Trends and Volatilities in International Capital Flows for Developing Countries

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Abstract: Flows of international capital to developing countries have fluctuated substantially over the last three decades. Empirical evidence concerning the main causes of international capital flows is, in general, mixed. There is strong support for the 'push' view that external factors have been important in driving capital inflows to emerging markets. However, the apparent importance of 'push' factors does not preclude the relevance of 'pull' phenomena. 'Pull' factors may be necessary to explain the geographic distribution of capital flows over time. This paper compares trends and volatilities in international capital flows for nine representative developing countries. During the 1970-90, international capital flows were mainly in the form of bank lending directed to governments and/or to the private sector. In the 1990s, capital flows took the form of foreign direct investment and portfolio investment, including bond and equity flows. The purpose of the paper is to examine the nature of foreign direct investment and portfolio investment, both of which help to finance investment and stimulate economic growth in the developing world.

Keywords: Foreign direct investment flows; portfolio investment flows; total flows; trends; volatilities

1. INTRODUCTION

Capital flows from rich to poor countries are worth examining for several reasons. Foreign capital can finance investment and stimulate economic growth, thereby smoothing out consumption and increasing the standard of living in the developing world. Capital flows can help developed countries achieve a better international diversification of their portfolios, and provide support for pension funds and retirement accounts into the future. However, large capital inflows tend to cause rapid monetary expansion, inflationary pressure, real exchange rate appreciation, and widening current account deficits in the recipient countries [Calvo et al., 1996]. These undesirable macroeconomic effects render the economy more vulnerable to foreign shocks. When the inflow of foreign capital is interrupted, the economy experiences reverse adjustments in the current account and real exchange rate. The process of adjustment to adverse shocks in capital movements can be painful, as dramatized by episodes of debt crises [Kim, 2000].

The factors that affect international capital flows can be characterized as internal to the economies receiving the flows (pull factors), external to those economies (push factors), or both. Internal factors include increases in creditworthiness as a result of macroeconomic stabilization, widespread liberalization of financial markets, and successful resolution of the debt problem. This 'pull' story leads to the optimistic view that the sustainability of these flows is, to a large extent, a function of domestic policies, which are under the control of developing countries. On the other hand, external factors include an increased availability of financial capital with a sustained decline in the world interest rate and recession in industrial economies. This 'push' story leads to the concern that these flows are highly volatile because they are subject to factors beyond the control of policy-makers [Fernandez-Arias, 1996].

The plan of the paper is as follows. Section 2 provides a quantitative classification of empirical international capital flows models. Various theoretical and empirical model specifications used in the literature are reviewed analytically and empirically in Section 3. A comparison of trends and volatilities in international capital flows for nine representative developing countries in 1977-2001 is given in Section 4. Some concluding remarks are presented in Section 5.

2. CLASSIFICATION OF MODELS OF INTERNATIONAL CAPITAL FLOWS

For purposes of evaluating the significance of empirical models of international capital flows, it is necessary to analyse such models according to established statistical and econometric criteria. The

primary purpose of each of these empirical papers is to evaluate the practicality and relevance of the economic, financial and political theories pertaining to international capital flows.

This paper reviews 30 published empirical studies on international capital flows [a subset of these papers is discussed in Hoti, 2001a]. A classification of the empirical papers is given according to the model specifications examined, the choice of dependent and explanatory variables considered, the number of explanatory variables used, issues concerning the recognition, type and number of omitted explanatory variables, and the number and type of proxy variables used when variables are omitted.

Scrutiny of the ECONLIT software package and the Social Science Citation Index for the most widely cited articles in the International Capital Flows literature yields at least 30 published empirical papers over the last decade in refereed journals (the first paper was published in 1991). The leading journals in the literature on international capital flows are World Bank Policy Research Working Paper Series (9 papers), Journal of Development Economics (4 papers), World Development (4 papers), World Bank Economic Review (3 papers), IMF Staff Papers and Working Papers (2 papers), Journal of International Money and Finance (2 papers), Multinational Business Review (2 papers), and 4 other journals each publishing one paper on the topic. For further details, see Hoti [2001b].

3. THEORETICAL AND EMPIRICAL MODEL SPECIFICATIONS

The general international capital flows model is typically given as:

$$f(Y_t, X_t, u_t; \beta) = 0 \qquad (1)$$

in which $f(.)$ is an unspecified functional form, Y is the designated (vector of) endogenous variables, X is the (vector of) exogenous variables, u is the (vector of) errors, β is the vector of unknown parameters, and $t = 1,...,n$ in the number of observations. As will be discussed below, equation (1) is typically given as a linear or log-linear regression model, or as a VAR model. The elements of Y and X will also be discussed below. Defining the information set at time $t-1$ as $I_{t-1} = [Y_{t-1}, Y_{t-2}, Y_{t-3}, ...; X_t, X_{t-1}, X_{t-2}, X_{t-3} ...]$, the assumptions of the classical model are typically given as follows:

(A1) $E(u_t) = 0$ for all t;
(A2) Constant variance of u_t;
(A3) Serial independence (namely, no covariation between u_t and u_s for $t \neq s$);
(A4) X is weakly exogenous (that is, there is no covariation between X_t and u_s for all t and s);
(A5) u is normally distributed;
(A6) Parameters are constant;
(A7) Y and X are both stationary processes, or are cointegrated if both are non-stationary.

There is, in general, little or no theoretical basis in the literature for selecting a particular model. In empirical analysis, however, computational convenience and the ease of interpretation of models are primary considerations for purposes of model selection. Of the 44 models given in the 30 studies and reported in Table 1, all but ten are univariate models.

Table 1: Classification by Type of Model*

Model	Frequency
Linear single equations	16
Log-linear single equations	5
VAR model	5
AR model	3
Probit	3
Tobit	2
Error correction model	2
Simultaneous equation system	2
Other**	6
TOTAL	44

*More than one model was used in some studies.
**Includes one entry for each of bivariate probit, logit, multinomial logit, log-linear two-equation system, state space form equations, and cointegrating single equation.

The most popular model in the literature is the linear single equation model, which is used 16 times, followed by the log-linear single equation model and the VAR model, each of which is used 5 times. Both the probit and the AR model are used 3 times, while the Tobit model, error correction models, and simultaneous equation system models are used twice each. Thus, most of the models used in the literature are linear or log-linear single-equation models.

The dependent variable for purposes of analysing international capital flows is broadly classified as the amount of capital flowing from one country to another. Of the different types of dependent variables used, with more than one dependent variable being used in some studies, the most frequently used variable is capital flows, which is used 71 times. This dependent variable is defined as net, gross or change in total, official, private, and bilateral flows; portfolio capital (bond and equity) flows; foreign direct investment flows (or a binary variable for foreign direct investment); short-, medium- and long-term debt and equity flows; and lending commitments.

There are two types of explanatory variables used in the various empirical studies, namely economic and financial variables on the one hand, and socio-political variables on the other.

Table 2: Classification by Number of Economic and Financial Explanatory Variables*

Number	Frequency
2	2
3	2
4	1
5	6
6	2
8	3
9	3
10	1
12	4
13	2
14	1
17	1
19	1
30	1
TOTAL	30

*Country risk and intellectual property indicators are treated as economic and/or financial variables.

Treating country risk and intellectual property indicators as economic and/or financial variables, and regional differences as socio-political variables, Tables 2 and 3 present the numbers of each type of variable and their frequency.

Table 3: Classification by Number of Socio-political Explanatory Variables*

Number	Frequency
0	17
1	5
2	3
4	1
5	1
6	2
8	1
TOTAL	30

*Regional and geographical differences are treated as socio-political variables.

In Table 3, the absence of any socio-political variable occurs 17 times in the 30 studies. Hundreds of different economic, financial and socio-political explanatory variables have been used in the 30 separate studies.

The unavailability of the required data means that proxy variables have frequently been used in place of the unobserved variables. Tables 4 and 5 are concerned with the important issue of omitted explanatory variables in each of the 30 studies. It is well known that, in general, omission of relevant explanatory variables from a linear regression model yields biased estimates of the coefficients of the included variables, unless the omitted variables are uncorrelated with each of the included explanatory variables. In some studies, there is an indication of the various types of variables that are recognised as being important. Nevertheless, some of these variables have been omitted because they are simply unavailable. The classification in Table 4 is by recognition of omitted explanatory variables, where the recognition is explicitly stated in the study. Such an explicit recognition of omitted explanatory variables is used primarily as a check of consistency against the number of proxy variables used.

Table 4: Classification by Recognition of Omitted Explanatory Variables*

Number Omitted	Frequency
0	11
1	6
2	5
3	4
4	2
5	1
8	1
TOTAL	30

*The classification is based on explicit recognition of omitted explanatory variables, and is used primarily as a check of consistency against the number of proxy variables used in the corresponding studies.

The classification in Table 5 is given according to the type of omitted explanatory variable, which is interpreted as predominantly economic or socio-political. Virtually all of the omitted explanatory variables are economic in nature, with only 6 of the 49 omitted variables in total being predominantly socio-political.

Table 5: Classification by Type of Omitted Explanatory Variables*

Omitted Variable	Frequency
Economic Factors	43
Socio-political Factors	6
TOTAL	49

*The various omitted variables are classified according to whether they are predominantly economic or socio-political in nature.

As some important economic, financial and socio-political explanatory variables have been omitted from 19 of the 30 studies (see Table 4), proxy variables have been used in all but one of these studies. Tables 6 and 7 are concerned with the issues of the number and type of proxy variables used. A comparison with Table 4 shows that the results in Table 6 are reasonably similar.

Table 6: Classification by Number of Proxy Explanatory Variables Used*

Number	Frequency
0	1
1	2
2	6
3	3
4	3
5	2
6	1
8	1
TOTAL	19

*One study explicitly recognized the omission of explanatory variables but used no proxy variables.

The classification in Table 7 is given according to the type of proxy variable used. Virtually all of the proxy

variables are predominantly economic in nature, with the remaining 8 of 59 proxy variables being predominantly socio-political, which is very similar to the results given in Table 5.

Table 7: Classification by Type of Proxy Explanatory Variables Used*

Proxy Variables	Frequency
Economic factors	51
Socio-political factors	8
TOTAL	59

*Some studies used both economic and socio-political variables.

4. COMPARISON OF TRENDS AND VOLATILIES IN INTERNATIONAL CAPITAL FLOWS

Quarterly seasonally adjusted data on international capital flows, comprising foreign direct investment (FDI) and portfolio investment (PI), were taken from the International Monetary Fund, International Financial Statistics (CD-Rom). Total international capital flows, designated "Total", is given as Total = FDI + PI.

Nine developing countries, namely Argentina, Brazil, Hungary, Indonesia, Mexico, Pakistan, Philippines, Russia and Slovenia, are selected as being representative of Latin America, Asia, and Eastern Europe. Data for Argentina, Brazil and Mexico are available for the period 1977(1) - 2001(2), 1979(1) - 2001(2), and 1979(1) - 2000(4), respectively. Data for Indonesia, Pakistan and Philippines are available for 1981(1) - 2001(1), 1984(1) - 2001(1), and 1977(1) - 2001(1), respectively. Data for Hungary, Russia and Slovenia are available for 1993(1) - 2001(2), 1994(1) – 2001(2), and 1992(1) – 2001(2), respectively.

Table 8: Descriptive Statistics for International Capital Flows (USD Millions)

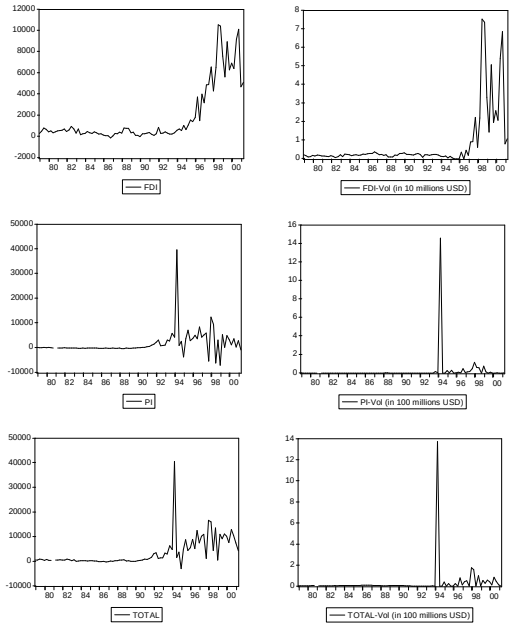
	FDI			PI			TOTAL		
Country	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV
Argentina	911	1750	1.92	856	3088	3.61	1776	3265	1.84
Brazil	1858	2745	1.48	1639	5010	3.06	3512	5843	1.66
Hungary	570	609	1.07	379	647	1.71	950	848	0.89
Indonesia	221	661	2.99	105	1085	10.3	335	1600	4.78
Mexico	1332	1157	0.87	998	2825	2.83	2330	3124	1.34
Pakistan	90	70	0.78	43	147	3.42	134	167	1.25
Philippines	165	207	1.25	190	512	2.69	389	598	1.54
Russia	672	414	0.62	435	3119	7.17	1107	3208	2.90
Slovenia	50	38	0.76	78	161	2.06	133	158	1.19

Three descriptive statistics, namely mean, standard deviation (SD) and coefficient of variation (CV = SD/mean), for FDI, PI and Total, expressed in millions of US dollars, are given in Table 8. The SD is frequently taken as an indicator of the risk associated with fluctuations in a particular financial variable over time, and CV allows a comparison to be made for SD associated with different means. Indonesia clearly has the most variable FDI, followed by Argentina, Brazil and the Philippines. Russia has the least variability in FDI, followed by Slovenia, Pakistan and Mexico. The variability in PI differs from that of FDI, with Indonesia being most variable, followed by Russia, Argentina, and Pakistan. The least variable PI is exhibited by Hungary, followed by Slovenia, Philippines and Mexico. Even though FDI comprises more than half of the total international capital flows for all countries apart from Philippines and Slovenia, the CV for Total reflects the CV of both FDI and PI. Hence, the most variable countries in Total are Indonesia, Russia, Argentina and Brazil, while the least variable are Hungary, Slovenia, Pakistan and Mexico.

Time series variations in the international capital flows for six of the nine countries are given in Figures 1-6. The data for Argentina, Philippines and Slovenia are available on request. In addition to the FDI, PI and Total international capital flows, the figures include the volatilities of each of these series, where volatility is defined as the squared deviation of each observation from the sample mean.

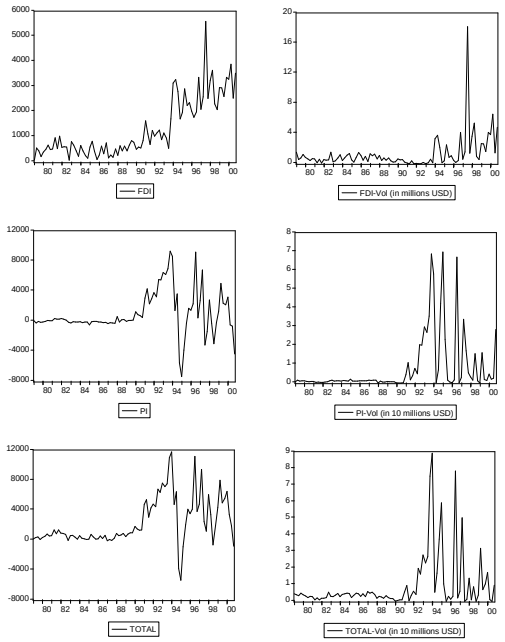
Until 1992, there was little variation, and hence little volatility, in the Total international capital flows and its two components for Brazil (see Figure 1). An extreme observation occurred in PI, and hence in Total, in 1994, which is reflected in an extreme volatility for this observation. The fluctuations in FDI, and hence in its volatility, are not suggestive of outlying effects. Although not given here, the pattern of variation in PI and Total for Argentina, as well as their respective volatilities, mirror those of Brazil. However, there is an outlying observation in FDI for Argentina in 1999, which is reflected in its volatility for this observation.

Figure 1: International Capital Flows for Brazil



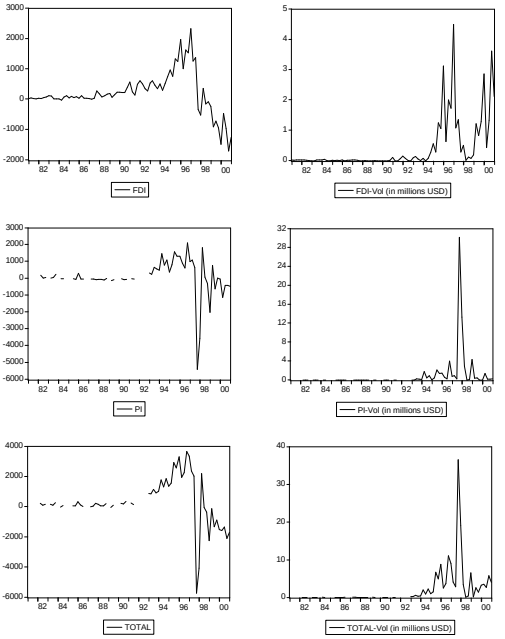
In Figure 2, it can be seen that Mexico has a similar pattern to Brazil and Argentina with regard to fluctuations in PI and Total, and in their volatilities. However, two significant differences are worth noting for Mexico: (i) there was a significant outflow of PI in 1994 associated with the peso crisis; and (ii) there is an outlying observation for FDI in 1997.

Figure 2: International Capital Flows for Mexico



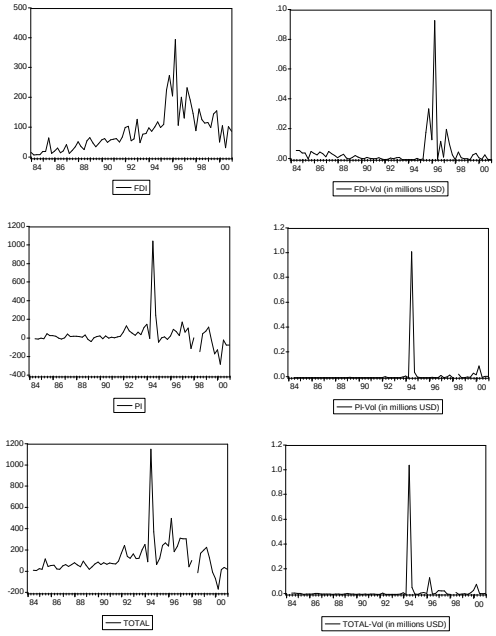
Two of the three Asian countries are given in Figures 3 and 4. There are some missing observations for PI, and hence Total, for Indonesia in Figure 3.

Figure 3: International Capital Flows for Indonesia



Although not given here, there are also several missing PI observations for the Philippines. Until 1992, there were only minor fluctuations in PI and FDI for Indonesia and the Philippines.

Figure 4: International Capital Flows for Pakistan



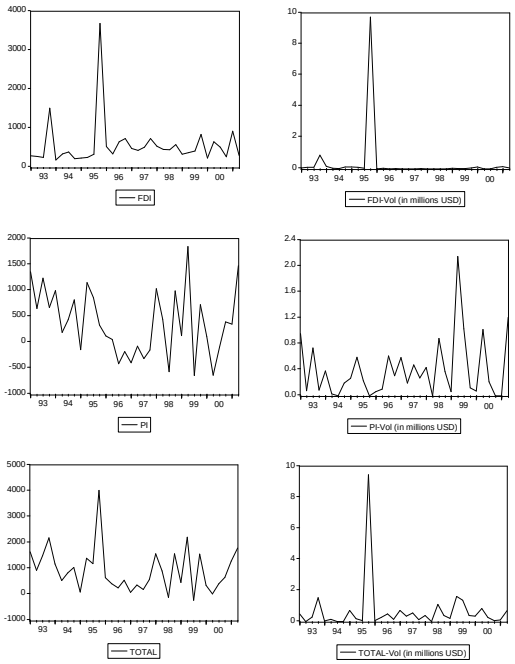
After the Asian financial and economic crises of 1997, FDI decreased steadily for several years in Indonesia, whereas PI decreased dramatically in 1997-98. The volatility in Total reflects that in PI for both Indonesia and the Philippines.

As shown in Figure 4, Pakistan did not have any dramatic outflows in either FDI or PI. However, there was an outlying FDI observation in 1996, and an outlying PI observation in 1994. The pattern in Total international capital flows, and its volatility, is virtually identical to that of PI for Pakistan.

There are far fewer observations for the three developing Eastern European countries. Although not given here, there are numerous missing observations for PI, and hence Total international capital flows, for Slovenia for the period 1992-95.

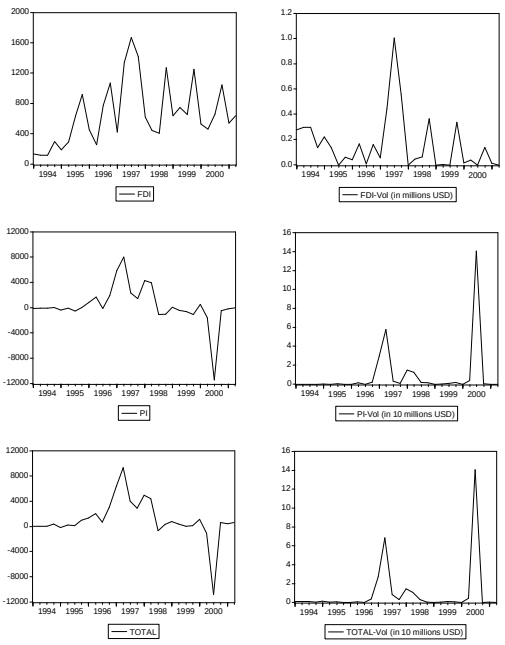
The fluctuations in FDI for Hungary, as given in Figure 5, are fairly low. There is an outlying observation in FDI in 1995, which is reflected in an outlying volatility. On average, the fluctuations in PI tend to be more positive than negative. However, the associated volatilities for PI do not seem to contain any outlying observations. Although the pattern of variation in Total differs from that of FDI, the volatility in Total international capital flows is dominated by the same outlying observation in 1995.

Figure 5: International Capital Flows for Hungary



The variations in FDI, PI and Total international capital flows for Russia are shown in Figure 6. Substantial variations in FDI are reflected in their volatilities, with a possible outlying observation in 1997. The fluctuations in PI are mirrored in the Total, with dramatic outflows of PI in 2000. This outflow is likely an outlying observation, as is the significant inflow in 1997.

Figure 6: International Capital Flows for Russia



5. CONCLUDING REMARKS

This paper evaluated the significance of 30 published empirical papers in the international capital flows literature according to established statistical and econometric criteria. Trends and volatilities in international capital flows for nine representative developing countries for 1977-2002 were compared. Such an evaluation permits a critical assessment of the relevance and practicality of the economic, financial and political theories pertaining to international capital flows.

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