.

South Asia Watch on Trade, Economics & Environment (SAWTEE). 2007. *Export Diversification Strategy for Nepal*. Kathmandu: SAWTEE.

Trade and Export Promotion Centre. *Nepal Overseas Trade Statistics*. Various Issues. Kathmandu

Turnovsky, Stephen J. 1974. "Technical and Price Uncertainty in a Ricardian Model of International Trade." *Review of Economic Studies*, 41 (2): 201-17. .

United Nations Conference on Trade and Development (UNCTAD). 2006. *The Least Developed Countries Report 2006*. Geneva and New York: United Nations.

United Nations Conference on Trade and Development (UNCTAD). 1997. *Trade and Development Report 1997*. Geneva and New York: United Nations.

United Nations Industrial Development Organization (UNIDO). 2002. *Industrial Development Perspective Plan: Vision 2020*. Prepared for Government of Nepal, Ministry of Industry, Commerce and Supplies on behalf of the United Nations Development Programme (UNDP).

World Economic Forum. 2007. *The Global Competitiveness Report 2007-08.* Available in: http://www.gcr.weforum.org.

Doing Business 2008. Available in http://www.doingbusiness.org/documents/DB-2008-overview.pdf

The Himalayan Times, August 28, 2007.

Website of *TradeMap*: www.trademap.org

ANNEX 1: Data for Computing REER

Year	Exports to India	Exports to Other Countries	Import from India	Import from Other Countries	IC per NRs	US $ per NRs	Global Inflation	Indian Inflation	Nepalese Inflation	REER
					(Base Year = 2000)					
1991	1552	5835	7323	15903	0.5950	0.0313	0.242	0.492	0.433	260.53
1992	1450	12257	11246	20695	0.6058	0.0234	0.313	0.561	0.524	209.53
1993	1622	15645	12542	26664	0.6104	0.0219	0.427	0.606	0.571	174.30
1994	2409	16885	17035	34535	0.6247	0.0203	0.563	0.666	0.622	141.56
1995	3124	14515	19616	44064	0.6247	0.0200	0.682	0.734	0.670	127.44
1996	3683	16199	24399	50056	0.6247	0.0181	0.762	0.776	0.724	115.95
1997	5226	17410	24853	68700	0.6247	0.0175	0.818	0.815	0.783	116.00
1998	8794	18719	27331	61671	0.6247	0.0161	0.866	0.854	0.848	111.04
1999	12531	23146	32120	55406	0.6247	0.0147	0.913	0.895	0.944	109.82
2000	21221	28602	39660	68845	0.6247	0.0145	0.958	0.937	0.976	107.05
2001	26030	29624	54701	60986	0.6247	0.0135	1.000	1.000	1.000	100.00
2002	27956	18989	56622	50767	0.6247	0.0130	1.039	1.024	1.029	98.04
2003	26430	23501	70924	53428	0.6247	0.0129	1.076	1.072	1.078	98.11
2004	30777	23134	78740	57538	0.6247	0.0136	1.115	1.132	1.121	99.66
2005	38917	19789	88676	60798	0.6247	0.0139	1.156	1.200	1.172	100.01
2006	40715	19519	107143	66637	0.6247	0.0138	1.198	1.251	1.265	103.53
2007	41729	17654	115872	78822	0.6247	0.0142	1.244	1.321	1.346	106.10

Sources: NRB, Reserve Bank of India, IMF and computations. The exports and imports data are in million rupees. The exports, imports, CPI and exchange rate figures for Nepal relate to the Nepalese fiscal year (starting from mid-July). The figures for annual Indian inflation are taken from August to July to make it comparable to the Nepalese figures. For example, the annual WPI for 1991 is the average monthly indices from August 1990 to July 1991. In the absence of the comparable data for the world inflation, the average inflation of the current and the previous calendar year's inflation is taken as a proxy for the inflation of the current Nepalese fiscal year.

The Composition of Public Expenditure, Physical Infrastructure and Economic Growth in Nepal

Prakash Kumar Shrestha*

This paper investigates the role of composition of public expenditure, particularly the expenditure on physical infrastructure, on economic growth in Nepal from the time series perspective based on the endogenous growth model. The impact of public expenditure on economic growth has been found to be positive. Hence, low economic growth in Nepal in recent years can be attributed to low government expenditure on infrastructure. Availability of infrastructure situation is very dismal. Given the sustainable debt scenario, Nepal can go for more investment in infrastructure by external borrowing at least for the medium term.

I. INTRODUCTION

The role and size of the government expenditure has always been in debate. Although neoclassical economists argue for a small role of the government in economic affair, some roles of the government cannot be ignored in economic activities. There are some public goods like physical infrastructure, and semi public goods like education and health, in which we expect the significant role of the government. Private sectors do not generally enter into these sectors because of externality, long gestation period and need of huge investment. But, private production requires directly or indirectly these public goods.[1] Hence, the impact of public investment on growth has been the subject of much attention in recent academic research and policy debates (Agenor, 2007). Beginning with Aschauer (1989a, 1989b, 1989c), there has been a series of debate about the productivity effects of government expenditure on economic growth from different perspectives.[2]

* Deputy Director, Nepal Rastra Bank and currently pursuing doctoral studies at the Department of Economics, New School for Social Research, New York, E-mail: prakash@nrb.org.np

[1] In addition, public goods and services even enter into the household's utility function (Barro, 1990).

[2] Public investment for a public infrastructure such as roads, airports and port facilities can have direct and indirect effects on private sector output and productivity growth (Aschauer, 1989b). Public capital can directly influence the production and distribution and indirectly increase the return of private capital through complementary relation.

Cross-country studies on economic growth have explored a large number of determinants of economic growth. Greiner, Semmler and Gong (2005) suggest that specific forces differ from country to country, in line with the stage of development. Public goods like physical infrastructure, education and health are also crucial determinants of economic growth in certain stage of development, for which the role of government cannot be ignored. Public provision is required due to the positive externality effects of the development of public goods.

Following the modeling strategy of Devarajan, Swaroop and Zou (1996), Greiner, Semmler and Gong (2005), and Semmler *et. al.* (2007), this paper discusses a general model that features a government that undertakes public expenditure on (a) education and health facilities which enhance human capital, (b) public infrastructure such as roads and bridges, irrigation, electricity necessary for market production activity, (c) public administration to support government functions, and (d) debt service. Accordingly, this paper examines the impact of the composition of the government expenditure on economic growth in Nepal for the period 1981-2007, since there has not been any study done in Nepal on this matter.[3] It is argued that Nepal's low economic growth is due to lack of adequate availability of infrastructure.

As regards the structure of this paper, Section II sketches a brief review of empirical evidence. Section III deals with a growth model incorporating accumulation of private physical capital as well as the composition of government expenditure. In Section IV, an overview of Nepalese economy is undertaken, followed by the empirical analysis in Section V. Finally, Section VI draws the conclusions.

II. OVERVIEW OF EMPIRICAL EVIDENCE

Endogenous growth models allow analyzing the impact of the fiscal policy on economic growth. Some early attempts were made by Aschauer (1989a, 1989b, 1989c), followed by Barro (1990). Aschauer (1989a) finds that core infrastructure (streets, highways, airports, mass transit etc) has the most explanatory power for private sector productivity in the Unites States during 1949-85. Extending his study to 7 developed countries, Aschauer (1989b) further found the strong positive correlation between the labor productivity and non-military capital expenditure.[4] He further argues that public investment makes crowding-in effect in contrast to general neo-classical view of crowding out effect of government expenditure because marginal return of private capital increases if public infrastructures are available (Aschauer, 1989b).

Barro (1990) found an inverted U-curve relationship between productive government expenditure and economic growth, implying the productivity effect of government expenditure up to a certain level. Based on data of 98 countries, Barro (1991) further found that an increase in resources towards nonproductive government consumption is associated with lower per capita. Moreover, Kessides (1993) examines a wide range of evidence on the impacts of infrastructure on economic development and concludes that infrastructure contributes to economic growth, both through supply and demand channels

[3] Some argue that a time series perspective on economic growth may be more useful for designing development strategies from particular country perspective (Griener *et.al*, 2005).
[4] He included the U.S., Japan, (West) Germany, France, United Kingdom, Italy and Canada.

by reducing costs of production, contributing to the diversification of the economy and providing access to the application of modern technology, raising the economic returns to labor. Infrastructure contributes to raising the quality of life by creating amenities, providing consumption goods (transport and communication services) and contributing to macroeconomic stability.

Using cross-country data of 100 countries for the period of 1970-1988, Easterly and Rebelo (1993) find a positive effect of investment in transport and communication on economic growth. Although the relationship between the per capita GDP growth and expenditure in infrastructure as percentage of GDP yield inconclusive results, Sanchez-Robles (1998) finds a positive impact of road length and electricity generating capacity in explaining subsequent economic growth in Latin American countries. Glomm and Ravikumar (1997) studied the implication of government expenditure on infrastructure and education using overlapping generation model, which depict the direct influence of public education expenditures on human capital accumulation, and subsequently on long term growth.

Based on his cross-regional study comparing infrastructure provision in Spain and the US, De la Fuente (2000) also concludes that causality flows from infrastructure investment to economic growth, but posits that, as a "saturation point" is reached, the returns on such investment declines. Agenor and Neanidis (2006) provide a more disaggregated discussion of government expenditure. Infrastructure affects not only the production of goods but also the supply of health and education services. The production of health (education) services depends also on the stock of educated labor (health spending).

In a recent study, Semmler *et. al*. (2007) propose as a practical rule of thumb that two-thirds of public investment should be directed towards public infrastructure that facilitates market production and the remaining one third to health and education, more or less evenly. Based on the calibration exercise, they argue such an allocation of resources would maximize income and welfare. They further emphasize that so long as resources for public investments are used in a growth maximizing way, debt sustainability will not be a problem.

In contrast to above findings, Devarajan *et. al* (1996) found, from the cross country study of 43 developing countries that the relationship between the capital component of public expenditure and per capital growth is negative, but an increase in the share of current expenditure has positive and statistically significant effects. Based on the study, they argue that developing countries governments have been misallocating public expenditures in favor of capital expenditure at the expenses of current expenditure. This contradictory situation of impact of the composition of government expenditure on economic growth has motivated to reexamine this relation in Nepalese economy. Since most of the studies are based on cross-sectional data, their results might have suffered from heterogeneity of countries. Hence, this paper focuses on time series perspective, given that no such study has been found solely using Nepal's data.

III. THE MODEL

This paper develops a model based on Devarajan *et. al* (1996) and Semmler *et. al* (2007), which involves both private and public sector, allowing the government to borrow

in contrast to balance budget in Devarajan *et. al* (1996) and Agenor and Neanidis (2006). It incorporates private physical capital and public capital which includes the public infrastructure to support the market production as well as facilities for health and education services. Hence, it establishes the linkage among the government expenditure, private capital and economic growth. Public capital is used to enhance both human capital and private capital as well.

As in Devarajan *et. al* (1996), the model proposed here considers two types of government expenditure: productive and unproductive.[5] The model will assess the effect of shift in composition of government expenditure and deficit financing on economic growth. In per capita term, aggregate production function is written with private capital 'k', two types of government expenditure 'g_1 (productive) and g_2 (unproductive) in CES type production function as

$$y = f(k, g_1, g_2) = [\alpha k^{-\rho} + \beta g_1^{-\rho} + \gamma g_2^{-\rho}]^{-1/p} \quad (1)$$

where $\alpha>0$, $\beta\geq 0$, $\gamma\geq 0$, $\alpha+\beta+\gamma=1$, $\rho\geq -1$

In contrast to Devarajan *et. al* (1996), I allow that the government can finance its expenditure by levying a flat-rate income tax, τ, and deficit financing in line with Semmler et.al (2007). Hence,

$$g = g_1 + g_2 = Tax + Df = \tau y + \upsilon y = (\tau + \upsilon)y \quad (2)$$

where τ is tax rate and Df is deficit financing ('v' percent of income), and y is national income.

$$g_1 = \phi(\tau + \upsilon)y \text{ and } g_2 = (1-\phi)(\tau + \nu)y \quad (3)$$

Let us assume $(\tau + \upsilon) = T$, hence $g_1 = \phi Ty$ and $g_2 = (1-\phi)Ty$ (3a)

Taking the government decision on τ, ϕ, and ν, the representative agent choose consumption 'c' and capital 'k' to maximize his/her welfare

$$\underset{c}{Max} \int_0^{\infty} e^{-\delta t} u(c)dt \quad (4)$$

u(c) is assumed to be $\frac{c^{1-\sigma}-1}{1-\sigma}$

Subject to

$$\dot{k} = (1-\tau)y - c \quad (5) \text{ [law of motion for capital]}$$

[5] For simplicity, just two types of classification have been made, but it can be extended to different compositions.

$$\dot{b} = rb - \theta g_2 \qquad (6)\ \text{[debt dynamics]}$$

where , δ is time preference, r is interest rate and θ is a part g_2 that is used for debt servicing. Elasticity of intertemopral substitution is the constant as $1/\sigma$. Initial population is normalized to 1.

Current value Hamiltonian,

$$H = \frac{c^{1-\sigma} - 1}{1-\sigma} + \lambda_1 [(1-\tau)y - c] + \lambda_2 [rb - \theta g_2] \qquad (7)$$

First order condition is

$$\frac{\partial H}{\partial c} = c^{-\sigma} - \lambda_1 = 0 \Rightarrow c^{-\sigma} = \lambda_1 \quad (8)$$

For the costate variables according to maximum principle,

$$\dot{\lambda_1} = \delta\lambda_1 - \frac{\partial H}{\partial k} = \delta\lambda_1 - \lambda_1 [(1-\tau)\frac{d(\alpha k^{-\rho} + \beta g_1^{-\rho} + \gamma g_2^{-\rho})^{-1/\rho}}{dk}] \qquad (9)$$

$$\dot{\lambda_2} = \delta\lambda_2 - \frac{\partial H}{\partial b} = \delta\lambda_2 - \lambda_2 r \qquad (10)$$

Equations for first order condition (8), equations for the costate variables (9) to (10), together with two state variable equations (5) and (6) constitute a system of five equations for five variables (c, k,b, λ_1, λ_2). Setting the differential equations (5), (6) (9) and (10) equal to zero and using equation (8), we get stationary state value of (c*, k*, b*, λ_1*, λ_2*). Using this steady state value into the production function, we get steady state per capita income. But our purpose here is to examine impact of composition of government expenditure and debt financing on per capita GDP growth.

From (8) and (9), we get dynamic equation for consumption as

$$\frac{\dot{c}}{c} = -\frac{1}{\sigma}[\delta - (1-\tau)\alpha k^{-\rho-1}(\alpha k^{-\rho} + \beta g_1^{-\rho} + \gamma g_2^{-\rho})^{\frac{-(1+\rho)}{\rho}}] \qquad (11)$$

After simple manipulation of Equation 11 as shown in Annex 1,

$$\frac{\dot{c}}{c} = \frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha + \left(\frac{g}{k}\right)^{-\rho}(\beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho})\right\}^{\frac{-(1+\rho)}{\rho}} - \delta\right] \qquad (12)$$

Assuming steady state growth rate of consumption as λ, which is also equation per capita income growth at steady state, and assume that along the steady state growth path the tax rate τ and 'v' is also constant.

By using (1), (2), (3), and (3a), we get (as depicted in detail in Annex 1)

$$\frac{g}{k}=\left[\left\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)\right\}^{-\rho}/\alpha\right]^{\frac{1}{\rho}} \tag{13}$$

Substituting (13) into (12), the following is obtained (as elaborated in Annex 1):

$$\frac{\dot{c}}{c}=\lambda=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha T^{\rho}/(T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho})\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right] \tag{14}$$

From Equation 10 at steady state,

$\delta = r$: subjective preference equals market real interest rate.

From Equation 14, we can derive a relationship between the steady state growth rate λ and the share of government expenditure devoted to g_1 (derivation is shown in Annex 1)

$$\frac{d\lambda}{d\phi}=\frac{\alpha(1-\tau)(1+\rho)(\alpha T^{\rho})^{\frac{-(1+\rho)}{\rho}}[\beta\phi^{-(1+\rho)}-\gamma(1-\phi)^{-(1+\rho)}]}{\sigma\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\}^{-\frac{1}{\rho}}} \tag{15}$$

The components g1 is productive if $\frac{d\lambda}{d\phi}>0$. The right-hand side of Equation 15 is positive if $\beta\phi^{-(1+\rho)}>\gamma(1-\phi)^{-(1+\rho)}$

or, $$\frac{\phi^{-(1+\rho)}}{(1-\phi)^{-(1+\rho)}}>\frac{\gamma}{\beta}\rightarrow\frac{\phi}{1-\phi}<\left(\frac{\beta}{\gamma}\right)^{\frac{1}{1+\rho}} \tag{16}$$

In Cobb-Douglas production function, ρ=0, Equation 16 becomes

$$\frac{\phi}{1-\phi}<\left(\frac{\beta}{\gamma}\right) \tag{17}$$

According to this condition, if the relative share of public expenditure devoted to the two goods g_1 and g_2 is below their relative output elasticities, then a shift in the mix towards g_1 will increase the economy's long-run growth rate (Devarajan *et al*., 1996). What will be the impact of rise in government expenditure through higher tax and / or higher deficit financing on economic growth? For this, we can differentiate steady state growth rate λ i.e. Equation 14 with respect to T (=τ+υ) so that we get

$$\frac{\partial \lambda}{\partial T} = \frac{T^{-1+\rho}\alpha T^{\rho}(-1-\rho)(1-\tau)\left(\frac{\alpha T^{\rho}}{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}}\right)^{-1+\frac{-1-\rho}{\rho}}}{(T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho})^{2}}$$

$\frac{\partial \lambda}{\partial T} > 0$ only if $T^{\rho} - \beta\phi^{-\rho} - \gamma(1-\phi)^{-\rho} < 0$ or $T^{\rho} < \beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho}$. In case of Cobb-Douglas production function, this condition implies $\beta + \gamma > 1$. Hence, intuitively, an increase in total government spending will raise steady-state growth rate only if productivity of the government spending ($\beta+\gamma$) exceeds the taxes rate and interest rate on debt.

IV. Overview of Nepalese Economy

Macroeconomic Situation of Nepal

Since the mid-eighties, Nepal has been adopting fiscal adjustment and restructuring programs by introducing Structural Adjustment Program (SAP) at 1985 in the initiative of the IMF and World Bank. The main objective in implementing the SAP was to attain macroeconomic balances and raise GDP growth rate on a sustainable basis. The SAP-I, implemented for the period of 1986/87 to 1988/89, sought to provide the transition from economic stabilization to more rapid development on a sustainable basis by laying the foundations for structural reform of the economy. The SAP-I actually focused on improving macroeconomic management by enhancing government revenues and public savings, restraining the growth of less essential expenditures and increasing investment levels, with the liberalization of industry, trade and exchange rate policies for promoting export development and freeing up imports. Moreover, it had also provisions of facilitating private investment and activities, improving management of public enterprises and initiating a longer term program for privatization, and strengthening development administration through a series of measures aimed at improving budgeting, planning and expenditure monitoring.

In order to increase the pace of the reforms and enhance economic growth, the second Structural Adjustment Program SAP-II was implemented in 1989/90 for three years. The SAP-II was complimented by a Policy Framework Paper (PFP) and IMF Structural Adjustment Facility (SAF) arrangement, which covered the same period. In late 1992, the government negotiated a new Enhanced Structural Adjustment Facility (ESAF) arrangement with the Fund. This provides a framework for continued economic reform and adjustment. Nepal recently completed three-year Poverty Reduction and Growth Facility program of IMF in 2007.

However, poverty has still persisted in Nepal because of low economic growth, inadequate social and economic infrastructure, and relatively high population growth.[6]

[6] Politically, Nepal is in a transitional process. After a decade long internal conflict that had begun in 1996 and ended in 2006, Nepal is now a young republic country. The Constituent Assembly election was held in April 2008, which has got mandate to draft new constitution to make Nepal as a federal state. Hence, Nepal is in the process of drafting new constitution, and coalition

One-third of the population are still living under the absolute poverty line. Over the two and half decades, economic growth has averaged about 4.4 percent only marginally exceeding the population growth rate of 2.2 percent. Even by South Asian standards, Nepal's level of social and economic infrastructure is low (UNDP, 2002). The poor have less access to basic social and economic infrastructure.

Figure 1 shows graphical exposition of some important macroeconomic variables related to Nepalese economy and Table 1 reflects summary statistics. In recent years, both per capita GDP growth and GDP growth itself have slowed down after some growth in the beginning of 1990s. Average inflation stood at 8.7 percent, although the first six years of 21st century witnessed inflation below 5 percent. Since 2006, inflation again went up higher than 5 percent. The highest inflation of 21.5 percent was recorded in 1991/92.

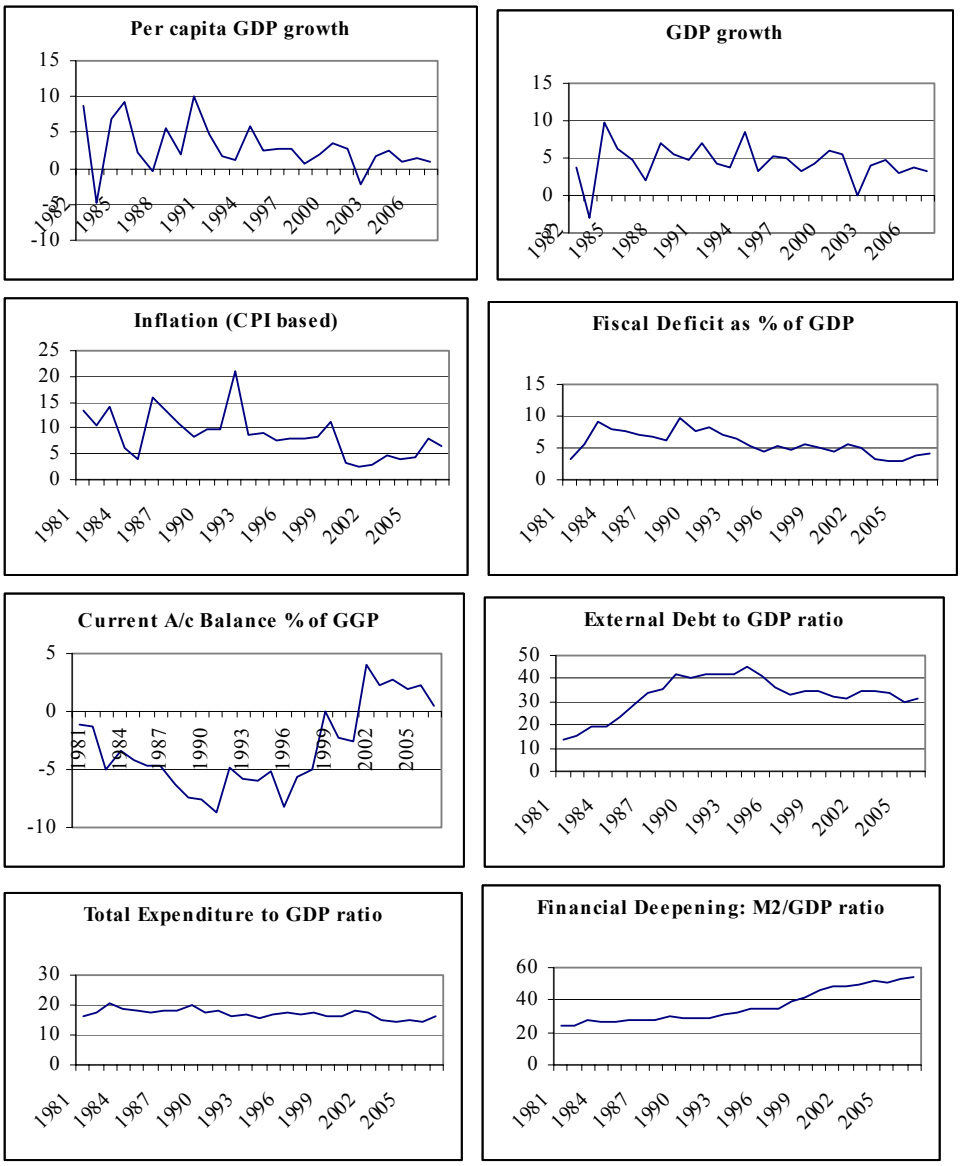
Following the fiscal consolidation with the IMF's structural adjustment program, fiscal deficit has declined to 2.9 percent of GDP in 2004 before picking up to 4.0 percent in 2007. It was also due to almost stable or even slightly declining total expenditure-GDP ratio in the review period. However, the average fiscal deficit in the sample period remained at 5.7 percent because of higher deficit in the first half of 1980s (Table 1). Such an IMF-recommended fiscal consolidation on the one hand and increasing security-related expenses on the other have squeezed the availability of fund to infrastructure development, resulting in weak infrastructure situation in Nepal, which is explained later.

Along with the reduction in fiscal deficit, current account deficit also declined gradually after reaching as high as 8.8 percent of GDP in 1991 and remained continuously higher than 5 percent until 1999. After some deficit in 2000 and 2001, current account turned into surplus since 2002, which still continued to exist, owing to increasing remittance inflows despite a huge trade deficit.

---

government led by the then rebel party that won the majority of the seats in Constituent Assembly election is in power since mid- 2008.

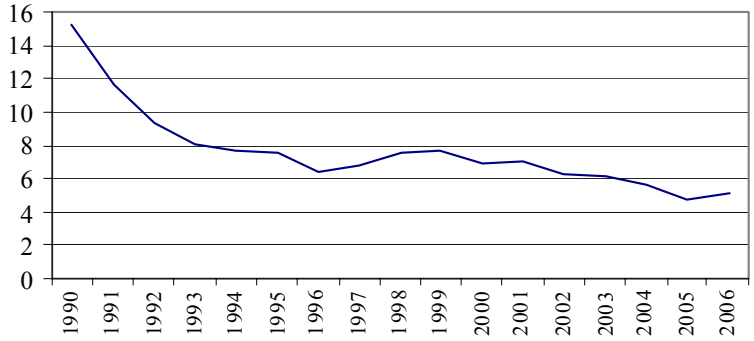
FIGURE 1: Overview of Some Macroeconomic Variables



After current account turned into surplus, external debt-GDP ratio has also declined gradually after mid-1990s. Now, external debt is about one-third of GDP. Hence, debt servicing as percent of exports of goods and services has declined in recent years. Debt

sustainability test, following the Bohn (1998) method[7], showed that Nepal has sustainable debt scenario for the period 1990-2007 (Shrestha and Pineda, 2009).

FIGURE 2: Debt Servicing as Percent of Export of Goods and Services



Source: Asian Development Bank. 2008. *Key Indicators*.

During the economic liberalization process in Nepal, which began in mid-eighties, the financial sector has expanded substantially. M2/GDP ratio, an indicator of financial deepening, increased from 24.7 percent in 1981 to 54.7 percent in 2007.

TABLE 1: Summary Statistics of Some Macroeconomic Indicators

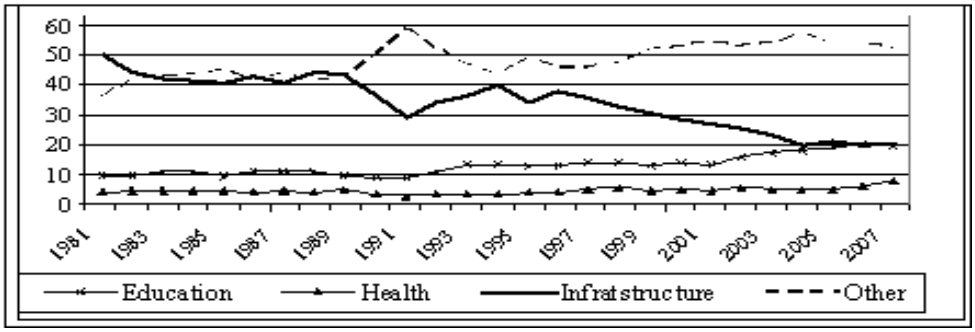
	Per Capita GDP Growth	GDP Growth	Inflation (CPI based)	Fiscal Deficit as % of GDP	Current A/c Balance as % of GDP	External Debt to GDP Ratio	Total Expenditure to GDP Ratio
Mean	2.91	4.44	8.71	5.71	-3.19	32.63	17.09
Standard Error	0.66	0.49	0.83	0.36	0.70	1.66	0.29
Median	2.37	4.50	8.28	5.45	-4.64	34.24	17.30
Standard Deviation	3.35	2.48	4.33	1.85	3.66	8.45	1.51
Sample Variance	11.20	6.16	18.79	3.43	13.39	71.38	2.27
Kurtosis	0.70	2.73	1.15	-0.69	-0.87	0.16	0.23
Skewness	0.33	-0.71	0.86	0.35	0.47	-0.86	0.41
Range	14.76	12.66	18.62	6.63	12.76	31.46	6.09
Minimum	-4.78	-2.98	2.45	2.95	-8.76	13.40	14.54
Maximum	9.98	9.68	21.07	9.57	4.00	44.86	20.64

[7] $\frac{S_t}{Y_t} = \alpha + \beta \frac{B(t)}{Y(t)} + \varepsilon_t$, where St is primary surplus, Yt is national income, B(t) is external debt. $\beta>0$ guarantees that intertemporal budget constraint of the country holds. Thru OLS estimates of this equation based on 1990 to 2007 data for Nepal, the following results are obtained which shows that Nepal's external debt is sustainable so far.

$$\frac{S_t}{Y_t} = \underset{(-5.04)}{-16.8} + \underset{(2.59)}{0.17} * \frac{B(t)}{Y(t)}, \quad \text{AdjR}^2 = 0.26, \text{DW} = 1.52$$

Figure 3 shows the movement of the composition of the government expenditure. Data shows that government has been giving an importance to education and health sector, which share in total expenditure have been rising. Due to increase in security related expenses with growing internal conflict since 1996, other expenses also went up since the mid-1990s. However, the share of expenditure to infrastructure has declined substantially.

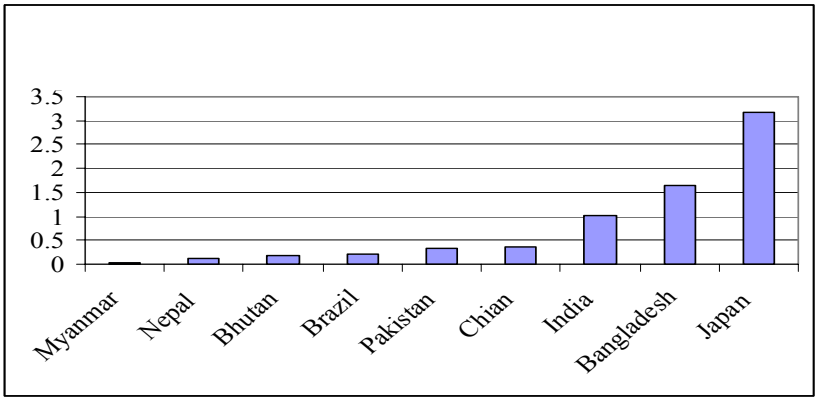
FIGURE 3: Composition of Government Expenditure (in percentage of total)



Infrastructure Situation in Nepal

As a result of low priority in infrastructure investment, the situation of infrastructure has remained quite weak in Nepal. Figure 4 reflects the road density of Nepal, which is comparatively very low. Road density per square km of land was 0.12 as of 2004 in Nepal compared to 1.01 in India (2006) and 3.16 in Japan (2006). In Nepal, only 37 percent of households have paved road within 30 minutes, while 27 percent have to travel for 3 hours or more according to the *Nepal Living Standard Survey 2003/04* (CBS, 2004).

FIGURE 4: Road Density (Km roads per square km of land)



Source: IRF. 2008. *World Road Statistics*.

Nepal has considerably improved its postal and telephone services, though they remain deficient in rural areas. Telephone penetration has reached 18.86 per hundred populations as of December 2008 (NTA, 2009). However, in international standard, it is quite low. Table 2 and Figure 5 show Nepal's comparative position in telephone facility, both mainlines and mobiles. Compared to 554 main line telephone per 1000 people in Japan and 46 in India, Nepal has 16 mainline telephones per 1000 people as of 2003. Similar is the situation for the access of mobile telephone.

As regards the electricity development, Nepal has remained very weak, despite having tremendous potentiality. According to *Nepal Living Standard Survey 2003/04* (CBS, 2004), only 37 percent of the households have access to electricity in their dwellings. Nepal has been in unprecedented energy crisis for last three years, with continuous load shedding (power-off) of as high as 16 hours a day recently, which has been adversely impacting the economic activities in recent years. Of the feasible potentiality of 43,000 megawatts (MW), Nepal has so far utilized a mere 560 MW, i.e. just 1.3 percent of total feasible potentiality. As a result, per capita electric power consumption in Nepal is comparatively very low as shown in Table 2 and Figure 6.

TABLE 2: Comparative Telephone Facility and Electricity Consumption

Countries	Telephone Mainline per 1000 People 2003	Mobile per 1000 People 2003	Electric Power Consumption Per Capita (Kwh) – 2002
Bangladesh	5	10	100
Nepal	16	2	64
Ethiopia	6	1	25
India	46	25	380
China	209	215	987
Brazil	223	264	1776
Japan	554	679	7718
France	566	696	6606

Source: World Bank. 2005. *World Development Indicators.*

FIGURE 5: Availability of Telephone Facility

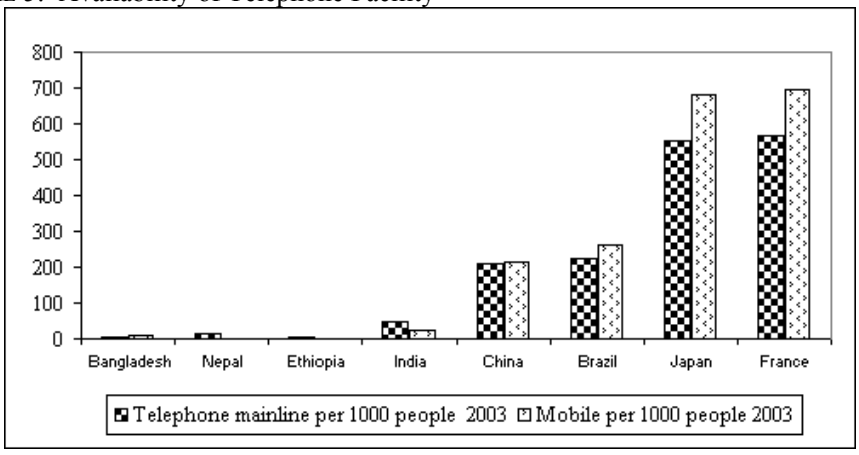
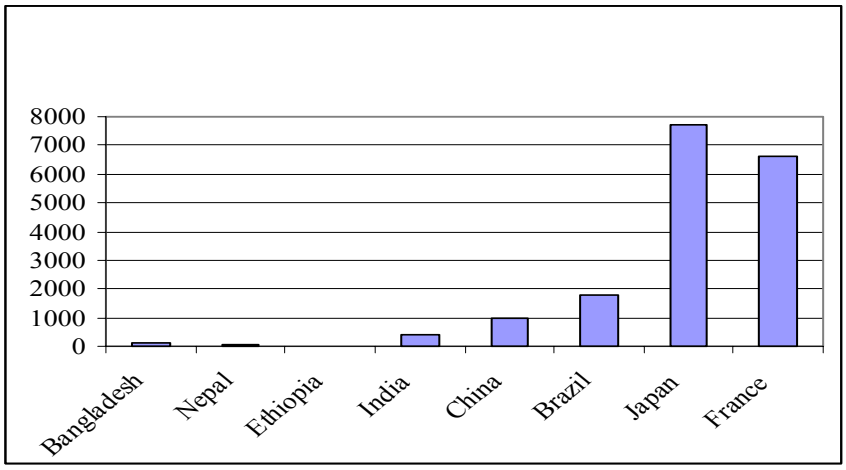


FIGURE 6 : Electric Power Consumption per Capita (Kwh) 2002



V. EMPIRICAL ANALYSIS

My empirical analysis focuses on the link between various components of government expenditure, deficit financing and economic growth in Nepal based on the above discussed model. The empirical analysis uses the data from 1981 through 2007 to examine the link between components of government expenditure, deficit financing and economic growth. Data are taken from the Asian Development Bank's website. The dependent variable is the five-year and three-year forward moving average of per capita real GDP to reflect that there is lag effect of public expenditure on public goods as in Devarajan *et. al*.(1996).

The method of OLS is used to estimate the following equation

$$RGDPC_{(t,\ t+5)} = \alpha_0 + \alpha_1 (TE/GDP)_t + \alpha_2 G_{Et} + \alpha_3 G_{Ht} + \alpha_3 G_{It} + \alpha_4 G_{Ot} + \alpha_4 (Df/GDP)t + \varepsilon_t \quad (18)$$

where RGDPC(t,t+5) =five-year forward moving average of per capita real GDP growth. TE/GDP is the share of total government expenditure in GDP, G_E and G_H is ratio of government expenditure on education and health to total expenditure, necessary for building human capital, G_I is the ratio of government expenditure on physical infrastructure to total expenditure[8], G_O is the other expenditure. Df/GDP is the ratio of deficit financing to GDP. Government can borrow to finance the expenditure on physical infrastructure, education and health. If the government is spending by borrowing abroad on productive areas, one can expect the per capita GDP to increase, but at the same time increasing external debt can drain up resources for debt financing, thereby reducing the government expenditure for productive purpose.

[8] It includes the government expenditure on transportation, communication, electricity and irrigation.

Table 3 shows the empirical estimates of the above Equation 18 in different version. In all versions of equations, share of expenditure on physical infrastructure in total expenditure has been found significantly positive to influence per capita real GDP. It shows the importance of physical infrastructure in Nepal. In fact, economic growth has been low in Nepal due to mainly lack of enough physical infrastructures. As discussed in Section IV, Nepal is seriously lacking necessary infrastructure. As a result, market is narrow for domestic product, and private production has been seriously suffering from lack of enough energy and road network.

Surprisingly, coefficient of education is significantly negative, against the general belief. Government has been focusing on the development of education, but economy is not growing much in response to that. In reality, there are unemployed educated people. With increasing access to the world, following the recent phase of globalization, there has been heavy brain drain. As a result, education expenditure in Nepal has actually been benefiting foreign countries and Nepal is just receiving remittance, but not internal output production and employment generation. Moreover, Nepal's education so far has not been able to develop entrepreneurship skill in the economy. One can even argue that education is not suitable for Nepal's reality. Educated people hardly live in village and contribute to increase in domestic output.

TABLE 3: Composition of Government Expenditure and Economic Growth
Dependent variables: five-year forward moving average of per capita growth rate

	Eq.1	Eq.2	Eq.3	Eq.4
Constant	0.03	0.05	0.04	0.05
	(1.08)	(1.36)	(1.08)	(1.35)
TE/GDP		-0.14		-0.21
		(-0.86)		(-0.83)
G_E	-0.21*	-0.26*	-0.24**	-0.24**
	(-2.16)	(-2.25)	(-1.79)	(-1.80)
G_H	-0.20	-0.12	-0.20	-0.08
	(-0.80)	(-0.43)	(-0.76)	(-0.29)
G_I	0.10*	0.11*	0.10*	0.11*
	(2.92)	(3.01)	(2.86)	(2.95)
G_O	-0.008	-0.00	-0.006	-0.00
	(-0.21)	(-0.01)	(-0.15)	(-0.01)
Df/GDP			-0.05	0.08
			(-0.34)	(0.36)
Adj R2	0.72	0.71	0.70	0.69
DW	1.94	1.72	1.82	1.80
Obs	22	22	22	22

Coefficient of health expenditure is found insignificant and negative. Government has also focused on health. However, it is also not contributing much to economic growth.

Because of decreasing mortality, expansion of health facility has been sustaining higher population growth. Because of other economic and non-economic factors like political instability, economy has remained sluggish despite improvements in health front. Expenditure on other areas which is contributing nothing to economic growth has been increasing even by lowering expenditure on infrastructure. It was due to rising internal conflict during 1996-2006; still Nepal is in political transition and has vulnerable security situation, seriously hampering productive activities. Internal insurgency has actually been compelling people to leave the country.[9] In this way, coupled with lack of security on the one hand and lack of energy on the other, industrial sector has been stagnant, even exhibiting negative growth in recent years, contributing less than 10 percent in GDP.

Using three-year average real per capital GDP growth as a dependent variable has not changed the result much as shown in Table 4. In this case also, coefficient of share of expenditure on physical infrastructure is still statistically significant and other variables are not.

TABLE 4: Composition of Government Expenditure and Economic Growth
Dependent variables: three-year forward moving average of per capita growth rate

	Eq.1	Eq.2	Eq.3	Eq.4
Constant	-0.03	-0.03	-0.06	-0.02
	(-0.74)	(-0.45)	(-1.10)	(-0.30)
TE/GDP		-0.03		-0.43
		(-0.11)		(-1.13)
G_E	-0.11	-0.12	0.01	-0.008
	(-0.77)	(-0.68)	(0.005)	(-04)
G_H	-0.35	-0.34	-0.37	-0.15
	(-0.90)	(-0.77)	(-0.94)	(-0.33)
G_I	0.14*	0.14*	0.14*	0.15*
	(2.61)	(2.48)	(2.50)	(2.72)
G_O	0.09	0.09	0.08	0.09
	(1.49)	(1.44)	(1.34)	(1.53)
Df/GDP			0.23	0.51
			(0.95)	(1.47)
Adj R2	0.54	0.51	0.53	0.54
DW	1.44	1.41	1.77	1.79
Obs	24	24	24	24

[9] More than 13,000 people were killed during 1996-2006 in internal armed conflict.

VI. CONCLUSION

Physical infrastructure plays the very important role to enhance economic growth by promoting private market production. Development of infrastructure demands serious role of government, because of being public goods. The analytical model above shows that a mix of public spending could lead to a higher steady-state growth rate for the economy. Based on the model, the empirical results suggest that expenditure on physical infrastructure is productive in Nepal, but its share is declining, resulting in slow growth of per capita income. In this context, similar to the conclusion of Semmler *et. al* (2007), it would be better to allocate more resources to develop physical infrastructure in Nepal, which not only facilitates private productive activities, but also generates employment in the economy for the mass unemployment, in contrast to the conclusion of Devarajan *et. al* (1996).

Given the sustainable debt scenario so far, Nepal has some leeway for increasing investment on public infrastructure from foreign borrowing. As the model in this paper shows, so long as productivity of the expenditure is higher than the interest rate, increase in expenditure will increase the growth rate in the economy. However, weak government and political transition are dragging the country into low development trap, with low capacity of the government to expend on physical infrastructure.

REFERENCES

Agenor, P. 2007. "Fiscal Policy and Endogenous Growth with Public Infrastructure." *Oxford Economic Paper*s 60: 57-87.

Agnor, P and K. Neanidis. 2006. "The Allocation of Public Expenditure and Economic Growth." *Economic Discussion Paper*, EDP-0608 (58). University of Manchester.

Aschauer, D. A. 1989a. "It is Public Expenditure Productive." *Journal of Monetary Economics* 23: 77-200.

Aschauer, D. A. 1989b. "Public Investment and Productivity Growth in the Group of Seven". *Economic Perspectives* 13: 17-25.

Aschauer, D. A. 1989c. "Does Public Capital Crowd Out Private Capital?" *Journal of Monetary Economics* 24: 71-88.

Barro, R. 1990. "Government Spending in a Simple Model of Endogenous Growth." *Journal of Political Economy* 98: 103-125.

Barro, R. J. 1991. "Economic Growth in a Cross Section of Countries." *Quarterly Journal of Economics* 106: 407-444.

Bohn, H. 1998. "The Behavior of U.S. Public Debt and Deficits." *Quarterly Journal of Economics* 113: 949-963.

CBS. 2004. *Nepal Living Standard Survey 2003/04*. Vol I. Kathmandu: Central Bureau of Statistics.

De la Fuente, A. 2000. "Infrastructures and Productivity: A Survey." *CSIC Working Paper*. Instituto de Análisis Económico, Barcelona. March.

Devarajan, S., V. Swaroop and H. Zou. 1996. "The Composition of Public Expenditure and Economic Growth." *Journal of Monetary Economics* 37: 313-344.

Easterly, W. and S. Rebelo. 1993. "Fiscal Policy and Economic Growth: An Empirical Investigation." *Journal of Monetary Economics* 32: 417-458.

Glomm, G. and R. Ravikumar. 1997. "Productive Government Expenditure and Long Run Growth." *Journal of Economic Dynamics and Control* 21 (1): 183-204.

Kessides, C. 1993. "The Contributions of Infrastructure to Economic Development – A Review of Experience and Policy Implications." *World Bank Discussion Papers,* No. 213.

Ministry of Finance. 2008. *Economic Survey 2007/08*. Kathmandu: Ministry of Finance.

Nepal Telecommunications Authority. 2009. *Management Information System.* Kathmandu: Nepal Telecommunications Authority.

Sanchez-Robles, B. 1998. "Infrastructure Investment and Growth: Some Empirical Evidence". *Contemporary Economic Policy* 16: 98-108.

Semmler, W., A. Greiner, B. Diallo, A. Rezai, and A. Rajaram. 2007. "Fiscal Policy, Public Expenditure Composition, and Growth." *Policy Research Working Paper 4405*, World Bank.

Shrestha, P. and P. Pineda. 2009. "Intertemporal Approach to Current Account Dynamics in Some Asian Economies: Theory and Empirical Evidence." Unpublished Essay Assignment for International Finance, New School for Social Research.

UNDP. 2001. *Nepal Human Development Report*. Kathmandu: UNDP.

ANNEX 1: Calculations

Solving Equation (11)

$$\frac{\dot{c}}{c} = -\frac{1}{\sigma}[\delta - (1-\tau)\alpha k^{-\rho-1}(\alpha k^{-\rho} + \beta g_1^{-\rho} + \gamma g_2^{-\rho})^{\frac{-(1+\rho)}{\rho}}] \tag{11}$$

$$= \frac{1}{\sigma}\left[\alpha(1-\tau)k^{-\rho-1}(\alpha + \beta\frac{g_1^{-\rho}}{k^{-\rho}} + \gamma\frac{g_2^{-\rho}}{k^{-\rho}})^{\frac{-(1+\rho)}{\rho}}.k^{\rho.\frac{1+\rho}{\rho}} - \delta\right]$$

$$= \frac{1}{\sigma}\left[\alpha(1-\tau)(\alpha + \beta\frac{(\phi Ty)^{-\rho}}{k^{-\rho}} + \gamma\frac{((1-\phi)Ty)^{-\rho}}{k^{-\rho}})^{\frac{-(1+\rho)}{\rho}} - \delta\right]$$

$$= \frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha + \frac{(Ty)^{-\rho}}{k^{-\rho}}(\beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho}\right\}^{\frac{-(1+\rho)}{\rho}} - \delta\right]$$

$$= \frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha + \left(\frac{g}{k}\right)^{-\rho}(\beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho}\right\}^{\frac{-(1+\rho)}{\rho}} - \delta\right] \tag{12}$$

Derivation for g/k

$$\frac{g}{k} = \frac{Ty}{k} = \frac{T(\alpha k^{-\rho} + \beta g_1^{-\rho} + \gamma g_2^{-\rho})^{-\frac{1}{\rho}}}{k}$$

$$= \frac{T(\alpha + \beta\frac{g_1^{-\rho}}{k^{-\rho}} + \gamma\frac{g_2^{-\rho}}{k^{-\rho}})^{-\frac{1}{\rho}}.k^{-p..(-\frac{1}{\rho})}}{k}$$

$$= T\left[\alpha + \beta\frac{(\phi Ty)^{-\rho}}{k^{-\rho}} + \gamma\frac{((1-\phi)Ty)^{-\rho}}{k^{-\rho}}\right]^{\frac{-1}{\rho}}$$

$$= T\left[\alpha + \frac{(Ty)^{-\rho}}{k^{-\rho}}(\beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho})\right]^{\frac{-1}{\rho}}$$

$$\frac{g}{k}.\frac{1}{T} = \left[\alpha + \left(\frac{g}{k}\right)^{-\upsilon}(\beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho})\right]^{\frac{-1}{\rho}}$$

$$\left(\frac{g}{k}.\frac{1}{T}\right)^{-\rho} = \left[\alpha + \left(\frac{g}{k}\right)^{-\upsilon}(\beta\phi^{-\rho} + \gamma(1-\phi)^{-\rho})\right]$$

$$\left(\frac{g}{k}\right)^{-\rho}\frac{1}{T^{-\rho}}-\left(\frac{g}{k}\right)^{-\rho}(\beta\phi^{-\rho}+\gamma(1-\phi)^{-\rho})=\alpha$$

$$\left(\frac{g}{k}\right)^{-\rho}(T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho})=\alpha$$

$$\left(\frac{g}{k}\right)^{\rho}=(T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho})/\alpha$$

$$\frac{g}{k}=\left[(T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho})/\alpha\right]^{\frac{1}{\rho}} \tag{13}$$

Derivation of Equation (14)

By substituting (13) into (12), we get

$$\frac{\dot{c}}{c}=\lambda=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha+\left(\left\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\right\}/\alpha\right)^{-\rho.\frac{1}{\rho}}(\beta\phi^{-\rho}+\gamma(1-\phi)^{-\rho})\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right]$$

$$\frac{\dot{c}}{c}=\lambda=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha+\left(\left\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\right\}/\alpha\right)^{-1}(\beta\phi^{-\rho}+\gamma(1-\phi)^{-\rho})\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right]$$

$$\frac{\dot{c}}{c}=\lambda=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha+\left(\alpha/\left\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\right\}\right)(\beta\phi^{-\rho}+\gamma(1-\phi)^{-\rho})\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right]$$

$$=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha\frac{(T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}+\beta\phi^{-\rho}+\lambda(1-\phi)^{-\rho})}{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}}\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right]$$

$$=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\alpha\frac{(T^{\rho})}{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}}\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right] \tag{14}$$

Derivation of Equation (15)

$$\lambda=\frac{1}{\sigma}\left[\alpha(1-\tau)\left\{\frac{(\alpha T^{\rho})}{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}}\right\}^{\frac{-(1+\rho)}{\rho}}-\delta\right]$$

$$\frac{\partial\lambda}{\partial\phi}=\frac{1}{\sigma}\left[\alpha(1-\tau)[-\frac{1+\rho}{\rho}\left\{\frac{(\alpha T^{\rho})}{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}}\right\}^{\frac{-(1+\rho)}{\rho}-1}\cdot\frac{\alpha T^{\rho}(-1)\{\beta\rho\phi^{-\rho-1}-\gamma\rho(1-\phi)^{-\rho-1}}{\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\}^{2}}\right]$$

$$=\frac{1}{\sigma}\left[\alpha(1-\tau)(1+\rho)\left\{\frac{(\alpha T^{\rho})}{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}}\right\}^{\frac{-1-2\rho}{\rho}}\cdot\frac{\alpha T^{\rho}\{\beta\phi^{-\rho-1}-\gamma(1-\phi)^{-\rho-1}}{\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\}^{2}}\right]$$

$$=\frac{1}{\sigma}\left[\alpha(1-\tau)(1+\rho)\left\{\frac{(\alpha T^{\rho})^{-\frac{(1+\rho)}{\rho}}}{\left\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\right\}^{-\frac{1}{\rho}}}\right\}.\{\beta\phi^{-\rho-1}-\gamma(1-\phi)^{-\rho-1}\}\right]$$

$$\frac{\partial\lambda}{\partial\phi}=\frac{\alpha(1-\tau)(1+\rho)(\alpha T^{\rho})^{-\frac{(1+\rho)}{\rho}}\{\beta\phi^{-(1+\rho)}-\gamma(1-\phi)^{-(1+\rho)}\}}{\sigma\{T^{\rho}-\beta\phi^{-\rho}-\gamma(1-\phi)^{-\rho}\}^{-\frac{1}{\rho}}} \tag{15}$$

Long-run Relationships of Macroeconomic Variables in Nepal: A VAR Approach

T. P. Koirala, Ph.D.*

This paper utilizes cointegration procedure of Johansen and Juselius (1990) in estimating the long run economic relationships of macroeconomic variables comprising M2 monetary aggregate, Real Gross Domestic Product (RGDP), Consumer Price Index (CPI) and Interest Rate (RT) using annual data ranging from 1975 to 2006. Since one cointegrating vector is found to be statistically significant among the variables under consideration, the result is tantamount to deducing the coefficients of Error Correction Model (ECM). In an application of the Augmented Dickey and Fuller (ADF) test to examine the presence of unit roots in the variables prior to the variables used in estimating long run relationships, the ADF sequential search procedure supports an existence of unit roots in all the variables. This paper also estimates the demand for money function in Nepal as an application of long run relationships between the variables using the said procedure. The coefficients of income and interest rate elasticity of M1 so estimated as depicted by the normalized cointegrating vector are in line with theoretical underpinning. Since the coefficients estimated in this paper rely on restricted VAR method that are contrary to the past practices in estimating cointegrating vector using the Engle-Granger (1987) two-step procedure in Nepal, the coefficients are supposed to be robust and consistent owing to the stronger restrictions imposed by cointegrating vector as against the a theoretical VAR approach.

I. INTRODUCTION

The methodological revolutions of economics and econometrics over the periods call for a fundamental change in our way of thinking about modelling economic phenomena. The test of unit roots and the ECM augmented by the vector of cointegrating variables particularly within the Vector Autoregressive (VAR) framework are the major landmarks in the dynamic econometrics that have attracted not only the attention of the specialist econometricians but also a large number of policy-oriented applied economists in the methods of estimation of economic relationships as well as modelling fluctuations in economic activities.

* Nepal Rastra Bank, Birgunj, Nepal, E-mail: Koiralat@nrb.org.np.

The problem of spurious regression invoked an emergence of methodological revolution in the estimation technique of economic variables. The static regression results can be considered as the long run equilibrium relationship and hence are free of the problem of spurious regression (Granger and Newbold, 1974) only when the time series under consideration show common trends instead of their own individual trends (Granger, 1981) and the accompaniment of an Error Correction Term (ECT) in the estimated model (Davidson, Hendry, Srba and Yeo, 1978) so that the resultant residuals are stationary. The trend is analyzed by looking at the 'order of integration' of the variables. If the polynomial has a unit root then the variable is said to be linear trend. The unit root test statistics introduced by Dickey and Fuller (1979), Phillips (1987), and Phillips and Perron (1988) are the tools of analysis to examine the presence of unit root in the variables.

The economic implication of the unit root tests emerges from the assumption of stability of the long run trend rate of growth of output. The untenable aggregate output in many countries is characterized by the non-stationarity in nature. This finding casts a doubt on the usefulness of the determinants of the trend rate of growth of output and cycles. The alternative macroeconomic models that have treated economic fluctuations as temporary deviations from a stable trend rate of growth of output as found by unit root tests offer different explanations for these fluctuations leading to the disagreement between the choices of alternative short run stabilization policies to the policymakers.

A technique that has gained tremendous popularity in the estimation of the long run relationships between the variables with the unit root variables is cointegration analysis. In a situation when the long run parameters estimated by utilizing static model is not in accordance with an economically realistic long run relationship, an ECT in the model is introduced by way of parameter restriction (Vogelvang, 2005).[1] The ECM, therefore, is the modelling technique for the short run dynamics with a given long run relationship between the variables (Davidson, Hendry, Srba and Yeo, 1978). It is an equation specified with variables in first differences augmented by an ECT where the latter term makes sense when the variables under estimation are unit roots. The essence of this technique is that the equilibrium theories involving non-stationary variables require the existence of a combination of the variables that is stationary though the individual variable has trend. In other words, within any equilibrium framework, the deviations from equilibrium must be temporary or the linear combination represents long term equilibrium for the system and the system cannot depart from this equilibrium in a substantial way. The main advantage of cointegration is that it can be used directly to test or falsify the

[1] The restriction can conveniently be imposed when the short run model: $Y_t = \beta_0 + \gamma_0 X_t + \gamma_1 X_{t-1} + \beta_1 Y_{t-1} + u_t$ is taken first differences and corrected for the newly introduced lags (the equation remains unchanged), gives a model like: $\Delta Y_t = \beta_0 + \gamma_0 \Delta X_t + (\beta_1 - 1)(Y_{t-1} - \frac{\gamma_0 + \gamma_1}{\beta_1 - 1} X_{t-1}) + u_t$. The parameter in parentheses for X_{t-1} is exactly equal to the long run parameter and can easily be restricted. If long run relationship is imposed: $Y = X$. This gives a restriction on the parameter of the long run response as: $\frac{\gamma_0 + \gamma_1}{\beta_1 - 1} = 1$. Substituting this value in the short run model results in the restricted short run model: $\Delta Y_t = \beta_0 + \gamma_0 \Delta X_t + (\beta_1 - 1)(Y_{t-1} - X_{t-1}) + u_t$. This is the ECM. The term $(Y_{t-1} - X_{t-1})$ is the ECT.

underlying theory. Together with unit roots, this has an important implication for the specifications and estimations of dynamic economic models.

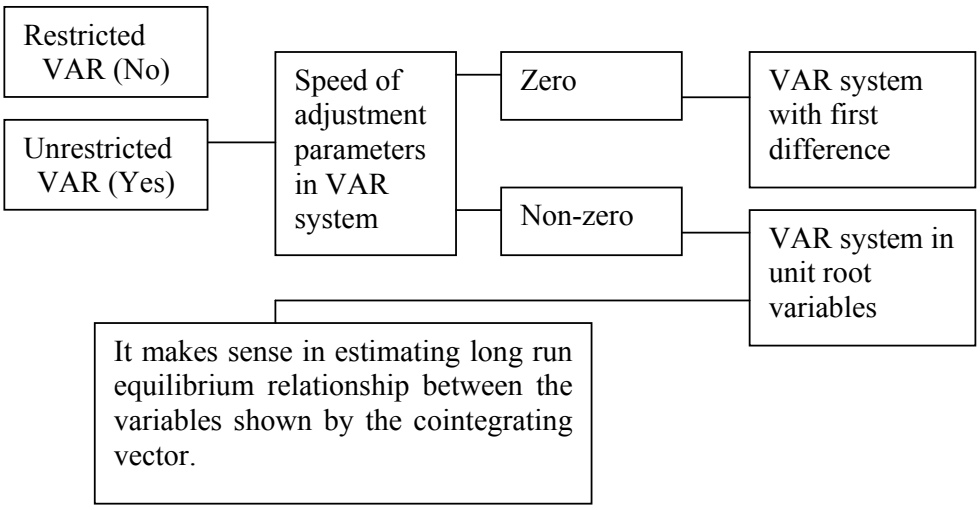
The ECM is a *n*-variables VAR in first differences augmented by the error-correction terms accompanied with respective speed of adjustment parameters. The VAR is a relatively new tool of macroeconometrics, yet it has rapidly become popular because of the inability of macroeconomists to agree on the correct structural model of the economy (Sims, 1980). Though the initiation of VAR model in estimation can be traced back to Jevons (1962), the arrival of VAR models on the scene was around 1980s only after Sims' (1980) challenge to structural econometric models as imposing incredible identifying restrictions based on casual interpretation of economic theory. The VAR treats all variables symmetrically without taking reference to the issue of dependent versus independent as against the major limitation of intervention and transfer function models that treat many economic systems and exhibit feedback (Enders, 2004). Sims (1986) argues that the primary advantage of this atheoretical VAR approach is that it does not specify restrictions from a particular structural model; yet under relatively weak conditions, the VAR provides a reduced form model 'within which tests of economically meaningful hypotheses can be executed. The critics of atheoretical VARs put an initiation of the structural VAR (SVAR) approach employed particularly by Blanchard (1989), Blanchard and Watson (1986), Bernanke (1986) and Keating (1989). The SVAR models identify economic structure through contemporaneous exclusion restrictions (Lucas and Sargent, 1978).

If the speed of adjustment parameters are equal to zero for the ECT under the restricted VAR system, the long run equilibrium relationship does not exist and the models are not one of ECM but that of first difference VAR. In this case, there is no matter of establishing the long run equilibrium relationships by way of cointegrating vector of the unit root variables (Enders, 2004). A cointegration necessitates coefficient restrictions in a VAR model. It is important to realize that a cointegrated system can be viewed as a restricted form of a general VAR model. Cointegrating vectors are obtained from the reduced form of a system where all of the variables are assumed to be jointly endogenous. Consequently, they cannot be interpreted as representing structural equations because, in general, there is no way to go from the reduced form back to the structure (Dickey, Jansen and Thornton, 1991). Nevertheless, they might be thought of as arising from a constraint that an economic structure imposes on the long run relationship among the jointly endogenous variables. For example, economic theory suggests that arbitrage will keep nominal interest rates, especially those on assets with the same or similar maturity, from getting too far away from each other. Thus, it is not surprising that such interest rates are cointegrated (Stock and Watson, 1988).

It is inappropriate to estimate a VAR of cointegrated variables using only first differences. The number of cointegrating vectors is determined by the rank of $(I - A)$ where *I* and *A* stand for identity matrix and (*nxn)* matrix of coefficients respectively. From a purely statistical point of view, cointegration places some restrictions on the matrix *A*. From an economic perspective, economic theory determines the matrix A and, therefore, places some restrictions on the long run behaviour of Y_t. If the matrix $\psi = (I - A_1 - A_2 - ... - A_p)$ is full rank, then any linear combination of Y_t will be a unit root process and, hence, nonstationary. This leaves an intermediate case where ψ is not a

matrix of zeros, but is less than full rank. The rank of ψ, r, is the number of linearly independent and stationary linear combinations of Y_t that can be found. In other words, it is the number of linearly independent cointegrating relations among the variables in Y_t. The estimate of ψ and $\hat{\psi}$ will almost always be of full rank in a numerical sense. The objective of tests for cointegration is to test for the rank of ψ by testing whether the eigenvalues of $\hat{\psi}$ are significantly different from zero (Theil and Boot, 1962). As discussed in the previous paragraphs, there are certain linkages between unit root variables, ECM and cointegration relationship in the VAR framework as presented in Figure 1.

FIGURE 1: Linkages between Unit Root, ECM, and Cointegration in the VAR Framework



Keeping this linkage in view, this paper has dual objectives in its empirical analysis. The first part of the analysis attempts to find equilibrium or long run parameters in a relationship with unit root variables. As far as unit root testing is concerned, the focus is placed on the application of the ADF sequential search procedure. With regard to the estimation of equilibrium relationships among the variables, the use of the Johansen and Juselius (1990) procedure in identifying the number of cointegrating relationships between a set of variables is applied. This paper also estimates the demand for money function in Nepal as an application of long run relationships between the variables using the Johansen and Juselius (1990) procedure. In order to achieve the said objectives, the relevant theoretical as well as empirical literatures are reviewed in the next section. The methodology, including the variables, the models to be utilized and the hypotheses to be tested is discussed in Section III. Section IV presents the results of long run equilibrium relationships of the macroeconomic variables followed by an estimation of demand for money in Nepal by applying the said procedure in examining long run relationships between the variables. The conclusion of this paper is presented in the last section.

II. LITERATURE REVIEW

A number of evidences in the examination of the long run relationships among the macroeconomic variables and methodologies adopted to obtain the results have been found both in the theories of economics and the empirical findings. Firstly, this paper discusses some issues relating to methodological perspectives and empirical evidences are presented subsequently. Macroeconomists have been aware that many macroeconomic time-series are not stationary in their levels but are stationary after differencing. Non-stationarity in the level form in the variables gives rise to several econometric problems. Variables whose means, variances and covariance change over time are known as non-stationary or unit-root variables and absence of such dependency in the variables are called stationary variables. [2] It can give rise to the possibility of a spurious relationship among the levels of the economic variables. If the means and variances of the unit root variables change over time, all the computed statistics in a regression model, which use these means and variances, are also independent and fail to converge to their true values as the sample size increases. Therefore, the conventional tests of hypothesis will be seriously biased towards rejecting the null hypothesis of no relationship between the dependent and independent variables. There is a serious problem if the null hypothesis is true. Unit root tests are applied to determine if the variables in a regression are stationary or non-stationary.

A number of alternative approaches are available to the research interested in estimating long run economic relationships. Two are of special interest: VAR and Structural econometric modelling. The VAR analysis accords a very limited role for the theory and restriction based analysis and emphasizes the importance of model selection on data based criteria. Structural econometric modelling, on the other hand, focuses on role of economic theory in the design and specification of the econometric model. Cointegration analysis can be viewed as effecting a reconciliation of these two approaches, since the existence of one or more cointegrating relationships between a set of variables implies that there are restrictions connecting the parameters in the VAR.

The technique of cointegration as an important tool of analysis for the economic relationships has been given due emphasis by different postulations. Friedman (1957) in his Permanent Income Hypothesis (PIH) postulated that a long run equilibrium relationship between consumption and permanent income holds true since the transitory component of consumption function is to be an I(0) variable.[3] Barro (1979) has also given a similar argument in his tax smoothing hypothesis that the tax rate should be set on the basis of permanent government expenditure, with transitory expenditure fluctuations financed by issuing debt. Barro's hypothesis implies the existence of cointegration

---

[2] Suppose y_t is a time series (or stochastic process) that is defined as stationary if

$E(y_t) = \mu$

$E[(y_t - \mu)^2] = \text{var}(y_t) = \chi(0)$

$E[(y_t - \mu)(y_{t-\tau} - \mu)] = \text{cov}(y_t, y_{t-\tau}) = \chi(\tau), \tau = 1,2,,...$

[3] $c_t = c_{p_t} + c_{T_t} = \beta y_{p_t} + c_{T_t}$ where, c_t c_{p_t}, c_{T_t} are total consumption, permanent income and transitory income respectively and β is factor of proportionality.

between tax rate and government expenditure. The purchasing power parity theory asserts that the difference between logarithms of domestic and world WPI and logarithm of the exchange rate are cointegrated provided that residual term is interpreted as the PPP deviations.[4] Therefore, the method of cointegration is considered as a technique which helps in establishing dynamic relationships accompanied with long run relationships between the variables under the VAR framework.

So far as the available empirical analysis using cointegration approach is concerned, Dickey, Jansen and Thornton (1991) compare the robustness of the findings made by three different proposed tests of cointegration viz., Johansen Test, Stock-Watson Test and Engle-Granger Test. A stable long run relationship has been found among the variables comprising income, interest rates and different monetary aggregates using 144 observations starting from first quarter of 1993 to the fourth quarter of 1988. Johansen test produced results that were markedly different from those obtained using the Engle-Granger and the Stock-Watson methodologies on the ground that the results estimated on the basis of latter tests are found to be more sensitive to the variable chosen as the dependent variable in the process of normalizing equation.

Using decennial wage and price indices for England by Phelps Brown and Hopkins (1957) over the period 1401 to 1900, Nachhane (2006) compares the DW statistic obtained from the linear bi-variate model of price as a function of wage and found the variables having an absence of cointegration. Further, the null hypothesis of no cointegration is not rejected in case of the application of an auxiliary regression in testing cointegration.[5] Therefore, there does not seem to be any evidence to support the hypothesis that wages and prices in England have historically moved in tandem.

Beyer (1998) analyzed the demand for money for Germany using the quarterly data from 1975 to 1994. The long run demand for money function for Beyer's study in terms of M3 is : $(m-p)^* = \delta_0 + \delta_1 y + \delta_2 RS + \delta_3 RL + \delta_4 \Delta_4 p$, where RS is a short-term interest rate, RL is a long term interest rate, and $\Delta_4 p$ is the annual inflation rate. In order for the model to be a valid one, there must be at least one cointegrating vector that transforms the function: $z_t = [(m-p)^*, \delta_1 y, \delta_2 RS, \delta_3 RL, \delta_4 \Delta_4 p]$ to stationary. He used Johansen trace test in the VAR consisting of five I(1) variables. The test rejected hypothesis of $r = 0$ but was unable to reject the hypothesis of $r \leq 1$ and hence found the presence of a single cointegrating vector. The cointegrating vector examined in his study is $(m-p) = 0.936y + 1.601RS - 3.279RL - 1.780\Delta_4 p$.

Nachane (2006) estimated the number of cointegrating vectors employing Maximum Likelihood (ML) method of Johansen using monthly data on Wholesale Price Index (WPI), Index of Industrial Production (IIP) and M3 for India over the period 1986 to 1996. The trace statistic rejects the null of $r = 0$ against the alternative of $r \geq 1$. But the

---

[4] $e_t = p_t - p^* + \eta_t$ where, e_t, p_t, p^* and η_t are logarithm of exchange rate, domestic WPI, world WPI and residual respectively. The η_t is interpreted as the PPP deviations which is $\eta_t = e_t - p_t + p^*$ and is assumed stationary.

[5] $\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \sum_{j=1}^{q} \beta_j \Delta x_{t-j} + c z_{t-1} + \varepsilon_t$ where, $z_{t-1} = y_{t-1} - \lambda x_{t-1}$ is ECT.

null of $r \leq 1$ is not rejected against the alternative of $r \geq 2$. Thus, the trace statistic indicates the presence of one cointegrating vector (i.e. $r = 1$). The λ_{max} statistic also supports the existence of a single cointegrating vector. The cointegrating vector normalized in terms of M3 is in the form of: $M3 = 0.745\,WPI_t + 1.804IIP_t - 2.66$. It shows a long run positive relationship between M3 and WPI and between M3 and IIP as economic reasoning would lead to believe.

Using quarterly data for Denmark over the sample period 1974:1 to 1987:3, Johansen and Juselius (1990) analyzed the number of cointegration for x_t vector represented by $x_t = (M2_t, y_t, i_t^d, i_t^b)'$. The null hypothesis of $r = 0$ against the general alternative $r = 1,2,3$ *or* 4 as given by λ_{trace} statistic is accepted even at 10 percent significant level implying no cointegration among the variables. However, one cointegrating vector is found to be statistically significant (i.e. $r = 1$) using $\lambda_{\max}$ statistic.

A number of empirical studies are available on the demand for money function generally. The theory of demand for money converts Irving Fisher's equation of exchange identity i.e. $ln\,M + ln\,V - ln\,P - ln\,q = 0$ into an equation of Velocity (V) as a function of a number of economic variables. In the theory of demand, V is unobservable and is proxied with some function of economic variable V^*, where $V^* = ln\,V + \varepsilon$ and ε denoting a random error associated with the use of the proxy for V. The proxy is a function of one or more observed variables, other than income and prices, that are hypothesized to determine the demand for money. If the proxy is good, the expected value of ε should be zero, and hence ε is stationary. The ε can be found to be stationary by the choice of different monetary aggregates in the Fisher's equation of exchange. Failure to find the cointegrated variables imply either V^* is a poor proxy for V or that the long run demand for money does not exist in any meaningful sense. The Fisher relationship embodies a long run relationship among money, prices, output and velocity. It hypothesizes the existence of cointegrating vector like: (1,1,-1,-1). The vector combines the four series into an uni-variate series, ε. Given this known cointegrating vector $(\beta_1, \beta_2, \beta_3, \beta_4)$, a test for cointegration can be performed by applying the conventional unit root tests on ε.

The relationship between money and income is embedded in the demand for money which is represented by income velocity of money. Various empirical findings indicate that M1 and income (i.e. income velocity of M1) are not cointegrated, or in other words, M1 and nominal GDP are not of (1,-1) (Nelson and Plosser, 1982, and Engle and Granger, 1987). However, according to Engle and Granger, (1987), M2 and income (i.e. M2 velocity of income) are cointegrated. In order to tests for cointegration, the theory of demand for money is reviewed. Accordingly, the reduced form demand for money function for estimation purpose is: $m^d/q = h(Z)$ where, m^d is demand for real money balance, q is real income, $h(Z)$ is the famous k in the Cambridge Cash Balance Equation which is the reciprocal of the income velocity of money. In equilibrium, the demand for real money balance equals the supply of real money, m^s, so that $h(Z)$ is observed simply as the ratio of real money stock to real income.

Khatiwada (1997) estimated the demand for money in Nepal assuming log of real narrow money balance (lnRM1) as a function of log of real income (lny) and interest rate (r) utilizing the Engle-Granger methodology. His finding reveals significant underlying relationship between real money balance, real income and interest rate. However, no such relationship was observed when narrow money (M1) was replaced by broad money (M2). The demand for money estimated by him is $ln\,\mathrm{RM1} = -4.44 + 1.25\,ln\,\mathrm{y} - .034\mathrm{r}$.

Pandey (1998) makes use of co-integration analysis and error correction modelling techniques to examine the money demand function in Nepal utilizing annual data ranging from 1965 to 1995. He uses the ECM based co-integration test which he found more powerful than that of Engle-Granger test in small sample size. The logarithms of narrow money (M1), agricultural GDP (YAG), non-agriculture GDP (YNAG) are found to be integrated of order one using DF and ADF test. The adjustment coefficient and cointegrating vector normalized with narrow monetary aggregate (M1) are -0.62499 and [1, 6.866, -0.6811, -0.9199] respectively. He concludes that a statistically robust demand for M1 can be estimated for Nepal using an error-correction dynamic specification. Considering the theoretical and empirical literatures as reviewed in this section, the approach of this paper is to examine the long run relationship between the macroeconomic variables employing Johansen and Juselius (1990) procedure, and make an application of the model in examining the demand for money in Nepal utilizing the latest available observations.

III. METHODOLOGY

Among the major important macroeconomic variables, this paper utilizes variables like broad monetary aggregate (M2), Real Gross Domestic Product (RGDP), Consumer Price Index (CPI), long term government yield (RT) and others for the analysis. The 32 annual time series data observations ranging from 1975 to 2006 is also used. The sources of secondary data are *Quarterly Economic Bulletin* (NRB publication), *Economic Survey* (GON publication) and *International Financial Statistics* (IMF publication). The three-period deflation is worked out on GDP to obtain RGDP. The variable for the long term interest rate is proxied by one year government bond yield and short term interest rate by 90-day treasury bills rate.

With regard to the model for the estimation, it is taken for granted from other representative work available in estimating long run relationship of macroeconomic variables. Among them, Engle and Granger (1987) suggested a simple two-step approach in testing cointegration in a bi-variate system. The first step in the Engle-Granger procedure is to estimate $y_t = \alpha + \beta x_t + u_t, (t = 1...T)$ using OLS where both the variables that are tested for cointegration should be I(1). The null hypothesis of a unit root on $\hat{u}_t$ corresponds to the absence of cointegration between the variables as against the alternative hypothesis of $\hat{u}_t$ being I(0), that is, variables are cointegrated. However, in order to overcome the possible problem of spurious cointegration for an application of $\hat{u}_t$ in deducing cointegration relationship, the proposed auxiliary regression is: $\Delta\hat{u}_t = a\hat{u}_{t-1} + \sum_{j=1}^{p} b_j \Delta\hat{u}_{t-j} + \varepsilon_t$. Cointegrating Regression Durbin-Watson (CRDW) Test

proposed by Bhargava (1986) corresponds to the rejection of the null of no cointegration if DW statistic of the two I(1) variables is positive and significant. Kremers, Ericsson and Dolado (1992) have proposed a test based on the ECM directly rather than on the unit root properties of the cointegrating regression residuals, provided cointegrating vector hypothesized a priori. The coefficient of the ECT is tested using *t* statistic under the null hypothesis of no cointegration against the significantly negative coefficient.[6]

The large sample properties on which the results were derived utilizing Engle and Granger (1987) may not be applicable to the sample sizes usually available to the researchers. Further, it is possible to find that one regression indicates that the variables are coingegrated, whereas reversing the order indicates no cointegration. This is a very undesirable feature of the Engle and Granger (1987) procedure because the test for cointegration should be invariant to the choice of the variable selected for normalization. In view of these difficulties, this study utilizes the Johansen and Juselius (1990) approach in examining long run equilibrium and short run dynamic of macroeconomic variables in Nepal.

Before employing the test of cointegration among the macroeconomic variables, test of unit roots among the variables is conducted to examine order of integration utilizing the ADF method. The method considers three different regression equations with difference between them that are concerned with the presence of the deterministic elements (such as intercept or drifts parameter) and time trend in their autoregressive process. In their Monte Carlo Study, Dickey and Fuller (1979) found that the critical values of $\gamma = 0$ depend on the form of the regression whether that is pure random walk or explicit introduction of deterministic elements and their corresponding statistics labeled as τ_τ, τ_μ and τ as shown in Table 1.

TABLE 1 : Equations in Estimating Unit Roots Using ADF

Eqn.	Model	Hypotheses (single and joint)	Test Statistic
1.	$\Delta y_t = \alpha_0 + \alpha_2 t + \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \varepsilon_t$	$\gamma = 0$	τ_τ
		$\gamma = \alpha_2 = 0$	ϕ_3
		$\alpha_0 = \gamma = \alpha_2 = 0$	ϕ_2
2.	$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \varepsilon_t$	$\gamma = 0$	τ_μ
		$\alpha_0 = \gamma = 0$	ϕ_1
3.	$\Delta y_t = \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \varepsilon_t$	$\gamma = 0$	τ

[6] $\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \sum_{j=1}^{q} \beta_j \Delta x_{t-j} + c z_{t-1} + \varepsilon_t$ where, $cz_{t-1} = y_{t-1} - \lambda x_{t-1}$ is ECT.

Dickey and Fuller (1981) provides three additional F-statistics (called ϕ_1, ϕ_2 and ϕ_3 in their terminology) to test joint hypotheses on the coefficients. These statistics are constructed as $\phi_i = \frac{(SSR_{Restricted} - SSR_{Unrestricted})/r}{SSR_{Unrestricted}/(T-K)}$ where, ϕ_i $(i = 1,2,3)$ are the F-statistics, $SSR_{Restricted}$ and $SR_{Unrestricted}$ stand for the sum of squared residual from the restricted and unrestricted models respectively, *r* is number of restrictions, *T* is number of usable observations and *K* is number of parameters estimated on the unrestricted model. Comparing the calculated values of ϕ_i to the appropriate values reported in Dickey and Fuller (1981) determines the significance level at which the restriction is binding. The null hypothesis is that the data are generated by the restricted model (an acceptance of the null hypothesis implies the choice of restricted model and hence restriction is not considered binding) against the alternative hypothesis of the data generated by unrestricted model.

With the unit root variables provided, this paper employs the Johansen (1988) and Johansen and Juselius (1990) procedure to examine the number of cointegrating vector and hence estimates the long run relationships between the variables. The procedure proposes a Maximum Likelihood (ML) estimation approach for the estimation and evaluation of multiple cointegrated vectors. This method considers the following model:

Let X_t be a vector of *N* time series, each of which is I(1) variable, with a vector autoregressive (VAR) representation of order *k*,

$$X_t = \pi_1 X_{t-1} + ... + \pi_k X_{t-k} + \varepsilon_t \qquad (1)$$

where, π_i are *(NxN)* matrices of unknown constants and ε_t is an independently and identically distributed (i.e. iid) *n*-dimensional vector with zero mean and variance matrix $\sum_e$ i.e. $N(0, \sum_e)$. The estimable equation for the cointegration relationship is as follows:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k+1} + \pi X_{t-k} + \varepsilon_t .^{7} \qquad (2)$$

where,

(a) Δ is the first difference operator

---

[7] Subtracting X_{t-1} from both sides of Equation 1:

(a) $\Delta X_t = [\pi_1 - I]X_{t-1} + \pi_2 X_{t-2} + ... + \pi_k X_{t-k} + \varepsilon_t$

From the RHS of (a) add and subtract $[\pi_2 - I]X_{t-2}$:

(b) $\Delta X_t = [\pi_1 - I]X_{t-1} + [\pi_2 + \pi_1 - I]X_{t-2} + ... + \pi_k X_{t-k} + \varepsilon_t$

Once again to the RHS of (b) add and subtract $[\pi_2 + \pi_1 - I]X_{t-3}$:

(c) $\Delta X_t = [\pi_1 - I]X_{t-1} + [\pi_2 + \pi_1 - I]X_{t-2} + [\pi_3 + \pi_2 + \pi_1 - I]X_{t-3} + ... + \pi_k X_{t-k} + \varepsilon_t$

Continuing this process will eventually lead to Equation 2.

(b) $\Gamma_i = \left(I - \sum_{j=1}^{i} \pi_j \right), i = 1...(k-1)$

(c) $\pi = \left(I - \sum_{j=1}^{k} \pi_j \right)$

In Equation 2, all terms are in the first difference form except the term πX_{t-k} which is in levels. According to Johansen and Juselius (1990) method, the rank of π determines the number of cointegrating vectors among the variables in X where π is an *(NxN)* matrix. If matrix π is of zero rank, the variables in X_t are said to be integrated of order one or a higher order implying the absence of a cointegrating relationship between the variables. In this case, the matrix π is null and Equation 2 reduces to a VAR in first differences. Similarly, if π is full rank, i.e. $Rank\ (\pi) = N$, all the components of the system of equations are *I(0)* rather than *I(1),* that is, the variables in the system are stationary and the cointegration analysis is irrelevant. If $Rank\ (\pi) = 1$, then there is a single cointegrating vector and the expression πX_{t-1} is the Error-Correction Term (ECT). Further, if the rank of π is $1 \le \text{Rank}(\pi)(N-1)$, then there is the cointegration case with the number of linearly independent cointegrating vectors being $r = Rank(\pi)$. If π is of reduced rank, $0 < r < n$, π can be expressed as $\pi = \alpha\beta'$ where α and β are *(nxr)* matrices, with *r* denoting the number of cointegrating vectors. Hence, although X_t itself is not stationary, the linear combination given by $\beta' X$ is stationary. Johansen and Juselius (1990) propose two likelihood ratio tests for the determination of the number of cointegrated vectors. One is the maximum eigenvalue test which evaluates the null hypothesis that there are at most *r* cointegrating vectors against the alternative of $r+1$ cointegrating vectors. The maximum eigenvalue statistic is given by,

$$\lambda_{max} = -T\, ln(1 - \lambda_{r+1}) \tag{3}$$

where $\lambda_{r+1}, ...\lambda n$ are the $n - r$ smallest squared canonical correlations and *T* = the number of observations. The second test is based on the trace statistic which tests the null hypothesis of *r* cointegrating vectors against the alternative of *r* or more cointegrating vectors. This statistic is given by,

$$\lambda_{trace} = -T \sum ln(1 - \lambda_i) \tag{4}$$

In order to apply the Johansen and Juselius (1990) procedure, a lag length must be selected for the VAR. The lag length is selected on the basis of the Akaike Information Criterion (AIC). Let *T* be the number of usable observations, *m* the number of components of the vector series X_t and *p* the lag being considered, the model with intercept terms to determine AIC statistics is calculated by,

$$AIC(p) = T\, ln\left|\sum(p)\right| + 2(m + pm^2) \tag{5}$$

where, $\sum(p)$ is the variance-covariance matrix of the OLS residual from the reduced form VAR model which may be written as:

$$X_t = \alpha + A_1 X_{t-1} + ... + A_p X_{t-p} + \varepsilon_t \quad (6)$$

where α is an *(mx1)* vector of constants, $A_1 + ... + A_p$ are *(mxm)* matrices of constant coefficients and ε_t is an *(mx1)* vector of serially uncorrelated errors with mean vector 0 and contemporaneous variance-covariance matrix $\sum_0$. Similarly, another criteria for the selection of lags is Schwarz Information Criterion (SBC) and is calculated by,

$$SBC(p) = T\, ln\left|\sum(p)\right| + (m + pm^2)\, ln(T) \quad (7)$$

The value of *p* which is selected is the one yielding the minimum of *AIC(p)* and *SBC(p)*. In the following section, the results of the analysis are presented by using the methodologies outlined earlier.

IV. RESULTS OF THE ANALYSIS

With regard to the first objective of this study, that is, to find equilibrium or long run relationships between the macroeconomic variables, a test of unit roots is conducted on the variables under consideration before examining cointegrating relationships between the variables using the method suggested by Johansen and Juselius (1990). So far as unit root testing is concerned, focus is placed on the application of the ADF sequential search procedure. The variables examined for unit root consists of CPI, RGDP, M2 and RT. Every variable is transformed to logarithms. The parameter of interest for the test of unit root in the different autoregressive model as presented in Table 1 is γ coefficients. If $\gamma = 0$, the time series sequence is considered as a non-stationary or having unit root. The critical values of γ depend on the form of regression whether that is pure random walk or explicit introduction of deterministic elements (drift term and time trend) and their corresponding statistics labeled as τ_τ (pure random walk), τ_μ (drift term) and τ (time trend). While selecting the lag length (ρ) of the first difference of the dependent variable, that has been introduced to overcome the problem of serial correlation of the dependent variable as depicted in Equation 2 in Table 1, this study resorts to the AIC.

TABLE 2: Unit Root Test of CPI, RGDP, M2 and RT (1975-2006)

Variables	α	@ trend	$\beta_i(\rho_1)$	γ	τ_τ	ϕ_3	ϕ_2	τ_μ	ϕ_1	τ
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CPI	.1912	.0028	.3041	-.0451	-.5219	-	-	-	-	-
	.1148	no	.2746	-.0138	-	0.07	-	-1.56	-	-
	no	no	.4756	.0101			2.95			2.792
	no	-.004	.2451	.0319	-	-	-	-	.432	-
RGDP	3.298	.0140	-.231	-.2803	-	-	-	-	-	-
					2.2659					
	-.228	no	-.352	-.0233	-	3.26	-	1.97	-	-
	no	no	-.2703	.0046			3.25			6.05
	no	.0018	-.352	.0035	-	-	-	-	2.83	-
M2	0.311	0.002	0.252	-0.021	-0.205	-	-	-	-	-
	0.243	no	0.238	-0.011	-	0.004	-	-2.011	-	-
	no	no	0.664	0.005	-	-	3.30	-	-	2.17
	no	-0.006	0.198	0.021	-	-	-	-	0.09	-
RT	8.05	-0.127	0.054	-0.59	-3.27	-	-	-	-	-
	2.317	no	-.100	-.245	-	-	2.03	-1.53	-	-
	no	no	.324	-.251	-	-	2.81	-	-	-.963
	no	-.0018	-.225	-0.030	-	-	-	-	2.82	-

Columns (6), (9) and (11) of the results presented in Table 2 show the calculated values of tau (τ) statistics for the three different models representing presence of both the constant and time trend (τ_τ), presence of drift term but no time trend (τ_μ), and pure random walk model (τ) respectively. The calculated values of τ_τ, τ_μ and τ at 5 percent significant level respectively are -3.60, -3.00 and -1.95 in making use of 32 samples in this study. If the calculated τ_τs values of CPI, RGDP, M2 and RT, as shown in Column (6), are compared with table value of -3.60, no single statistic is found to be greater than table value depicting the variables under consideration are unit root in the deterministic trend (both drift term and time trend). Similarly, if the table value of -3.00 at 5 percent significant level, in case of the model in presence of drift term but no time trend, is compared to (τ) values, the variables comprising CPI, RGDP, M2 and RT are found to be non-stationary or unit root. The calculated statistics possessing positive sign are ruled out because the rejection of null should be significantly negative.

The results explained above are further supported by the calculated larger values of ϕ_i comprising 7.24, 5.68 and 5.18 at 5 percent significant level under the joint hypotheses of $\phi_3(\gamma=\alpha_2=0)$, ϕ_2 $(\alpha_0=\gamma=\alpha_2=0)$ and ϕ_1 $(\alpha_0=\gamma=0)$ respectively. Since the calculated values of ϕ_3, ϕ_2 and ϕ_1, as presented in Columns (7), (8) and (10), all the variables under the test viz., CPI, RGDP, M2 and RT are found to be less than that of the critical values, under the model with different restriction, the variables are said to be unit root. In summing up the result of unit root test as explained above, the variables analyzed in this study are unit root variables in their level form and hence can be applied for the estimation of equilibrium relationship by way of cointegration.

With regard to the estimation of equilibrium relationships among the variables, the use of the Johansen and Juselius (1990) procedure is applied in identifying the number of cointegrating vectors and using them to obtain long run relationships between a set of variables. The number of distinct cointegrating vectors can be obtained by checking the

significance of the characteristics roots of (*NxN)* matrix π of level variables of restricted VAR model as shown in Equation 2. It is known that the rank of a matrix π is equal to the number of its characteristics roots that differ from zero. In the cointegration analysis, only estimates of π and its characteristics roots are worked out. As mentioned in the methodology, the test for the number of characteristic roots that are insignificantly different from unity can be conducted using 'trace statistics' and 'maximum eigenvalue statistics'. The objective of tests for cointegration is to test for the rank of π by testing whether the eigenvalues of estimated, $\hat{\pi}$ are significantly different from zero (Theil and Boot, 1962). Two statistics are used to test for the number of cointegrating vectors in the Johansen and Juselius (1990) methodology: the trace and maximum eigenvalue statistics. In the trace test, the null hypothesis is that the number of cointegrating vectors is less than or equal to k, where k is 0, 1, 2 or 3. In each case, the null hypothesis is tested against the general alternative. The maximum eigenvalue test is similar, except that the alternative hypothesis is explicit. The null hypothesis $k = 0$ is tested against the alternative that $k = 1$, $k = 1$ against the alternative $k = 2$, etc. The critical values for these tests are tabulated by Johansen and Juselius (1990). Both the test statistics and the estimated cointegrating vector, setting the coefficient of M2 equal to one, are reported in Tables 3 and 4.

As the objective of this study is to examine long run equilibrium relationships among the major macroeconomic variables of Nepal viz, M2, RGDP, CPI and RT utilizing the procedure outlined earlier, the test of maximum eigenvalue and the trace statistics are employed in order to obtain the number of cointegrating vectors and hence examine the long run parameters by way of normalization. Since the individual variable show no visible trend, it is decided to use a model where time trend $b = 0$ and $\mu \neq 0$ and unrestricted (Johansen and Jesileus, 1990). The estimated values of the characteristic roots (eigenvalues) of the matrix π in descending order are $\hat{\lambda}_1 = .64140$, $\hat{\lambda}_2 = .42218$, $\hat{\lambda}_3 = .18706$ and $\hat{\lambda}_4 = .11698$. The trace (λ_{trace}) and maximum eigenvalues (λ_{max}) statistic corresponding to $\hat{\lambda}_1$, for example, are calculated as $\lambda_{(0)} = -32[ln(1-.64140) + ln(1-.42218) + ln(1-.18706) + ln(1-.11698)] = 59.0712$ and $\lambda(0,1) = -32\,ln(1-0.64140) = 31.7922$ respectively. The calculated values of λ_{trace} and λ_{max} for the various possible values of r are reported in Column (4) of Tables 3 and 4.

TABLE 3 : Test Based on Maximum Eigenvalue (λ_{max})

Four Variable VAR (M2, RGDP, CPI, RT), Order of VAR = 1 (1975 to 2006)

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Max-Eigen Statistics (λ_{max})	0.05 Critical Value	0.10 Critical Value
$r = 0$ *	$r = 1$	.64140	31.7922	27.4200	24.9900
$r \leq 1$	$r = 2$	.42218	17.0031	21.1200	19.0200
$r \leq 2$	$r = 3$	.18706	6.4199	14.8800	12.9800
$r \leq 3$	$r = 4$	.11698	3.8568	8.0700	6.5000

**denotes rejection of the hypothesis at the 0.05 level*

Maxmium eigenvalue test indicates 1 cointegrating vector, that is, $r = 1$

TABLE 4 : Test Based on Trace Statistic(λ_{trace})
Four Variable VAR (M2, RGDP, CPI, RT), Order of VAR = 1 (1975 to 2006)

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Trace Statistics (λ_{trace})	0.05 Critical Value	0.10 Critical Value
$r = 0$	$r \geq 1$	.64140	59.0719	48.8800	45.7000
$r \leq 1$	$r \geq 2$	.42218	27.2798	31.5400	28.7800
$r \leq 2$	$r \geq 3$	.18706	10.2767	17.8600	15.7500
$r \leq 3$	$r \geq 4$	.11698	3.8568	8.0700	6.5000

**denotes rejection of the hypothesis at the 0.05 level*
Trace test indicates 1 cointegrating vector, that is, r = 1

Using first order VAR of the four variables under investigation, the hypothesis of $r = 0$ is uniformly rejected in favor of the alternative $r = 1$ employing the maximum eigenvalue tests.[8] The maximum eigenvalue test of $r = 1$ versus $r = 2$ fails to reject the null hypothesis of $k = 1$ implying one cointegrating vector. Turning to the trace test, $r \leq 1$ $r \leq 2$ and $r \leq 3$ cannot be rejected while the hypothesis $r = 0$ can be rejected at 5 percent significant level (i.e. 59.0719>48.880). However, all the trace statistics found other than first row are smaller than the 5 percent critical value which is tantamount to rejection of more than one cointegrating vector. Consequently, this test indicates that M2 is cointegrated with RGDP, CPI and RT. Moreover, there appears to be a single cointegrating vector. If $\text{rank}(\pi) = 1$, then there is a single cointegrating vector and the expression πX_{t-1} is the ECT. In practice the cointegrating vectors $\hat{\beta}_i (i = ...r)$ are normalized by setting one of the elements arbitrarily to 1. Let the estimated number of cointegrating vectors be r and cointegrating vectors are $\hat{\beta}_1 ... \hat{\beta}_r$ corresponding to the r largest roots $\hat{\lambda}_1 ... \hat{\lambda}_r$ and corresponding adjustment vectors be $\hat{\alpha}_1 ... \hat{\alpha}_r$ which can be written as $\hat{\beta} = [\hat{\beta}_1 ... \hat{\beta}_r]$ and $\hat{\alpha} = [\hat{\alpha}_1 ... \hat{\alpha}_r]$ or it can be shown as $\hat{\pi} = \hat{\alpha}\hat{\beta}'$. In the present study, since the estimated number of cointegration vector $r = 1$, then the eigen vector (cointegrating vectors) is β_1 corresponding to the r largest root $\hat{\lambda}_1$ with the corresponding adjustment vectors be $\hat{\alpha}_1$.

[8] VAR Lag Order Selection Criteria (Endogenous variables: M2 RGDP CPI and RT)

Lag	LogL	LR	FPE	AIC	SBC	HQ
1	197.1966	NA	2.84e-11*	-12.94261*	-12.18135*	-12.70989*
2	202.0188	6.888866	6.67e-11	-12.14420	-10.62168	-11.67875
3	215.2170	15.08373	9.67e-11	-11.94407	-9.660296	-11.24590
4	226.7435	9.879785	1.97e-10	-11.62453	-8.579494	-10.69363

Where, * indicates lag order selected by the criterion, LR: sequential modified LR test statistics (each test at 5% level, FPE: final prediction error, AIC: Akaike Information Criterion, SBC: Schwarz Information Criterion, and HQ: Hanna-Quinn Information Criterion.

Analyzing the normalized cointegrating vector and speed of adjustment coefficients in the present study, single cointegrating vector $r = 1$ has been selected. The estimated cointegrating vector corresponds to $\beta' = (\hat{\beta}_1\ \hat{\beta}_2\ \hat{\beta}_3\ \hat{\beta}_4)$ is $\beta' =$ (3.4705, -2.8379, -5.1788, -0.0401) which if normalized with respect to $\hat{\beta}_1$, is $\beta' =$ (-1.0000, 0.8177, 1.4922, 0.0115). The economic interpretation of the normalized coefficient is that there is long term positive relationship between M2 and RGDP, CPI and RT with the coefficient shown by normalized cointegrating vector. The corresponding speed of adjustment or vector weight for the variables M2, RGDP, CPI and RT respectively are $\hat{\alpha} =$ [-.07710 .00857 .01246 2.0863]. In this vector, one and only coefficient of ECT is found to be statistically significant with Student t statistics of -5.4272, R^2 is 0.5039 and DW statistics of 1.88.

Johansen (1995) also gives more formal tests for discriminating between the alternative models. The test statistics involve comparing the number of cointegrating vectors under the null and alternative hypotheses. Denoting the two sets of ordered characteristic roots of the unrestricted and restricted models respectively by $\hat{\lambda}_1 ,> \hat{\lambda}_2 ...> \hat{\lambda}_r$ and $\hat{\lambda}^*_1 ,> \hat{\lambda}^*_2 ...> \hat{\lambda}^*_r$, asymptotically, the statistic $-T\sum_{i=r+1}^{n}[ln(1-\hat{\lambda}^*_i) - ln(1-\hat{\lambda}_i)]$ has a χ^2 distribution with $(n-r)$ degrees of freedom. The results interpreted above are based on Model C, i.e. unrestricted intercepts and no trends in VAR model. If the use of Case C is not justified after the examination, Case B is considered to be preferable. The eigenvalues in the restricted and unrestricted version of Models B and C as well as other specifications are presented in Table 5 for the purpose of comparing the models under different restrictions.

TABLE 5: Test of Model based on Different Restriction
(Variables: M2, RGDP, CPI and RT) (1975 to 2006)

	Model specification	Eigen Values ($\hat{\lambda}_i$ or $\hat{\lambda}^*_i$)			
Case A	No intercepts or trends in VAR	.9770	.4280	.2260	.1300
Case B	Restricted intercepts, no trends in VAR	.9771	.5235	.1351	-
Case C	Unrestricted intercepts, no trends in VAR	.6414	.4221	.1870	.1169
Case D	Unrestricted intercepts, restricted trends in VAR	.6480	.4231	.3575	.1584
Case E	Unrestricted intercepts, unrestricted trends in VAR	.5788	.4225	.3569	.0061

The eigenvalues in the unrestricted version of Model B are $\hat{\lambda}_i$: .9771, .5235, and .1351 and those in the restricted version of Model C are $\hat{\lambda}^*_i$: .6414, .4221, .1870, and .1169. The statistic to test the model selection assumes the value $-32\sum_{i=2}^{3}[ln(1-\hat{\lambda}^*_i) - ln(1-\hat{\lambda}_i)] = 4.1922$ (since $T = 32$ and $r = 1$). This is distributed as a χ^2 with $(N-r)$=(4-1)=3 d.f. The 5% critical value is 7.88 and hence the statistic is insignificant. Therefore, the restriction imposed by the chosen model viz. Model C is accepted.

TABLE 6 : Test of Parameter Restriction (Variables: M2, RGDP, CPI and RT) (1975 to 2006)

Restriction on	Long run Coefficient				χ^2 Value
	M2	RGDP	CPI	RT	
M2 = 0	none	none	none	none	10.367
RGDP = 0	-1	0.000	1.903	0.018	3.5324
CPI = 0	-1	1.704	0.000	-0.487	11.555
RT = 0	-1	0.759	1.476	0.000	3.3192
M2	M2=1	RGDP=1	CPI=1	RT=1	12.0407
M2	M2=0	RGDP=0	CPI=0	RT=0	31.7922

So far, as the test of parameter restriction is concerned, the restriction of the parameters of normalized cointegrating vector such that either $\beta_1 = 0$ or $\beta_2 = 0$ or $\beta_3 = 0$ or $\beta_4 = 0$ entails one restriction each on one cointegrating vector, where the likelihood ratio test has a χ^2 distribution with $r(N - s)$ or 1(4-3)=1 d.f. (where r is the number of cointegrating vector, N the number of variables and s the number of independent cointegrating parameters). The calculated value of χ^2 for each variable restricted equals to zero are presented in the last column of Table 6. Since the tabulated value with 1 degree of freedom is 3.841 at 5 percent significant level, the zero restrictions in case of RGDP and RT cannot be rejected while such restrictions are rejected in case of M2 and CPI.

The subsequent part of the analysis, in turn, is to analyze demand for money function in Nepal as an application in examining long run relationship between the variables using the methodology of Johansen and Juselius (1990). Unavailability of disaggregated data particularly in developing countries like Nepal is one of the big constraints for the econometric research work. The selection of the relevant variables that are considered important for the empirical analysis have been chosen on the basis of the different theories of demand for money and empirical analysis related to this area. As there are no quarterly time series on GDP, annual data have been used. Two interest rate variables are included in the VAR system: 90-day treasury bill rate proxied for the short-term interest rate and one year bond yield proxied for the long term interest rate. This study examines whether M1 or M2 monetary aggregates are the appropriate variable included in the VAR system in explaining the demand for money in Nepal. M1 monetary aggregate consists of currency held by the public and demand deposits of commercial banks whereas M2 incorporates time deposits in M1 monetary aggregate. As guided by various theoretical as well as empirical findings, the regressors consist of different proxies of RGDP, interest rate variables.

A general specification of the long run demand for money is $M^d = f(P, Q, Z)$ where M^d, *P, Q* and *Z* denote the nominal money stock, the level of prices, nominal income level and all other variables that affect money demand respectively. Assuming that economic agents do not suffer from money illusion, M^d can be written as

$M^d/P = m^d = f(Q/P, Z) = f(q, Z)$. This indicates that demand for real money balance m^d is a function of real income q, and some other variables. Keeping these theoretical underpinning, this study selects three variables VAR comprising M1, RGDP and RT to examine demand for money in Nepal. The results of maximum eigenvalue (λ_{max}) and trace statistics (λ_{trace}) are presented in Table 7 and Table 8 respectively.

TABLE 7: Test Based on Maximum Eigenvalue (λ_{max})
Three Variable VAR (M1, RGDP and RT), Order of VAR = 1 (1975 to 2006)

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Max-Eigen. Statistics (λ_{max})	0.05 Critical Value	0.10 Critical Value
$r = 0$	$r = 1$ **	0.4852	19.9199	21.1316	19.0200
$r \leq 1$	$r = 2$	0.3098	11.1244	14.2646	12.9800
$r \leq 2$	$r = 3$	0.0605	1.8733	3.8414	6.5000

** denotes rejection of the hypothesis at the 0.05 level*
*** denotes rejection of the hypothesis at the 0.10 level*
Max-eigenvalue test indicates 1 cointegrating vector, that is, $r = 1$

TABLE 8: Test Based on Trace Statistic(λ_{trace})
Three Variable VAR (M1, RGDP and RT), Order of VAR = 1 (1975 to 2006)

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Trace Statistics (λ_{trace})	0.05 Critical Value	0.10 Critical Value
$r = 0$ *	$r \geq 1$	0.4852	32.9177	29.7970	28.7800
$r \leq 1$	$r \geq 2$	0.3098	12.9977	15.4947	15.7500
$r \leq 2$	$r \geq 3$	0.0605	1.8733	3.8414	6.5000

** denotes rejection of the hypothesis at the 0.05 level*
Trace test indicates 1 cointegrating vector, that is, $r = 1$

Analyzing the normalized cointegrating vector and speed of adjustment coefficients, single cointegrating vector $r = 1$ has been found. The estimated cointegrating vector corresponds to $\beta' = [\beta_1 \ \beta_2 \ \beta_3]$ or $[-6.545 \ \ -8.685 \ \ -0.562]$[9] which if normalized with respect to $\hat{\beta}_1$, becomes $\beta' = [1.000 \ \ 1.3269 \ \ -0.086]$. The t statistics for RGDP is 15.09 and for TR 4.59. The economic interpretation of the normalized coefficient is that there is long term positive relationship between M1 and RGDP and between M1 and RT

[9] The corresponding Eigenvector is:

$$\begin{bmatrix} M1 & RGDP & SR \\ -6.545 & -8.685 & 0.562 \\ -1.815 & 0.050 & 0.301 \\ 4.113 & 6.792 & -0.187 \end{bmatrix}$$

as shown by the normalized cointegrating vector. The corresponding speed of adjustment or weight vector for the vector of variables [M1 RGDP SR] is $\hat{\alpha} = [-0.2032 \quad -0.0631 \quad -6.461]$ with standard error of $(0.056 \quad 0.062 \quad 2.267)$.

The coefficient for our dynamic specification confirms the fact that the rate of growth of M1 depends positively and significantly on both the rate of growth on the real GDP and interest rate (short-term). However, the positive and significant coefficient in the long run relationship prompts it to opine that money is a luxury good because higher the level of income, the more rapid is the rate of growth of money. Notwithstanding various theories and empirical studies related to demand for money both in case of developed as well as developing countries have an unanimity to include interest rate as an argument in the demand for money, there is a controversy regarding the choice of interest rate as the proxy for opportunity cost of holding money. The appropriate choice rests on long as well as short-term interest rate with due emphasis on former in the Keynesian demand for money.

So far, a single cointegrating vector was found in case the demand for real money balance is proxied by M1, as the results presented in Tables 7 and 8; a test conducted replacing M1 by M2 in the system of VAR yields an absence of even a single cointegrating vector.

TABLE 9 : Test Based on Maximum Eigenvalue (λ_{max})
Three Variable VAR (M2, RGDP and RT), Order of VAR = 1 (1975 to 2006)

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Max-Eigen Statistics (λ_{max})	0.05 Critical Value	0.10 Critical Value
$r = 0$	$r = 1$	0.365	13.635	21.132	18.034
$r \leq 1$	$r = 2$	0.277	9.765	14.264	16.659
$r \leq 2$	$r = 3$	0.083	2.624	3.841	8.006

Max-eigenvalue test indicates no cointegrating vector in the VAR

TABLE 10: Test Based on Trace Statistic(λ_{trace})
Three Variable VAR (M2, RGDP and RT), Order of VAR = 1 (1975 to 2006)

Null Hypothesis	Alternative Hypothesis	Eigenvalues (λ_i)	Trace Statistics (λ_{trace})	0.05 Critical Value	0.10 Critical Value
$r = 0$	$r \geq 1$	0.365	26.024	29.797	27.321
$r \leq 1$	$r \geq 2$	0.277	12.389	15.494	13.683
$r \leq 2$	$r \geq 3$	0.083	2.624	3.841	8.007

Trace test indicates no cointegrating vector in the VAR. system

Test based both on the maximum eigenvalue statistics and trace statistic can not reject the null hypothesis of no cointegration, i.e. $(r = 0)$ as against the general alternative of

one or more cointegrating vectors (i.e. $r > 0$) (in case of maximum eigenvalue statistics) and specific alternative of $r = 1,2,3$ cointegrating vector (in case of trace statistic) since the values of computed (λ_{max}) and (λ_{trace}) statistics are found to be less than the critical values as shown in Table 9 and 10. Therefore, both the (λ_{max}) and (λ_{trace}) statistics supports the hypothesis of no cointegration among the variables. Hence, what can be concluded is that the choice of the monetary aggregate variables, i.e. M1 versus M2 can have significant bearings on the determination of cointegrating vectors. Single cointegrating vector is obtained in case of choice of M1 as against no cointegration among the variables using M2 monetary aggregate.

V. CONCLUSION

Among the alternative approaches available to the researchers interested in estimating long run economic relationships, this paper employs cointegration method of Johansen and Juselius (1990) in examining economic relationships among macroeconomic variables. The variables used for the analysis are M2, RGDP, CPI and RT. By utilizing 32 annual data observations covering the period from 1975 to 2006 and the said variables under consideration, one cointegrating vector is found to be statistically significant and hence the result is the same as interpreting the coefficients of ECM. The ADF sequential search procedure supports an existence of unit roots in the variables. This paper also estimates the demand for money function in Nepal as an application of long run relationships between the variables using the method outlined earlier. The coefficients of income and interest rate elasticity of M1 monetary aggregate so estimated are possessing theoretical a priori as represented by the normalized cointegrating vector contrary to an absence of cointegrating relationships in case of the replacement of M1 by M2. As the coefficients derived in this paper belong to restricted VAR method as opposed to the past practices in estimating cointegrating vector using the Engle-Granger (1987) two-step procedure, the coefficients are supposed to be robust and consistent because of the imposition of stronger restrictions. Further, estimating long run relationships by merging structural models and time series econometrics utilizing SVAR approach is an area of further research in Nepal.

REFERENCES

Barro, R.J. 1979. "On the Determination of the Public Debt." *Journal of Political Economy* 87: 940-971.

Bernanke, B. 1986. "Alternative Explanations of the Money-income Correlation." *Carnegie-Rochester Conference Series on Public Policy* 25: 49-100.

Beyer, A. 1998. "Modelling Money Demand in Germany." *Journal of Applied Econometrics* 13: 57-76.

Bhargava, A. 1986. "On the Theory of Testing for Unit Roots in Observed Time Series." *Review of Economic Studies* 53: 369-384.

Blanchard, O. 1989. "A Traditional Interpretation of Macroeconomic Fluctuations." *American Economic Review* 79: 1146-1164.

Blanchard, O. and M. Watson. 1986. "Are Business Cycles Alike?." In Robert J. Gordon, eds., *The American Business Cycle.* Chicago: University of Chicago Press: Chicago.

Davidson, J.E.H., Hendry, D.F., Srba, F. and S. Yeo. 1978. "Econometric Modeling of the Aggregate Time-series Relationship between Consumers' Expenditure and Income in the United Kingdom." *The Economic Journal* 88: 661-692.

Dickey, D.A. and W.A. Fuller. 1979. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root." *Journal of the American Statistical Association* 74: 427-431.

Dickey, D.A. and W.A. Fuller. 1981. "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root." *Econometrica* 49: 1057-1072.

Dickey, D.A., D.W. Jansen and D.L. Thornton. 1991. "A Primer on Cointegration with an Application to Money and Income." *Federal Reserve Bank of St. Louis* : 58-78.

Enders, W. 2004. *Applied Econometric Time Series*. New York: John Wiley & Sons.

Engle, R.F. and C.W.J. Granger. 1987. "Co-integration and Error Correction: Representation, Estimation and Testing." *Econometrica* 55: 251-276.

Friedman, M. 1957. A *Theory of the Consumption Function.* Princeton: Princeton University Press.

Goldfeld, S. 1973. "The Demand for Money Revisited." *Brookings Paper on Economic Activity* 3: 577-638.

Jevons, W.S. 1862**.** "On the Study of Periodic Commercial Fluctuations." in D. F. Hendry and M.S. Morgan, 1995 (eds.) *The Foundations of Econometric Analysis.* Cambridge: Cambridge University Press.

Johansen, S. 1988. "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control* 12: 231-254.

Johansen, S. and K. Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money." *Oxford Bulletin of Economics and Statistics* 52: 169-210.

Johansen, S. 1995. "*Likelihood based Inference in Cointegrated Vector Autoregressive Models."* Oxford: Oxford University Press.

Keating, John W. 1989. "Monetary Policy Regimes and Macroeconomic Fluctuations." *Working Paper* 139, Washington University, St. Louis.

Khatiwada, Y.B. 1997. "Estimating the Demand for Money in Nepal: Some Empirical Issues." *Economic Review, NRB Occasional Paper* 9.

Lucas, R. Jr. and T. J. Sargent. 1978. "After Keynesian Macroeconomics." In *After the Phillips Curve: Persistence of High Inflation and High Unemploymen,* Federal Reserve Bank of Boston Conference Series 19: 49-72.

Nachane, D.M. 2006. "*Econometrics-Theoretical Foundations and Empirical Perspectives."* New Delhi: Oxford University Press. .

Nelson, C.R. and C.I. Plosser. 1982. "Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications." *Journal of Monetary Economics* 10: 139-162.

Pandey, R.P. 1998. "An application of Cointegration and Error Correction Modelling: Towards Demand for Money in Nepal." *Economic Review, NRB Occasional Paper* 10.

Phelps, B.E.H. and S.V. Hopkins. 1957. "Wage Rates and Prices: Evidence for Population Pressure in the Sixteenth Century." *Economica* 24: 289-306.

Phillips, P.C.B. 1987. "Towards a Unified Asymptotic Theory for Autoregression." *Biometrika* 74: 535-547.

Phillips, P.C.B. 1987. "Time-series Regression with a Unit Root." *Econometrica* 55: 277-301.

Phillips, P.C.B. and P. Perron. 1988. "Testing for a Unit Root in Time-series Regression." *Biometrica* 75: 335-346.

Sims, C.A. 1980. "Macroeconomics and Reality." *Econometrica* 48: 1-48.

Sims, C.A. 1986. "Are Forecasting Models Usable for Policy Analysis?." *Quarterly Review Federal Reserve Bank of Minneapolis*, Winter: 2-16.

Stock, J.H. and M. Watson. 1988. "Testing for Common Trends." *Journal of the American Statistical Association* 83: 1097-1107.

Theil, H. and J.C.G. Boot. 1962. "The Final form of Econometric Equation systems." *Review* of *the International Statistical Institute* 30: 136-152.

Vogelvang, B. 2005. "*Econometrics: Theory and Applications with EView."* Pearson Education Limited.

●

GUIDELINES FOR ARTICLE SUBMISSION

The *Economic Review: Occasional Paper* (ISSN 1608-6627) is a publication of the Nepal Rastra Bank. Submission of a paper to the Review will be taken to imply that it represents original work not previously published, and it is not being considered elsewhere for publication, and that if accepted for publication it will not be published anywhere without the consent of the Editorial Board. Further, the articles so received are subject to approval by the Editorial Board; however, the ideas and opinions expressed in the articles published in the Review are solely those of authors. The contents of articles in no way represent views and policies of the Nepal Rastra Bank or that of the Editorial Board.

Submitted articles should be written in English, typed in double spacing with wide margins (3 cm) on one side of standard paper. The title page should contain the title, the name, institutional affiliation(s), full postal address, telephone/fax number and E-mail of each author, and, if there are more than one author, indicate which author is responsible for correspondence. Footnotes, if any, should be numbered consecutively with superscript arithmetic numerals at the foot of each page. Figures and tables should be on separate sheets and have descriptive titles. References in the text should follow the author-date format and followed, if necessary, by the page numbers; for example, Hemphill (1974, 637). References should be listed alphabetically in the following style:

- Anderson, T.W., and C. Hsiao. 1982. "Formulation and Estimation of Dynamic Models Using Panel Data." *Journal of Econometrics* 18: 47–82.
- Chu, K., E. C. Hwa, and K. Krishnamurty. 1983. "Export Instability and Adjustment of Imports, Capital Inflows, and External Reserves: A Short Run Dynamic Model." In David Bigman and T. Taya, eds., *Exchange Rate and Trade Instability*. Cambridge, Mass.: Ballinger.
- Goldstrein, Morris, and Mohsin Khan. 1985. "Income and Price Effects in Foreign Trade." In R. W. Joners and P. B. Kenen, eds., *Handbook of International Economics*, vol. II. New York: Elsevier.
- Hemphill, William. 1974. "The Effect of Foreign Exchange Receipts on Imports of Less Developed Countries." *IMF Staff Papers* 21: 637–77.

The article should be accompanied by an abstract of not more than 100 words, and the preferred maximum length of a submission is 30 typed pages.

Author(s) submitting to the Review should provide their article both in hard copy and on a computer diskette. This latter should be labeled with the title of the article, the name(s) of the author(s) and the word processing software, the preferred word processing software for the Review being Microsoft Word. Submission should be sent to:

The Editorial Board
Economic Review: Occasional Paper
Nepal Rastra Bank, Research Department
GPO Box No. 73, Baluwatar, Kathmandu, Nepal
Fax : 977-1-4414553
Telephone: 977-1-4419804, Ext. 357
email: statistics@nrb.org.np