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# Domestic Credit and Foreign Capital Inflows in Pakistan

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**Abstract:** We use Johansen-Juselius cointegration approach and vector error correction model to estimate Kouri and Porter (1974) capital flow equation for Pakistan for recently adopted free float exchange rate regime. Objective is to test the sensitivity of net foreign assets to net domestic assets. Johansen-Juselius Cointegration and vector error correction estimates provide evidence of long run relationship among the variables of interest and higher sensitivity of net foreign assets to net domestic assets. Hence any change in net foreign assets is more than fully offsetted by changes in net foreign assets in opposite direction. This finding cast doubt on notion that free float exchange rate regime provides independence to the Central Bank to conduct an independent monetary policy.

*Keywords*: Central Bank, Monetary Policy, Capital inflows, Domestic credit, Real exchange rate
*JEL Classification:* E4, E5, E41, E52

## 1. Introduction

Foreign capital inflows play pivotal role in sustainable economic development of emerging market economies. They bridge saving-investment gap and thus contribute to higher economic growth, help the recipient country to finance its external imbalance and meet its foreign debt obligations, reduce exchange rate volatility and cushion the economy from external shocks (see Lee, 1996, Khan, 1996, Zhang, 2010 and Khan and Ahmed, 2005). Negative effects of foreign exchange reserve accumulation include exchange rate appreciation, rise in domestic prices due to increase in country's monetary base, increase in stock prices, contagion and herding behavior and reduction in monetary authorities' efficacy to conduct an independent monetary policy when firms and households are exposed to foreign currency shocks (see Hagiwara, 2004, Gilal, 2011, Calvo et al., 1994, Lee, 1996 and Avdjiev et al., 2012).[iv]

Traditional empirical literature divides factors affecting capital inflows in two broad categories pull/domestic factors and push/external factors (see Calvo et al., 1994, Calvo et al. 1996, Lee, 1996; Khan, 1996; Altınkemer, 1998; Celasun et al., 1999; Christensen, 2004; Lavigne, 2008; Glick and Hutchison, 2008; Ljubaj et al., 2010). Pull factors are internal factors that attract capital inflows and include bilateral trade, real gross domestic product (GDP), exchange rate stability, external debt and exchange rate regime. It is assumed that capital inflows attracted by pull factors have positive effect on domestic macroeconomic indicators. Push factors on the other hand, are external factors and include lending countries real GDP, short term real interest rate differential and investors' risk avoiding attitude.[v] Capital inflows caused by external factors are more disruptive and are subject to developed countries' internal macroeconomic conditions and financial developments.[vi] Improvement in lender countries' macroeconomic conditions results reversal of capital inflows and have distortionary effect on recipient country economic and financial

conditions. Domestic investors' self-fulfilling expectations[vii] and country's financial openness may be the third relevant determinant of capital inflows[viii] (Montiel, 1998).

Capital inflows have always remained a focus of both theoretical and empirical literature. They are assumed to be welfare augmenting; change consumption pattern and exploit marginal productivity differential among different countries (Byrne and Fiess, 2011). At macro level capital movement is associated with its marginal product and economic growth. However, differential marginal product is not the sole determinants of capital inflows (Feldstein and Horioka, 1980). Other factors that influence capital inflows are investors risk avoiding attitude, legal and financial (taxes) restrictions, institutional rigidities that restrict movement of large segment of domestic savings and lack of capital movement to maximize net of tax return of each investor. Cumulative effect of all these factors is that capital may not fully exploit differential in its marginal product. Failure of capital to respond to such a differential is called Lucas (1990) Paradox. Lucas (1990) attributes paucity of rich to poor countries capital inflows to low level human development in latter countries. Reinhart and Rogoff (2004) while explaining Lucas Paradox emphasize the importance of credit market and political risk for lack of rich to poor countries' capital inflows. They suggest that abatement of credit market imperfection through better institutions will enhance the role of human development and economic growth in attracting capital inflows to poor and emerging countries.

Earlier empirical literature has focused upon finding out the relevant determinants of capital flows. Luca and Spatafora (2012) evaluated the interaction between capital inflows, financial development and domestic investment in developing countries.[ix] Ralhan (2006) found macroeconomic variables as relevant determinants of capital inflows for Australia, India, Indonesia, Argentine, Brazil, Chile, Colombia, and Mexico. Fratzscher (2011) using 50 countries' weekly portfolio data found common factors as important determinants of capital inflows to many of these countries during 2005-2007 and 2007-2008 global financial crisis. However, idiosyncratic factors appear to be relevant determinants of capital inflows in post crisis period to emerging Asian and Latin American countries. Forster et al. (2014) employed dynamic hierarchical factor model and found (a) global factors, (b) inflows specific factors, (c) regional factors and (d) country specific factors as relevant determinants of capital inflows to a sample of 47 countries. Country specific factors followed by regional factors explained major portion of variation of capital. Global factors on the other hand, explained smaller part of variation.

Contrary to earlier empirical literature that has attempted to find out capital inflows determinants, we evaluate the sensitivity of foreign capital inflows to domestic monetary conditions in Pakistan. We estimate Kouri and Porter (1974) capital flow equation to evaluate how net capital inflows respond to changes in net domestic assets. Results indicate higher sensitivity of net foreign assets to changes in net domestic assets. Any change in domestic monetary conditions resulted more than equal and opposite changes in net foreign assets. This finding cast doubt on the notion that free float allows Central Banks to pursue independent monetary policy. Other relevant explicators of net foreign assets in the country are national income, real exchange rate and interest rate differentials. The remaining paper follows as: in section we discuss Kouri and Porter (1974) capital flow equation. Section 3 is addressed to data discussion and in section 4 estimation results are given. Concluding remarks are given in section five.

## 2. Theoretical Model

We study the interaction between domestic credit and net foreign assets by estimating capital flow equation using Johansen (1988) and Johansen and Juselius (1990) multivariate cointegration approach. The objective is to find out the extent of interaction between net domestic assets and net foreign assets. In order to do that, we follow Kouri and Porter (1974) approach and estimate following capital flow equation:

$$nfa_t = \beta_0 + \beta_1 nda_t + \beta_2 mpi_t + \beta_3 id_t + \beta_4 q_t + v_t \quad (1)$$

Where $nda_t$ = net domestic assets, $nfa_t$ = net foreign assets, $mpi_t$ = manufacturing production index, $id_t$ = interest rate differential and $q_t$ = real exchange rate.[x] $\beta_1$ is an offset coefficient and ranges between zero and minus one. $\beta_1$ = -1 suggests fully mobile capital. In such a case any change in $nda_t$ results equal and opposite changes in $nfa_t$. Under such circumstances, monetary authorities' of the country are constrained to pursue an independent because any effort to change domestic component of monetary base ($nda_t$) is foiled by equal and opposite change in its foreign component ($nfa_t$). As a result, monetary base of the country remains unaffected. $\beta_1$ = 0 is consistent with insensitivity of $nfa_t$ to $nda_t$. Such situation characterizes Central Bank autonomy in formulating an independent monetary policy. $0 < \beta_1 < -1$ represents partial response of $nfa_t$ to $nda_t$. $\beta_2$ is expected to be positive because an increase in manufacturing production index (a proxy used for real income) raises demand for domestic money. As a result domestic interest rate increases which attracts further capital flows in the country. $\beta_3$ could be greater or less than zero. $\beta_3 > 0$ implies $i_t > i_t^*$ which provides incentive to foreign investors to move their capital in the country to earn higher profits. $\beta_3 < 0$ when $i_t < i_t^*$. In such a case investors withdraw their capital from low to high profiting country. $\beta_4 > 0$. An increase in real exchange rate ($q_t$) improves country's competitiveness in international market. This improves country's external account and results capital inflows.

## 3. Data

All data is taken from International Monetary Fund International Financial Statistic CD ROM. Real exchange rate data is not directly available. It is constructed by adjusting nominal exchange rate with relevant country consumer price index. Interest rate differential is simply the difference between Pakistan interbank call money rate and the US 3 month commercial paper rate. Manufacturing production index ($mpi_t$) is used in lieu of unavailability of monthly national income data. $mpi_t$ data was interpolated with linear interpolation method to fill in the missing values. Resulting $mpi_t$ was seasonally adjusted with X-12 ARIMA seasonal adjustment program. Monthly data from August 2000 to December 2013 is used. Choice of sample is based on shift in Pakistan's exchange rate regime from managed to free float on 17th July, 2000 and Pakistan's commitment to Western countries' war on terror.

## 4. Estimation Results

We employ Johansen (1988) and Johansen and Juselius (1990) multivariate cointegration approach for finding out the number of cointegrating relationship from vector of variables (in our case it consists of $id_t$, $mpi_t$, $nda_t$, $nfa_t$ and $q_t$) Since this method has already been used extensively in empirical literature therefore, we do not reproduce it here. This approach has the advantage of allowing us to examine the number of long run relationships and test if the individual coefficients entering into cointegrating space confirm their theoretical predictions (McDonald, 1993). In addition, direction of normalization does not change results due to endogeneity of all variables entering into cointegrating space (Gilal, 2011).

Prior to applying multivariate cointegration tests, we used Augmented Dicky Fuller (ADF) for testing the integrating order of variables of interest. Table 1 reports ADF test results in levels and first difference. It seems all variables are *I*(1) in levels in both specifications. However, first difference results stationary of all variables except for $nda_t$. $nfa_t$ also appears to be stationary in first difference at ten percent significance level. $nda_t$, on the other hand, seems to be *I*(2) and requires second differencing to be stationary.[xi] Despite differing integrating order, we still expect a linear combination of nonstationary variables to be stationary (MacDonald, 1993.

Johansen (1988) and Johansen and Juselius (1990) approach is sensitive to chosen lag length (Banerjee et al., 1993). Therefore, we estimated unrestricted vector autoregression system comprising the variables of interest for up to 11 lags and calculated different information criterion for choosing optimal lag length. Table 2 show log likelihood ratio statistic suggests a VAR of order 11. FPE and AIC VAR of 4 lags and SC and HQ suggested lag length is 2.

Initially, we tested number of cointegrating vectors for 11 lags. However, the results were not promising. We therefore, used 4 lags while estimating number of cointegrating vectors using Johansen (1988) and Johansen and Juselius (1990) multivariate cointegration test. Table 3 report results of cointegration test. Both trace and maximum Eigen value test statistics provide evidence of one cointegrating vector.

On the basis of evidence of one cointegrating vector, we estimated restricted VAR (VECM) imposing one cointegrating vector restriction on it. Table 4 reports VECM results. It is evident that all explicators except real exchange rate have significant effect on net foreign assets ($nfa_t$). Interest rate differential and real income have positive effect on net foreign assets. Hence an increase in real income and interest rate attract further capital inflows in the country. However, net domestic asset ($nda_t$) estimate is surprisingly large and confirms its theoretical prediction. It indicates that an increase / decrease in net domestic assets results more than equal and opposite changes in net foreign assets. This finding has important policy implication for the conduct of independent monetary policy in recently adopted free float regime by the country. It casts doubt on the notion that flexible exchange rate regime provides independence to Central Banks to formulate and independent monetary policy (Gilal et el., 2015a). Significant error correction term shows that on average 8 percent of deviation of net foreign assets from their equilibrium level is adjusted in each month.

## 5. Concluding Remarks

This paper evaluated the interaction between net domestic assets and net foreign assets using Johasnen-Juselius multivariate cointegration and vector error correction method for Pakistan for recently adopted free float exchange rate regime. The objective was to check how net foreign assets responded to changes in net domestic assets. Johansen-Juselius multivariate cointegration approach provides evidence of one cointegrating vector among the variables of interest. Normalized cointegrating vector obtained from VECM shows higher sensitivity of net foreign assets to changes in net domestic assets. Any change in net domestic assets resulted more than equal and opposite changes in net foreign assets. This finding casts doubt on the notion that free float exchange rate regime provides Central Banks autonomy to conduct an independent monetary policy. Other relevant determinants of net foreign assets in the country are interest rate differential and real income.

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[iv] See Borio et al. (2012) for policy implication of rise in international credit for monetary authorities.
[v] See Byrne and Fiess (2011) for (a) common components in capital flow data of emerging and developing countries, (b) stochastic trend in common component and idiosyncratic component, (c) drivers of global capital flows and (d) association of individual countries with common factors based on their institutional characteristics, financial openness and human capital.
[vi] See Jeanneau and Micu (2002) for reasons for increased international lending to Asia, Latin America and Eastern Europe from 1990 to 1997. Also see Arslan and Taskin (2014) on interaction between domestic credit and capital flows.
[vii] See currency crisis literature.
[viii] Refer to Montiel (1998) for survey of empirical literature on the determinants of capital inflows, policy response and macroeconomic implications for recipient countries.
[ix] See Bevan and Estrin (2004) for determinants of Western countries mainly European Union investment in Central and Eastern European countries.
[x] Real exchange rate is simply nominal exchange rate adjusted for foreign to home country inflation differential.
[xi] Phillips-Perron unit root test shows that all variables are $I(1)$ in levels and $I(0)$ in first difference.

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Table 1 ADF Test in log level and log first difference

| | Log Levels | | Log First Difference | |
|---|---|---|---|---|
| Variable | Constant | Constant and Trend | Constant | Constant and Trend |
| $id_t$ | -1.296793 | -2.519733 | -3.707075 [a] | -3.701648 [a] |
| $mpi_t$ | -0.845196 | -1.160555 | -3.593909 [a] | -3.904923 [a] |
| $nda_t$ | 0.125092 | -3.198644 | -2.147495 | -2.107924 |
| $nfa_t$ | -2.463774 | -2.062145 | -2.859529 [b] | -3.331216 [b] |
| $q_t$ | -0.342532 | -1.404942 | -3.473662 [a] | -3.360471 [b] |
| *5% critical values* | -2.880853 | -3.440263 | -2.880987 | -3.440471 |

Note: $a$ and $b$ denotes 5 and 10 percent significance level. First difference 5 and 10 percent significance values for constant and constant plus trend are -2.577219 and -3.144707 respectively. One sided 5 percent critical values are taken McKinnon (1996).

Table 2 Lag Length Criterion

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 707.4850 | NA | 3.01e-11 | -10.03550 | -9.930441 | -9.992807 |
| 1 | 1770.450 | 2034.819 | 1.10e-17 | -24.86358 | -24.23322* | -24.60742* |
| 2 | 1791.972 | 39.66105 | 1.15e-17 | -24.81388 | -23.65824 | -24.34426 |
| 3 | 1808.944 | 30.06472 | 1.30e-17 | -24.69920 | -23.01826 | -24.01611 |
| 4 | 1851.510 | 72.36332 | 1.02e-17* | -24.95015* | -22.74392 | -24.05360 |
| 5 | 1871.715 | 32.90538 | 1.10e-17 | -24.88165 | -22.15012 | -23.77164 |
| 6 | 1885.494 | 21.45580 | 1.31e-17 | -24.72135 | -21.46453 | -23.39788 |
| 7 | 1898.882 | 19.88955 | 1.58e-17 | -24.55545 | -20.77334 | -23.01852 |
| 8 | 1913.178 | 20.21912 | 1.90e-17 | -24.40254 | -20.09514 | -22.65214 |
| 9 | 1931.686 | 24.85330 | 2.16e-17 | -24.30980 | -19.47710 | -22.34593 |
| 10 | 1970.343 | 49.14967 | 1.87e-17 | -24.50490 | -19.14691 | -22.32757 |
| 11 | 2005.177 | 41.80136* | 1.73e-17 | -24.64539 | -18.76211 | -22.25460 |

Note: * indicates lag order selected by the criterion. LR refers to sequential modified Likelihood Ratio test statistic (each test at 5% level). FPE, AIC, SC and HQ denote Final Prediction Error, Akaike Information Criterion, Schwarz Information Criterion and Hannan-Quinn Information Criterion respectively.

Table 3 Johansen Cointegration Test

| $\lambda_{Trace}$ Rank Test | | | |
|---|---|---|---|
| $H_0 : r = r_0$ | $H_1 : r \geq r_0$ | $\lambda_{Trace}$ | 95% Critical Values |
| $r = 0$ | $r \geq 0$ | 76.697 [a] | 69.819 |
| $r \leq 1$ | $r \geq 1$ | 31.702 | 47.856 |
| $r \leq 2$ | $r \geq 2$ | 18.047 | 29.797 |
| $r \leq 3$ | $r \geq 3$ | 6.979 | 15.495 |
| $r \leq 4$ | $r \geq 4$ | 1.433 | 3.842 |
| **$\lambda_{Max}$ Rank Test** | | | |
| $H_0 : r = r_0$ | $H_1 : r = r_0 + 1$ | $\lambda_{Trace}$ | 95% Critical Values |
| $r = 0$ | $r = 1$ | 44.995 [a] | 33.877 |
| $r \leq 1$ | $r = 2$ | 13.655 | 27.584 |
| $r \leq 2$ | $r = 3$ | 11.069 | 21.132 |
| $r \leq 3$ | $r = 4$ | 5.545 | 14.265 |
| $r \leq 4$ | $r = 4$ | 1.434 | 3.841 |

**Note:** $a$ denotes 95% significance level. $r$ shows number of cointegrating vectors or cointegrating relations. Null and alternative hypothesis are denoted by $H_0$ and $H_1$.

Table 4 Normalized Cointegrating Vector (VECM).

| $nfa_t$ | Constant | $id_t$ | $mpi_t$ | $nda_t$ | $q_t$ | Ect(-1) |
|---|---|---|---|---|---|---|
| 1.000 | -17.379 | -0.644 | -1.687 | 1.847 | 1.641 | -0.081 |
| | | (-3.051) [a] | (-1.901) [b] | (3.032) [a] | (0.799) | (-6.461) [a] |

Note: *a* and *b* denote 5 and 10 percent significance level.