

INTERNATIONAL JOURNAL OF SOCIAL SCIENCES

Volume 4, Number 1, June 2005

EDITOR

IMOH E. UKPONG
University of Uyo, Nigeria

ASSOCIATE EDITORS

Akpan H. Ekpo, *Nigeria*

Graham Chapman, *UK*

Uwem E. Ite, *UK*

Ukana Ikpe, *Nigeria*

Isidore Eyo, *Nigeria*

Akpan U. Akpan, *Nigeria*

*Published in cooperation with the
Faculty of Social Sciences, University of Uyo, Nigeria.*



Growth Effects of Capital Account Liberalization: Evidence from Vector Error Correction Model in Nigeria

Taiwo Olubanko Ajilore

Department of Economics

Obafemi Awolowo University, Ile-Ife, Nigeria.

E-mail banjotaiwo@yahoo.com

Accepted 28th October 2004

ABSTRACT - Theoretical and empirical literature continued to present conflicting thesis on the desirability and consequences of capital account liberalisation, especially for developing countries. The study focused at verifying the growth effects of this phenomenon for the Nigerian deregulation economy.

The paper uses the cointegration and the associated error-correction procedure on quarterly data on Nigeria for the period 1986(1) and 2000(4) to estimate a standard growth liberalisation for the Nigerian Economy. The results from the Augmented Dickey-Fuller (ADF) test confirmed that all variables are of random walk; ie $\{I(1)\}$, while the Johnsen cointegration likelihood ratio test established the presence to two cointegrating relationship among the four-variable model. Consequence upon the foregoing, an error-correction model was developed which was shown to be well specified relative to its own information set and capable of parsimoniously representing the data set.

The findings from this study confirmed that the surge in inflow of foreign private capital that occasioned the opening of the country capital accounts in the late eighties have had positive effects on growth performance in Nigeria. This result runs contrary to common positions in literature that capital account liberalization is inimical to economic performance for less develop countries.

KEYWORDS: Capital account, Liberation, Vector error, Nigeria

INTRODUCTION

Governments of many industrial countries have attributed their efficiency gains, increase gains, increased diversification opportunities and financial development to the widespread capital account liberalization undertaken over the past quarter of a century. Desirous of benefiting from the payoff of this process of international financial integration, may economically less developed countries have over the last two decades implemented far reaching capital account reforms measures as a component of the broader structural adjustment policy programme. However theoretical and empirical evidence have continued to produce conflicting signal on the role of capital account liberation, especially between the developed and developing countries (see amongst others, Grilli and Milesi-Ferretti (1995); Rodrick (1998); Kray (1998); Edwards (2001); Arteta, Eichengreen and Wyplosz (2001). Dismantling of capital controls in many emerging economics seems to be attended by rising incidence of financial crises, thus raising doubts as to the linkage between capital account liberation and growth. Concern has also been expressed as to whether the cost of increased vulnerability to financial fragility might not outweigh the growth effect of financial integration (Renu 2001).

These issues are significant for Nigeria as it liberalizes its capital account as part of its broader financial liberalization strategy. In spite of the theoretical disputes and the concomitant policy debate that have produced a burgeoning empirical literature, studies that attempt to examine and resolve these issues in Nigeria have been virtually non-existing. Hence this study attempts to provide an understanding of the nature of the economic effects of capital movement liberalization in Nigeria. Prior to 1986, Nigeria had a closed capital account with capital mobility being restricted through administrative controls and outright prohibition. In the aftermath of protracted economic crisis of the early 80's Nigeria embarked upon an economic reform programme aimed at transforming the controlled economy into a market driven one, and capital movement liberation happen to be part of the broader financial liberalization policy put in place then.

External financial liberalization involves policy options that increase the degree of ease with which residents can acquire assets and liabilities denominated in foreign currencies and non-residents can operate in national financial markets. With the deregulation of the foreign exchange, all existing restrictions on capital transfer were abolished. All that was required was the evidence of importation and exportation to be provided to the Federal Ministry of Finance. In addition, all applications for capital transfers were to be backed by appropriate documents and settled at the appropriate exchange rate. As

shown in Figure 1, there was a remarkable recovery in the magnitude of flow of foreign private capital to Nigeria in the early nineties, with a spur of capital inflows between the period 1992 – 1996, with a peak performance in 1995, thus reversing a declining trend of the late eighties. Outflow of private capital respond poorly to market oriented reforms. This experience is quite similar to other emerging Asian economics that typically experienced a rise in inward flows than outward flows, confirming the fact of their being capital scarce economics.

Empirical literature however offered two broad explanations for this phenomenon. Calvo, Leiderman and Reinhart (1993) attributed it to the fall in US interest rates between 1989 – 1992, coupleed with recession in many European countries which drove investors in search of higher returns, to developing countries. Others attribute it to credible economic reforms, improved macro-economic performance and domestic polices that encourage investors confidence (Chuhan, Claessens & Mamingi, 1993). It however need be noted that the net private capital flow to emerging markets increases seven-fold between 1990 and 1996 (Renu Kohli, 2001). It is thus most likely that Nigeria became a recipient of this global trend consequent upon the opening of its financial markets. It should also be noted that these periods coincide with a reversal in the declining trend in the GDP growth rate in Nigeria, in fact with the exception of 1987, the growth rate between 1998 and 2000 have been consistently positive, though at varying levels.

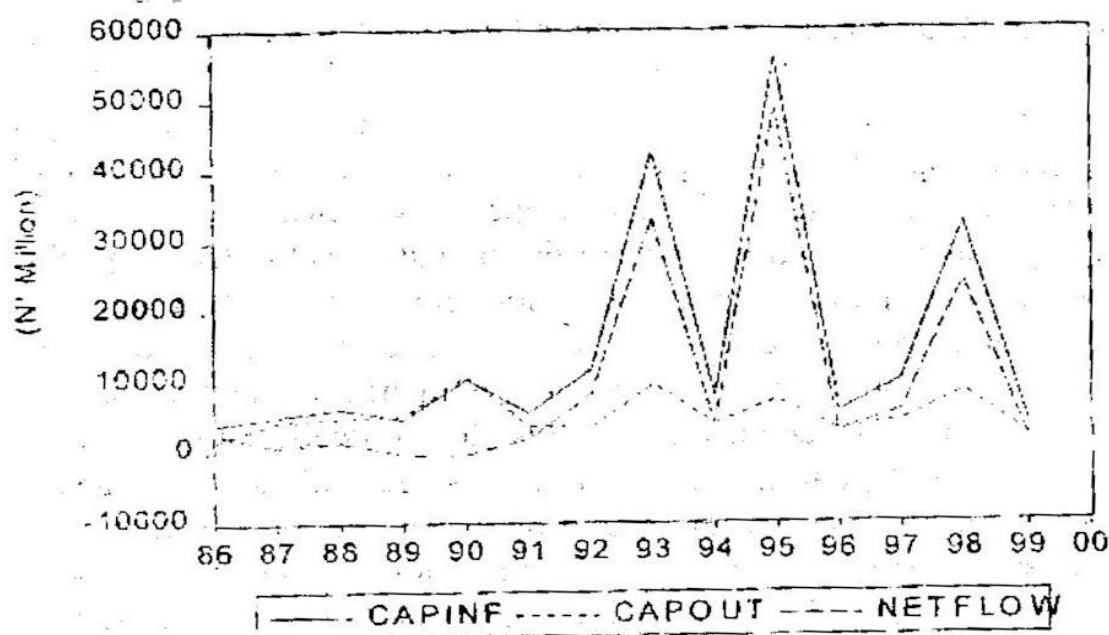


Fig. 1: Flow of Foreign Private Capital to Nigeria (1986 - 2000)

Theoretical and Empirical Issues

Classic economic theory argues that international capital mobility allows countries with limited savings to attract financing for productive domestic investment projects, enables investors to diversify their portfolios, spreads investment risk more broadly and promotes inter-temporal trade. *More specifically, capital mobility means that households, firms, or even* countries can smooth consumption by borrowing money from abroad when incomes are low in the home country and repaying when incomes are high. The ability to borrow abroad can thus dampen business cycles. Also by lending abroad, households and firms can reduce their vulnerability to domestic economic disturbances. Companies can protect themselves against sudden cost increase in the home country, for example, by investing in branch plants in several countries. Capital mobility thus enables investors to achieve higher risk-adjusted rates of return which encourage savings and investment that deliver faster economic growth.

However, critics of international financial liberalization have hinged their arguments on whether free capital movements can deliver an efficient allocation of resources. It has been pointed out that liberalized financial markets are so distorted by incomplete information and other problems that transactions often yield outcomes asymmetric. This information gaps give rise to the associated problems of adverse selection, moral hazard and herding that plague financial markets in general. Such asymmetries lead to inefficiencies, and in the extreme, can lead to costly financial crisis. Aside from these contrasting theoretical positions, the mixed set of empirical results derived in the literature further heightened the debate on the role of capital account liberation and economic growth.

Empirical works with supportive evidence of positive influence of capital account openness on growth, include, amongst others, the work of Quinn (1997). Making use of financial openness indicators in a standard growth regressions, his work is one of the first studies to identify positive result between capital account liberalization and growth. Klein and Olivei (2000) also find a positive effect of capital account liberalization on growth among industrial countries, but do not find evidence to support this thesis for non-industrialization countries. Edwards (2001) added another conjecture that the effects of capital account liberalization depends upon the level of development of an economy. He found evidence that suggest that capital account openness detracts from growth for countries at lower levels of income but promotes growth in industrialized countries and in the richer emerging market economies. Artete, Eichengree and Wyplosz (2001) also produce evidence to indicate that the effect of capital account liberalization across

countries depends upon the degree of macro-economic stability. They posit that countries that open their capital account grow faster only if accompanied by stable macro-economic environment. Bakaert, Harvey and Lundblad (2001) however, provide the strong evidence supporting the hypothesis that capital account liberalization promotes growth among developing countries.

Several studies have found no correlation between capital account and economic growth. These amongst others include Grilli and Milesi-Ferretti (1995), Rodrick (1998), Krayy (1998) and Eichengreen (2001).

Data and Methodology

Edison, Klein, Ricci and Slok (2002) provide a comprehensive review of measures and indicators of capital account liberalization found in empirical literature. Most of these measures are qualitative and rules based, however, researchers have constructed several alternative quantitative measure of capital account liberalization. One of them adopted in this study is that of Kraay (1998) who gauges the extent of capital mobility (CAL) through the use of actual capital inflows and outflows as a percentage of GDP. The regressand in the model is the growth in real GDP (RGDP). The control variables included in the growth model are the level of consolidated tertiary institution enrolment (EDU), as a measure of human capital, and the ratio of total investment to GDP (INV) serves to capture the influence of investment in the growth equation.

The study uses quarterly data on Nigeria for the period 1986 – 2000. The data series are collected mainly from Central Bank of Nigeria (CBN) Statistical Bulletin and Federal Office of Statistics (FOS) Digest of Statistics. A greater percentage of the data points were decomposed given that most of the data series were only given as annual figures. This is done adopting the method of Quarterly Interpolation of Annual Statistics Series: Using Robust Non-parametric methods of Asogu, (1996).

The concept of Cointegration creates the link between integrated process and the concept of steady state equilibrium. This is based on the idea that although two different series may not themselves be stationary, some linear combinations of them may indeed be stationery, with generalization to more series. That is, “for a vector of time series, all of which are stationery only after differencing, there might be some linear combinations that are stationary without differencing” (Granger 1983). The rule is that “variables of different orders cannot be cointegrated,” otherwise their linear combinations will not be stationary.

The theory of Cointegration arises out of the need to integrate short-run dynamics with long-run equilibrium. The traditional approach to the

modeling of short-run disequilibrium is the partial adjustment model. An extension of this in the Cointegration techniques is the error correction mechanism (ECM). Several authors, (Granger and Newbold, 1977; Davidson et al., 1978, and Granger and Engle, 1985) have proved that Cointegration is a sufficient condition for an ECM formulation. Consequently, the study first ascertains the time series properties of each of the times series variables of the model by employing the Augmented Dickey-Fuller (ADF) test for stationary (see Dickey and Fuller 1979, 1981). The equation estimated for the ADF test is as follows:

$$\Delta X_t = \alpha_0 + \beta_1 X_{t-1} + \delta_t + \sum_{i=1}^m \theta_i \Delta X_{t-i} + \varepsilon_t \dots\dots\dots (1)$$

Where, Δ is the first-difference operator, t is the time trend, ε is the stationary random error, and m is the maximum lag length. The null hypothesis is that the series contains a unit root which implies that $\beta=0$. The null hypothesis is rejected if β is negative and statistically significant. To determine the long-run relationship between economic growth and the model's explanatory variables, the Johansen cointegration procedure is utilized (see Johansen 1991, and Johansen and Juselius 1990). The procedure involves the estimation of a VECM in order to obtain the likelihood-ratios (LR). The VECM used in this is a follows:

$$\Delta Y_t = \theta_0 + \sum_{i=1}^{k-1} \theta_i \Delta Y_{t-i} + \alpha \beta' Y_{t-k} + \varepsilon_t \dots\dots\dots (2)$$

Where, Δ is the difference operator, Y_t is vector of time series variables, θ_0 represents the interception, and ε represents the vector of white noise process. The matrix b consists of r ($r < n - 1$) cointegrating vectors. Similarly, the matrix a contains the error correction parameters. The Johnson cointegration technique produces two likelihood ratio test statistics namely the trace test and the maximum eigenvalue test. The number of significant non-zero eigenvalues determines the number of cointegrating vectors in the system. Since the asymptotic distributions of the trace and maximum eigenvalue test statistics follow χ^2 distributions, a simulation procedure is needed to identify proper critical values for each test (see Osterwald-Lenum, 1992).

Following from the preceding analysis, the error-correction model used in this study is based on the following regression equation:

$$RGDP_t = \alpha Z_{t-1} + \sum_{i=1}^a RGDP_{t-i} + \sum_{j=1}^b \beta_j CAL_{t-j} + \sum_{k=1}^c \beta_k LEDU_{t-k} + \sum_{l=1}^d \beta_l LINV_{t-l} + \ell_t \dots\dots (3)$$

Where Z_{t-1} represents the error-correction term lagged by one period. **RGDP** is the Nigeria's real GDP, **LCAL** is the natural logarithm of the ratio of capital flows to GDP, **LEDU** is the natural logarithm of Nigeria's consolidated schools enrolment, **LINV** is the natural logarithm of the ratio of public investment to GDP, a,b,c and d represent the optional lag lengths obtained from the Akaike Information Criterion (see Akaike, 1973).

Empirical Result

A. Unit Roots Tests

Before we estimate the equation, we determined the underlying properties of process that generate our time series variables, that is a test of the stationary properties of the variables. Macro-economic data often appear to possess stochastic trend that can be removed by differencing the variables. We use the Augmented Dickey Fuller (ADF) t-test for testing the order of integration. The null hypothesis being tested is that $d = 0$ (random walk with a drift) against the alternative of stationarity. The results are as presented in table 4.1. As shown in the table, the ADF test indicated that all the series are non-stationary. However, all the first differenced series turn out to be stationary. All the first differenced test results have t-statistics exceeding MacKinnon's critical values, so that hypothesis $d = 0$ could now be rejected.

Table 4.1: Augmented Dickey Fuller tests of Unit Roots

Variables	ADF Test Statistics	Order of Integration
A. Series in Levels		
RGDP	-2.5264	
LCAL	-1.2949	
LEDU	-1.0326	
LINV	-0.0464	
B. Series in First Differences		
RGDP	-4.1706*	1(1)
LCAL	-4.2795*	1(1)
LEDU	-5.6237*	1(1)
LINV	-4.3488*	1(1)

ADF is the Augmented Dickey-Fuller test: it gives the t-statistics from a specification that includes a constant and two (2) lagged changes in the dependent variable. A * indicates rejection of the null hypothesis ($\delta=0$) of non-stationarity of the 5% level of significance.

B. Test for Cointegration

We employed the Johnson Cointegration test to check for cointegration among the time series. This become necessary because all variables contain unit roots in the level, therefore cointegration is the appropriate dynamic modeling technique for them. A linear combination of these variables is

identified such that this combination is stationary. If such combination exists, then the variables are said to be cointegrated. The results of the test are as shown in Table 4.1 below:

Table 4.2: Johansen Cointegration Likelihood Ratio Test

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.786986	155.7002	53.12	60.16	None**
0.603302	69.10195	34.91	41.07	At most 1**
0.212318	17.32544	19.96	24.60	At most 2
0.068279	3.960406	9.24	12.97	At most 3

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level.

The result reveals the presence of two cointegrating relationships, and we thus conclude that there exist a stable equilibrium relation among our variables notwithstanding that the individual variables are non-stationary.

C. Correction Solution of Model Equation:

For the ECM, we adopted the general to specific (GTS) framework, which specifies an over-parameterized error-correction model. This is informed by the need to identify the main dynamic patterns in the models and to ensure that a too short lag length has not restricted the dynamics of the model. All variables were equally lagged. The over-parameterized models seems difficult to interpret; we therefore simplify these models into a more interpretable and parsimonious models. The reduction is carried out by imposing zero coefficients on those levels and lags of variable with low 't' statistics.

The overall aim is to determine which variables are relevant in explaining the short-run behaviour of our model. The resulting Schwartz and Akaike information criteria, as well as standard error of regression were employed as guide to parsimonious reduction. A fall in these values is indication of model parsimony. The short-run dynamics have been specified to include the error correction term (ECM lagged one period) estimated from the cointegration regressions.

Table 4.3 corresponds to the over-parametized economic growth model, which incorporates the lagged changes of the model variables. This is then simplified until theory consistent and data coherent results are achieved by gradual deleting insignificant variables. The final parsimonious model is as shown in Table 4.4. The results indicate that the resulting Schwartz and Akaike information criteria as well as standard error of regression declined

Table 4.3: Equation of Over-Parameterized Economic Growth Model

Dependent Variable: DRGDP

Method: Least Squares

Sample (adjusted): 1987:2 2000:4

Included observations: 55 after adjusting endpoints

Variables	Coefficient	Std. Error	t-Statistic	Prob.
DRGDP(-1)	-0.060256	0.310217	-0.645863	0.4057
DRGDP(-2)	-0.070854	0.121703	-0.866453	0.4970
DRGDP(-3)	-0.070854	0.132107	-0.186345	0.4097
DRGDP(-4)	-0.323191	0.093453	-3.458314	0.0014
DLCAL	0.065335	0.089992	0.726010	0.4727
DLCAL(-1)	0.048362	0.027712	0.306175	0.6764
DLCAL(-2)	0.258362	0.045712	0.360715	0.3646
DLCAL(-3)	0.800362	0.277012	0.301756	0.4676
DLCAL(-4)	-0.011214	0.053967	-0.207799	0.8366
DLEDU	1.239454	0.330747	3.747442	0.0006
DLEDU(-1)	0.353929	0.258035	1.371631	0.1789
DLEDU(-2)	1.03E-11	0.380892	3.32E-11	1.0000
DLEDU(-3)	-1.57E-11	0.838092	-5.08E-11	1.0000
DLEDU(-4)	-0.357673	0.258811	-1.381987	0.1757
DLINV	0.253625	0.172723	0.348763	0.7294
DLINV(-1)	0.146628	0.745211	0.559928	0.5528
DLINV(-2)	0.166248	0.774121	0.599285	0.6527
DLINV(-3)	0.168624	0.27741.1	0.928595	0.5528
DLINV(-4)	-0.530641	0.462704	-1.146827	0.2592
ECM1	1.005787	0.151265	6.649187	0.0000
R-squared	0.712088	Mean dependent var		-0.004396
Adjusted R-squared	0.555793	S.D. dependent var		0.125697
S.E. of regression	0.083776	Akaike info criterion		-1.846058
Sum squared resid	0.245643	Schwarz criterion		-1.116119
Log likelihood	70.76659	Durbin-Watson stat		1.950579

Table 4.4: Equation of Pasimonius Economic Economic Growth Model

Dependent Variable: DRGDP

Method: Least Squares

Sample (adjusted): 1987:2 2000:4

Included observations: 55 after adjusting endpoints

Variables	Coefficient	Std. Error	t-Statistic	Prob.
DRGDP(-4)	-0.309041	0.085427	-3.617615	0.0007
DLCAL	0.055955	0.023342	2.397146	0.0203
DLEDU	0.970694	0.184853	5.25113	0.0000
DLINV(-4)	-0.434559	0.268970	-1.615645	0.1125
ECM1	1.029662	0.137190	7.505395	0.0000
R-squared	0.653037	Mean dependent var		-0.004396
Adjusted R-squared	0.625280	S.D. dependent var		0.125697
S.E. of regression	0.076945	Akaike info criterion		-2.204948
Sum squared resid	0.296025	Schwarz criterion		-2.022463
Log likelihood	65.63607	Durbin-Watson stat		2.156726

respectively from -1.1161, -1.8460 and 0.0837 in the over-parameterized model to -2.0224, -2.2049 and 0.0769 in the parsimonious model. These confirmed that model parsimony was being achieved as the model was being reduced. The result of parsimonious model indicated a well-defined error correction term, indicating a feedback of 102% of the previous quarter's disequilibrium.

The results in table 2 support the thesis that Capital Account Liberalization propels economic growth in the Nigerian situation. This is in difference to the result of some of the research earlier discussed. Researchers such as Klein and Olivei (2000) and Edwards (2001) found out that capital account liberalization have significant effect in promoting growth only in industrial countries. This result is however in line with the findings of Bekaert, Harvey and Lundblad (2001) that capital account liberalization promotes growth among developing countries. Education, as depicted by variable DLEDU, as expected impacted positively on economic growth. Contrary to expectation, and though not statistically significant, investment expenditure, as denoted by variable DLINV(-4) lagged four quarters exercised a negative influence on economic growth.

The information provided by the R^2 and DW – statistics suggest that our model equations are adequate representation of the data. The value of adjusted R^2 in the model is 0.6557 and 0.6252 for the overparametized and parsimonious model respectively. This indicated that about 65% and 62% of variations in economic growth are explained by explanatory variables. The Durbin Watson statistics ranges between 1.95 and 2.16, which aptly suggests an absence of autocorrelation in our analysis.

Summary and Conclusion

Theoretical and empirical literature continued to present conflicting thesis on the desirability and consequences of capital account liberalization, especially for developing countries. The study focused at verifying the growth effects of this phenomenon for the Nigerian deregulated economy.

The paper uses the cointegration and the associated error-correction procedure on quarterly data on Nigeria for the period 1986(1) and 2000(4) to estimate a standard growth in order to examine the growth effects of capital account liberalization for the Nigerian Economy. The results from the Augmented Dickey-Fuller (ADF) tests confirmed that all variables are random walk; i.e. $\{1(1)\}$, while the Johnson cointegration likelihood ratio test established the presence of two cointegrating relationship among the four-variables model. Consequence upon the foregoing, an error-correction model

Taiwo

was developed which was shown to be well specified relative to its own information set and capable of parsimoniously representing the data set.

The finding from this study confirmed that the surge in inflow of foreign private capital that occasioned the opening of the country capital accounts in the late eighties have had positive effects on growth performance in Nigeria. This result runs contrary to common positions in literature that capital account liberalization is inimical to economic performance for less developed countries.

REFERENCES

- Edwards Sebastian (2001), (Capital Mobility and Economic Performance : Are Emerging Economics Different?" *NBER Working Paper* No. 8076.
- Eichengreen Barry, (2001), *Capital Account Liberalization: What Do Cross-Country Studies Tell Us?* Berkeley, Carlifornia. University of California.
- Eichengreen B., Mussa, M., Dell'Araccia., Detragiache E. Miles-Ferretti G. (1999). "Liberalizing Capital Movements: Some Analytical Issues". *Economic Issues* No. 17 International Monetary Fund.
- Garibaldi P. Mora, N., Sahay R and Zettelmeyer J (2002). "What Moves Capital to Transition Economies. *IMF Working Paper Series* WP/20/64
- Granger, C. W. and P. Newbold. (1977(. "Spurious Regressions in Economics" *Journal of Economics*, 2: 111 – 120
- Granger, C. W. J. (1993), "Co-Integrated Variables of Error-Correction Models". *Working Paper*, 83013, University of California, San Diego
- Grilli Vittorio and Gian Maria Millessi-Ferretti (1995) "Economics Effect and Structural Determinants of Capital Controls". *Staff Papers*, *International Monetary Fund*. Vol. 42.
- Johansen, S. and K. Juselius (1990). "Maximum Likelihood Estimation Inference on Cointegration – With Application to the Demand for Money" *Oxford Bulletin of Economics and Statistics*, Vol. 52.
- Klein, M. V. and Olivei, G (2000), "*Capital Account Liberalization, Financial Depth and Economic Growth*" Boston: Flecher School of Law and Diplomacy, Tufts University.
- Kraay Aart (1998) "*In Search of the Macro-economic Effects of Capital Account Liberation*" Washington, The World Bank.

Quinn, Dennis, (1997), "The Correlates of Change in International Financial Regulation". *American Political Science Review*, Vol. 91, No. 3.

Renu Kohli (2001), "Capital Flows and Their Macro-Economic Effect in India. *IMF Working Paper Series* WP/02/192

Rodrik Dani (1998) "*Who Needs Capital Account Convertibility?*": Cambridge: Massachusetts: Harvard University.