A Portfolio-Balance Analysis of Relationship between Different Types of Private Flows to Developing countries

By

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Key Words: Direct Investment, Portfolio Investment, Developing Countries

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Abstract

This paper investigates whether foreign direct and portfolio investment in developing countries are perfect substitutes as was found earlier for total U.S. capital outflows. It uses a portfolio balance model to regress U.S. portfolio foreign investment in developing countries on U.S. direct foreign investment there, and investment in the U.S. from developing countries. We conclude that portfolio investment rather than being a substitute, is complementary to direct investment: one dollar increase in U.S. direct investment in developing countries increases portfolio investment there by 48 cents. Capital flows to developing countries are not fungible, and composition of such flows matters.

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1. Introduction

External finance for developing countries[1] can come from one of the following four sources: i) official loans and grants, ii) private debt including commercial bank loans, bonds issued by developing countries in industrial countries, and export credits, iii) foreign direct investment (FDI), and iii) portfolio equity investment. Traditionally, official loans and grants have been . However, there have been significant changes in the composition of external finance to developing countries in recent years.

First, FDI flows to developing countries have increased at very high rates since 1986 with the annual average rate of increase being 31%. The result is that by 1993 FDI became the largest single source of external finance for developing countries. Second, since 1990 both foreign portfolio equity investments in these countries and bonds issued by developing countries in industrial countries have increased by truly amazing rates-. by a factor of approximately ten. This increase, and the tripling of FDI inflows since 1990, has meant that total private capital flows to developing countries are now approximately four times what they were just nine years back (in 1990) - even though official flows have fallen during this period. The result is that private flows now constitute approximately 78% of all external finance flows to developing countries.[2]

However, despite their overwhelming importance, not enough attention has been paid to studying the effects of these types of private capital flows; or to analyze interrelationships between different kinds of these inflows. In the rest of this section, we first review the recent literature on both overall private capital and FDI and portfolio flows to developing countries. Then, we summarize the questions we will seek to answer in this paper.

Ghosh and Ostry (1993) test whether capital flows to developing countries are determined by economic fundamentals or by purely speculative forces. They use an inter-

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[1] In this paper, countries classified as low or middle income for the whole of 1979-1998 by the World Bank (in either of its two publications World Development Report and World Debt Tables/Global Development Finance) are termed developing countries.

[2]The information in these two paragraphs is based on World Bank (2000).

temporal optimizing approach. Economic fundamentals are indeed found to be the most important determinant of capital flows to developing countries. On the other hand, Calvo, Leidernian and Reinhart (1993) show that "push" factors (external or erogenous developments) had been more important in explaining the capital inflows to Latin America than "pull" factors (internal policy reforms).

Paper and proceedings of two major conferences on portfolio flows to developing countries have been published as volumes edited by Claessens and Gooptu (1993) and Frankel (1994), respectively. The former was organized into the following parts: issues, trends, and prospects of portfolio flows, benefits to industrial and developing countries, barriers to portfolio flows and security design and policy implications for developing countries. The second volume deals with, among others, international capital asset pricing model, foreign equity transactions in U.S. portfolios, Links and spillovers among, financial and equity markets around the pacific rim, etc.

Kant (1996) analyzes the relationship between foreign direct investment and capital flight. He concludes the following: i) FDI inflows are always associated with a reduction in capital flight, ii) Capital flight is primarily caused by general economic mismanagement rather than by favorable treatment of foreign capital, and iii) a wider rather than a narrower measure from the bewildering measures and concepts of capital flight that have been used in the literature is more appropriate. Goldfajn and Valdes (1997) use a three-period, three agents (investors, financial intermediaries, and central bank) model and show intermediaries' role of transforming maturities results in larger movements of capital and higher probability of crisis.

The above literature review reveals little work on the interrelationships of different components of private flows to developing countries; i.e. whether, and how FDI and portfolio flows to developing countries are themselves related. One paper on the relative volatility of different types of private flows to developing countries is by Claessens, Dooly and Warner (1995) who find what a flow is labeled, whether short term or long, term, has no bearing on its time series properties.

Capital inflows of any kind (if unaccompanied by an equal current or capital outflow, or an equivalent sterilization) cause real exchange appreciation. Balance of Payments (BOP) statistics record exchange of value between residents and non-residents rather than exchange of payment. Thus, reinvestment of earnings is considered a capital inflow in the BOP statistics. Since such a capital inflow does not pass through the foreign exchange market, it

does not cause exchange rate appreciation. If reinvested earnings are a more important part of FDI, then real exchange rate appreciation attendant with FDI inflow will also be smaller.

FDI involves a financial transaction in the first instance. Still, the control element inherent in FDI ensures that the FDI investor also takes some real decisions (say, on real output). Since portfolio investment is a pure financial investment, there is no presumption of any real investment accompanying it automatically. Thus, we may expect that FDI is linked to capital formation to a greater extent than portfolio investment.

However, in spite of the expected differences, as far as one can tell, there does not seem to be any formal study that compares the effects of FDI and portfolio inflows to developing countries in a unified framework. Further, any or all of the different effects can continue without dilution only if these flows are not substitutes for each other. However, Ruffin and Rassekh (1986) find that FDI and portfolio outflows from the U. S. are perfect substitutes! If so, additional, FDI (portfolio) flow neither adds to capital formation nor does it provide additional current account financing. Thus, this question has important policy implications.

Ruffin and Rassekh's intuitive explanation relies on non-firm-specific multinational firm capital, and full integration of capital markets in the U. S. and foreign countries. Then, a dollar of investment temporarily disturbs home and foreign capital markets raising interest rates at home and lowering them abroad. To restore equilibrium portfolio investment abroad falls by exactly one dollar.

However, as noted by Geert Bekaert (1995), developing countries' capital markets are not globally well integrated for the following reasons: poor credit ratings, high and variable inflation, exchange rate controls, lack of a high-quality regulatory and accounting framework, and of sufficient country fimds, and the limited size of some stock markets. Further, Wilfted Ethier (1986) concludes that firm-specific (or internal) transactions is the singular characteristic distinguishing multinational's transactions from the (usual) inter-firm transactions. Hence, FDI and portfolio investments in developing countries are unlikely to be perfect substitutes.

The main task of this study is to empirically establish this last conclusion with the help of the same portfolio-balance model as that used by Ruffin and Rassekh (1986). We will also examine the exact degree or extent of substitutability or complementarily between direct and portfolio foreign investment in developing countries. The model and hypotheses are described in the next section.

2. Model and Hypotheses:

A portfolio balance model is used for the following reasons. According to the internalization hypothesis, MNFs come into being to internalize returns to their ownership-specific assets (Hood and Young, 1979). For example, specific inputs like R & D, advertising, marketing, distribution, management, finance, trade secret, patent and organization could be ownership-specific. In fact, it is the ownership of these inputs that enables the MNF to produce and compete effectively in distant countries with deferent industrial relations, legal system, culture and 1anguage. Thus, a host of microeconomic factors (mostly unobserved) dealing with the economics of industrial organization explain the establishment of an MNF.

Similarly, the financial decisions of MNFs involve a variety of microeconomic variables involving the details of corporation finance. Explanation of these financial decisions will have to be cross-sectional in nature, drawing on the individual characteristics of different companies. If FDI is a function of many unobserved microeconomic variables, which are uncorrelated with the relevant macroeconomic variables, aggregate FDI will be erogenous in a time-series analysis of the portfolio balance model. Thus, if we include FDI as an explanatory variable in an equation that otherwise accounts for portfolio investment, we can test the relationship, if any, between FDI and portfolio investment.

Model:

In a world of uncertainty, home and foreign investments will be imperfect substitutes. Let r represent the real rate of return to domestic investment; it is then defined by:

$$r = (i - n)/(1 + n), \qquad (1)$$

where i is the nominal interest rate and n is the expected inflation rate in the home country. Similarly, let r* denote the real rate of return domestic residents earn by covered investment in the foreign country; then r* is

$$r^* = [(1 + i^*)F/(1 + n)S] - 1, \qquad (2)$$

where i* is the appropriate foreign nominal interest rate, and F and S are forward and spot exchange rates on the date of investment. The forward rate is for delivery of the foreign currency on the maturity date of foreign investment.[3]

[3] Using the forward exchange rate to calculate the return U.S. investors earn in the foreign country implies that covered interest parity condition holds between U.S. and foreign countries.

Let Z^L denote the real quantity of private assets (held by U.S. private agents in developing countries; similarly, Z* is the real quantity of private assets owned by foreign residents in the U.S.; W the quantity of U.S. real financial wealth and y its real income. The modified version of the portfolio balance model used here is

$$Z^L = F(r, r^*, W, Z^*). \quad (3)$$

The variable r* in equation (3) is a vector and Z* is added as an explanatory variable to capture any link between capital imports and capital exports to and from the U. S.

Money market equilibrium is incorporated in the model as follows. Per the standard theory, the demand for real money balances, L, depends on real income, y, and the nominal interest rate, i. Further, from (1),

$$i = n + r + nr. \quad (1')$$

Thus, money market equilibrium holds in the home country when

$$m = L(i, y) = L(n+r+nr, y) \quad (4)$$

where m is the exogenously given real money supply. Combining Equations (1), (3) and (4), we get

$$Z^L = Z(n, r^*, m, y, W, Z^*). \quad (5)$$

Equation (5) cannot be estimated as it stands. A simple solution is to linearize (5) by taking first differences[4], that is,

$$dZ^L = Z_n dn + Z_{r^*} dr^* + Z_m dm + Z_y dy + Z_w dW + Z_{Z^*} dZ^*, \quad (6)$$

where the symbols Z with various subscripts represent the partial derivatives with respect to the variable in the subscript, while the d_ expressions are the first differences of the respective variables.

Specific Hypotheses:

The final regression equation that will be estimated can now be stated. Separate dZ^L into its two components: $dZ^{Lp} + dZ^{Ld}$, where Z^{Lp} and Z^{Ld} are portfolio and direct investment (respectively) from the U. S. in developing countries; and keep only dZ^{Lp} on the left hand side. Then, the final form of (6) can be stated as

$$dZ^{Lp} = a_0 + a_1 dn + a_2 dr^* + a_3 dm + a_4 dy + a_5 dW + a_6 dZ^{Ld} + a_7 dZ^* + a_8 dG^e + a_9 dI + u. \quad (7)$$

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[4]We will see below that taking first differences also makes the non-stationary variables stationary.

A constant term is added to capture the effects of omitting variables with a time trend; u is the error term. The expected real price of gold, G^e, is added as a variable to serve as a proxy for speculation. The last variable, index of globalization, I, is added because both direct and portfolio flows may have been influenced by increasing globalization of the world economy during the estimation period.

The coefficient of special interest is a_6. If it is negative, portfolio flows substitute for FDI flows. Further, greater its absolute magnitude greater is the extent of substitutability. On the other hand, if a_6 is positive, the two flows are complementary, with the magnitude again giving us the strength of now positive relationship. An increase in U.S. real GDP and/or in the real expected price of gold will decrease U.S. portfolio investment abroad. On the other hand, the effect of each of the other right hand side variables on Z^{Lp} can be expected to be positive.

3. Data and Estimation:

The model is estimated using quarterly data from 1979:I to 1998:IV. The Survey of Current Business (published by the U.S. Department of Commerce's Bureau of Economic Analysis) in its December issue publishes changes in the U.S. international investment position on a quarterly basis by geographical areas. Both FDI and portfolio investments are separately covered. Data on both U.S. investments abroad and foreign investments in U.S. by area are presented. Although historical data by some other geographical groupings [for example, EC(6), EC(9) and later EC(12)] are also reported, relevant areas for our purposes are Western Europe, Canada, Japan, Australia, Eastern Europe, Latin America, other Asia and Africa, and Others. FDI and portfolio investment data for the last four areas listed are combined to yield the developing countries total.

One issue concerns countries included in the vector of foreign real interest rates: we limited ourselves to a few representative developing countries. The following criteria was used to choose such countries: a) the U.S. had substantial investments in those countries, b) they did not suffer hyperinflation during the estimation period, c) they had more flexible exchange rates, d) and for which forward exchange rate information was available. On these criteria, Mexico and Korea are chosen.[5]

[5] Other than tax haven countries (Bahamas, Bermuda, British West Indies, and Netherlands Antilles) U.S. had substantial investments in the following countries also: Argentina, Brazil, Chile, and Colombia. See various issues of U.S. Treasury Bulletin. Of

The information on total private financial wealth in the U.S. is obtained from the Balance Sheets for the U.S. Economy published by the Board of Governors of the Federal Reserve System. The rest of the data, viz. U.S. GDP, money supply measures, consumer price index (CPI), spot exchange rates, foreign interest rates, and gold price are obtained from either the International Financial Statistics or the Federal Reserve Web-site. All relevant variables are measured in real terms.

One variable that is derived from other data is the index of globalization, I. Following Obstfeld (1998), the sum of absolute values of current account balances of fifteen largest economies divided by the sum of their GDPs is used as the index of globalization. Since current account balance equals either foreign lending or foreign borrowing, use of this index in the regression should tell us whether the expected increase in relative global lending/borrowing affected portfolio flows from the U.S. to developing countries.

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these countries, Brazil suffered from hyperinflation during this period, Argentina's currency was pegged to U.S. dollar at least since 1993 (see Exchange Rate Arrangements pages of IMF's International Financial Statistics), and forward exchange rate information for Chile and Columbia is not available.

Estimates of expected inflation are needed both directly in the equation, and indirectly in the r* variables. First, inflation rate for each quarter is computed from the CPI data. Then, Box-Jenkins techniques are used to estimate the expected inflation rate. Identification stage and tests for non-stationarity indicated that U.S. inflation rate was stationary. Different ARMA models are fitted to the inflation rate since 1977. Following Enders (1994), the model with the lowest AIC and SBC statistics among those whose Ljong-Box-Pierce statisitc (Q-statistic) was insignificant at all meaningful lags is selected.[6] This model, ARMA (1, 3), also had R^2 and adjusted R^2 that were among the highest (.7634 and .7524, respectively), and it converged after 22 iterations.[7] Since we a) use quarterly data and b) to compute real interest rates generally use nominal interest rates on instruments 90-days maturity, the expected inflation rate is defined as the one-step ahead forecasted inflation rate from the fitted time-series model.

Expected rather than current gold price is used in the regression since the objective is to account for speculation. Similar Box-Jenkins techniques are used to forecast the expected gold price. ARMA (2, 2) model was chosen on the bases of low AIC and SBC values among models with insignificant Ljong-Box-Pierce statistic at all meaningful lags. This model's R^2 and adjusted R^2 are .8617 and .8550, respectively and it converged after 33 iterations.

The variable dZ* is endogenous, but it is difficult to specify a simple structural equation because at least three countries are involved. Similarly, dr* and dW may have endogenous elements, but it is again not easy to model them. Instead, Durbin-Wu-Hausman (DWH) test is used to examine whether endogenous elements in any of these variables make

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[6] The Q-statistic is insignificant with large p-values if there is no serial correlation in the residuals up to the lag specified for a particular value of the statistic. AIC, Akaike information criterion, and SBC, Schwartz Bayesian criterion respectively equal T ln(residual sum of squares) + 2n and T ln(residual sum of squares) + n ln(T), where T is the number of usable observations and n is the number of parameters estimated. Of these two, SBC will always select a more parsimonious model then AIC and has superior large sample properties. However, the selected model had both the lowest AIC and the lowest SBC values.

[7] If the model fails to converge rapidly, it indicates that the estimated parameters are unstable. The suggested maximum number of iterations is 50. Of the twelve models fitted two, ARMA (1,4) and ARMA (2,3), had both higher R^2 (.7663 and .7667) and adjusted R^2 (.7526 and .7530). Nevertheless, their AIC and SBC values were higher. Both because of their higher AIC and SBC values and an additional parameter, they can be expected to have lower forecasting performance.

the OLS estimators inconsistent. Following Pindyck and Rubinfeld (1996) and Davidson and MaCkinnon (1993), this test is described below. Let

$$Y = BX + U, \qquad (8)$$

where Y is a 1xT vector representing the dependent variable, B is a 1xk vector of coefficients, X is a kxT matrix of explanatory variables some of whom may have endogenous elements, and U is a 1xT vector of the error term. Because of correlation of X with U, estimation of (8) may not give consistent results.

DWH test first involves regressing the endogenous elements of X on a set of instruments. Let W be an hxT matrix of purely exogenous variables in X, and V a (k-h)xT matrix of variables in X that contain endogenous elements. The corresponding 1xh and 1x(k-h) coefficient vectors are B^W and B^V, respectively. Then,

$$Y = B^W W + B^V V + U. \qquad (8')$$

The first stage of this test is to regress each variable in V on W: W is an appropriate choice of instruments for each variable in V since W is known to be exogenous. Let the predicted or fitted values of V from these regressions be V^P so that the residuals, R, are:

$$R = V - V^P, \qquad (9)$$

where R is a (k-h)xX matrix.

The second stage of this test involves running an artificial regression of Y on V and R, i.e. using OLS on

$$Y = B^V V + B^R R + U, \qquad (10)$$

where B^R is the 1x(k-h) vector of coefficients on residuals from the first stage regressions. Under the null hypothesis, these coefficients should equal zero. Then, the DWH test is simply the *F* test for $B^R = 0$.[8]

As stated above, there are four variables suspected of having endogenous elements: Z*, r* for Mexico and Korea, and W. DWH test was performed on all four of these variables, all four combinations of three variables at a time, and all six combinations of two variables at a time. The null hypothesis of $B^R = 0$ (inconsistent OLS estimators) was rejected for three of the four combinations of three variables at a time, and four of the six combinations of two variables at a time. The regression with the highest adjusted R^2 and the least number of coefficients with wrong signs was chosen.

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[8] Alternatively, the second stage regression may be run on V and V^P, and performing an *F* test for coefficients on V^P to equal zero. The two tests will give identical results since they have the same SSR.

Regression Results:

As stated above, each nominal variable was deflated by CPI to get real values. Both Dicky-Fuller and Phillips-Perron tests for non-stationarity were applied to these variables and to globalization index. These tests indicated that the said variables were not stationary. However, they become stationary after we take their first differences. The first difference version of these variables was used in the regression. (Only expected inflation rate was stationary without first differencing, and was not differenced). Three measures of money supply, M1, M2, and M3, were alternatively used in the regression analysis. Regression with M3 gave the best result, and is presented in this paper. Applying OLS to the equation gave a DW statistic of 1.5363 which indicated the presence of positive serial correlation. Cochrun-Orcutt procedure was used to transform the model to remove serial correlation.

Table 1 summarizes the results from the final regression. The regression equation is significant at 1 % level. The coefficients generally have the right signs except for U.S. money supply, GDP, and expected inflation. The globalization index is significant at 12% level of significance. Total investment in the U.S. from developing countries and U.S. direct investment in such countries are highly significant: at .3% level and 1.2% levels of significance. In either case, the effect is positive. Thus, a dollar increase in these variables increases U.S. portfolio investment in developing countries. U.S. direct investment in developing countries, dZ^{Ld} , has the most significant and powerful effect on U. S. portfolio investment in that region. We can reject the hypothesis that U. S. portfolio investment in developing countries is independent of its direct investment there: but we cannot reject the hypothesis that the former complements the latter. Thus, a dollar increase in U.S. direct investment in developing countries increases portfolio investment there by 48 cents.

Although these two variables are complements, they are nowhere being perfect complements. U.S. direct investment in developing countries induces about half as much U.S. portfolio investment there. Thus, Ruffm and Rassekh's result that U.S. FDI substitutes, dollar for dollar, its foreign portfolio investment does not hold for developing countries. Rather, U.S. FDI has a magnifying effect on developing countries by inducing substantial portfolio investment there.

4. Implications and Significance

As stated above, FDI and portfolio inflows constitute the two most rapidly growing sources of external for developing countries; and FDI has been the largest single source since 1993. We have found that portfolio flows to developing countries are not perfect substitutes for FDI flows (as was found for total U. S. capital outflows). Thus, the specific composition of the private flows is relevant: a decrease in portfolio investment will not be made up by an equal increase m FDI inflows, and vice versa.

The next step would be to examine the time path and sequence of these two kinds of outflows to developing countries. We could examine whether direct investors in developing countries provide signals to portfolio investors, or is it vice-versa: i.e. is either of these two inflows the "follower"? If yes, does that flow remain the "follower" in the outward direction also? These questions have not been studied in earlier work on both overall private capital and FDI and portfolio flows to developing countries. Sudden reversal of portfolio (only?) flows in the case of some developing countries in recent years has already caused major financial crisis for those countries, as well as threatening domino-like effects on other economies and the global financial system. Thus, understanding fully the effects and relationships of these two types of private flows has considerable significance.

Table 1: Regression of dZ^{LP} on dZ^{Ld} and dZ*

Variable	Coefficient	Standard Error	t-Ratio
Constant	-948.42	1451	-0.653
Dn	-1107.6	750.4	-1.476
DrMex	.056	.073	.767
Dm	-16.866	13.31	1.267
Dy	3.9754	10.08	0.394
DW	3.4256	3.731	0.918
dZ^{Ld}	0.48183	0.1563	3.082
dZ*	0.60109E-01	0.2336E-01	2.574
DI	0.6896E+06	0.4369E+06	1.578
DG	-3.1296	6.716	-0.466

Note: Dependent Variable: dZ^{LP}; $R^2 = 0.5223$; Adj. $R^2 = 0.4591$

References

1. Bekaert, G., 1995, "Market Integration and Investment Barriers in Emerging equity Markets." World Bank Economic Review 9, 75-107.

2. Board of Governors of the Federal Reserve Board, (1999), Balance Sheets for the U.S. Economy. Washington, D.C.

3. Calvo, G. A., L. Leiderman, and C. Reinhart, 1993, "Capital Flows Latin America: The Role of External Factors." IMF Staff Papers 40, 108-51.

4. Claessens, S., M.P. Dooley, and A. Warner, 1995, "Portfolio Capital Flows: Hot or Cool?" World Bank Economic Review 9, 153-74.

5. Claessens, S. and S. Gooptu. eds., 1993, Portfolio Investment Developing Countries. Discussion Paper No. 228, The World Bank, Washington, D.C.

6. Davidson, Russell and James G. MacKinnon, 1993, Estimation and Inference in Econometrics. Oxford University Press.

7. Enders, Walter, 1994, Applied Econometric Time Series. John Wiley, New York.

8. Ethier,, W., 1986, "The Multinational Firm." Quarterly Journal of Economics 101, 805-33.

9. Frankel, J., ed., 1994, "Internationalization of Equity Markets." National Bureau of Economic Research, Cambridge.

10. Ghosh, A.R. and J.D. Ostry. 1993, "Do Capital Flows Reflect Economic Fundamentals in Developing Countries?" Working Paper No. WP/93/34, International Monetary Fund, Washington, D.C.

11. Goldfajn, llan and Rodrigo 0. Valdes, 1997, "Capital Flows and Twin Crises: The Role of Liquidity." Working Paper, 97/87, The International Monetary Fund, Washington, D.C.

12. Hood, N. and S. Young, 1979, The Economics of Multinational Enterprise. London: Longman.

13. International Monetary Fund, International Financial Statistics, various issues.

14. Kant, C., 1996, "Foreign Direct Investment and Capital Flight," Princecton Studies in International Finance, No.80. Princeton, New Jersey.

15. Obstfeld, Maurice, 1998, "The Global Capital Market: Benefactor or Menace?" Journal of Economic Perspectives 12, 9-30.

DATA APPENDIX

This appendix describes the variable definitions, data sources, and data manipulation to put them in the form required for estimation. Data are presented towards the end of this Appendix.

Variable Definitions and Data Sources

Z^{Lp} = Stock of U.S. portfolio investment in less developed countries, viz. Eastern Europe, Latin America, other Asia and Africa, and Others. Quarterly stocks constructed by using end of 1991 as the benchmark stock and adjusting backward and forward by quarterly U.S. investments (flows) in these regions. Source: Survey of Current Business, various issues. (The 1991 benchmark stock numbers were obtained from the June 1993 issue). Units: billions of dollars.

Z^{Ld} = Stock of U.S. direct investment in less developed countries. Source and units: same as Z^{Lp}.

Z^* = Stock of total investment by less developed countries in the U.S. Source and units: same as above.

Historical quarterly investment flow data from the U.S. to different geographical areas and vice versa was actually downloaded from the U.S. Commerce Department's web-site.

G^e = G^e was obtained by using Box-Jenkins procedures on gold price, G, as described in the text.

G = London gold bullion price. Source: International Financial Statistics (IFS). Units: dollars per fine ounce.

m = U.S. M3. Source: IFS. Units = billions of dollars.

y = U.S. GDP in current prices taken from IFS. Units: billions of dollars.

CPI = U.S. Consumer Price Index, 1999 = 100. This variable is used to deflate the nominal variables and to calculate the U.S. inflation rate. Source: IFS.

n = Expected inflation rate = quarterly change in the CPI for the U.S. forecasted over the next quarter. This was obtained by performing Box-Jenkins procedures on U.S. inflation rate.

W = Total private financial assets in the U.S. End of the year data were converted to quarterly data by multiplying changes in the year end amounts by quarterly savings ratio. Quarterly domestic savings were obtained from various issues of IFS by subtracting private and government consumption from GDP. Source: Balance Sheets for the U.S. Economy, and IFS.

I = Globalization index. Fifteen countries were identified that had among the highest GDP for the whole period, 1979-1998, and for which consistent set of data are available. GDP data in U.S. dollars are available only on an annual basis (from the World Development Report), while the current account U.S. dollars numbers are available quarterly from IFS. The sum of the absolute value of the latter for the fifteen countries was divided by the sum of the former to obtain this index. Source: World Development Report and IFS.

The rest of the data consist of nominal interest rates, i, spot exchange rates, S, and forward exchange rates, F, for Korea and Mexico. Each of these variables is a period average obtained by averaging two successive quarter-end observations. The nominal interest rates used are as follows: Korea = discount rate, and Mexico = deposit rate. Source for nominal interest rates and spot rates: IFS; for forward exchange rates: IMF staff. Units for spot and forward exchange rates: U.S. dollars per local currency.

Note: In the following section, variables Z^{Lp}, Z^{Ld}, Z*, G, G^{e}, m, y, and W are nominal values.

Quarter	Z^{Ld}	Z^{Lp}	Z^*	G	G^e	m	CPI	y	Quarter
1979:I	45294	68520	-193696	213.83	234.5689	1683.8	52.883	2464.9	1979:I
1979:II	47567	68349	-182691	238.33	257.0135	1729.3	54.697	2522.4	1979:II
1979:III	49983	68218	-172555	258.59	277.634	1784.3	56.503	2592.6	1979:III
1979:IV	50260	68145	-167000	316.83	330.8301	1809.7	58.155	2650.1	1979:IV
1980:I	50491	67740	-158870	412.91	431.5505	1851.1	60.421	2722.9	1980:I
1980:II	49152	67657	-154417	631.41	651.5169	1886	62.601	2719.4	1980:II
1980:III	49967	67352	-148098	543.97	605.7901	1936.9	63.785	2783.2	1980:III
1980:IV	51589	67199	-134824	648.01	602.2819	1996.3	65.454	2911.6	1980:IV
1981:I	52570	67151	-132482	608.06	578.6538	2059.2	67.183	3043.2	1981:I
1981:II	54331	67256	-121062	518.75	488.1137	2120.2	68.742	3073.3	1981:II
1981:III	55283	67315	-107613	478.86	428.3943	2181	70.709	3163.2	1981:III
1981:IV	55247	68521	-78932	420.99	388.3357	2254.9	71.723	3183.9	1981:IV
1982:I	57275	68536	-62348	420.41	397.8983	2305.6	72.311	3178.6	1982:I
1982:II	57142	68547	-40421	362.84	363.0378	2362.1	73.418	3231.6	1982:II
1982:III	57158	69372	-39023	332.99	319.6397	2415.7	74.806	3259.1	1982:III
1982:IV	57322	70212	-31468	380.17	362.424	2460.9	74.959	3299.1	1982:IV
1983:I	57741	70310	-22360	427.18	438.5683	2536	74.925	3361	1983:I
1983:II	58288	70674	-20228	464.02	483.5947	2588.1	75.862	3469.2	1983:II
1983:III	59729	70637	-13545	427.91	435.3709	2629.3	76.774	3563.3	1983:III
1983:IV	60650	70584	3060	410.21	383.8784	2699.2	77.438	3664.6	1983:IV
1984:I	59708	69897	8477	387.74	362.9872	2773.2	78.281	3791.1	1984:I
1984:II	60520	68663	24489	383.71	372.28	2852.6	79.141	3879.7	1984:II
1984:III	63064	68500	30115	378.81	379.4834	2908.1	79.993	3942.2	1984:III
1984:IV	67500	68241	44261	345.11	346.8697	2992.8	80.581	3996.7	1984:IV
1985:I	69668	68048	48661	333.823	322.1107	3058.1	81.109	4081.2	1985:I
1985:II	72805	67136	58806	301.78	295.8388	3106.3	82.08	4134.8	1985:II
1985:III	76612	65590	63178	319.377	313.2171	3153.3	82.685	4221.4	1985:III
1985:IV	77828	64091	80933	323.293	333.2937	3209.7	83.425	4285.3	1985:IV
1986:I	83352	63381	88784	324.267	334.7448	3278.3	83.63	4358.2	1986:I
1986:II	88491	60845	95160	343.427	345.3959	3355.7	83.425	4385.6	1986:II
1986:III	91512	58692	112423	341.847	346.8099	3439.7	84.047	4443.3	1986:III
1986:IV	90576	57407	131466	381.447	380.4904	3501.2	84.524	4501.7	1986:IV
1987:I	93875	54952	122251	404	412.7173	3543.8	85.461	4565.6	1987:I
1987:II	99140	53238	125815	406.097	412.8449	3596.3	86.577	4645.1	1987:II
1987:III	103070	52706	149932	449.59	441.1086	3649.7	87.548	4722.6	1987:III
1987:IV	105504	52976	166316	457.34	457.7731	3692.2	88.306	4835.9	1987:IV
1988:I	108873	52790	179931	473.057	467.45	3767.6	88.832	4898.5	1988:I
1988:II	112547	51382	203452	454.267	446.374	3842.8	89.955	5000.5	1988:II
1988:III	115657	50699	227521	451.33	432.4166	3884.1	91.154	5094.5	1988:III
1988:IV	115403	50654	262059	427.433	413.0821	3935.5	92.098	5205.3	1988:IV
1989:I	118801	49978	286705	415.56	400.8086	3970.6	93.118	5316.9	1989:I
1989:II	123437	49445	306438	393.773	383.6358	4009.8	94.649	5413.1	1989:II
1989:III	128507	49394	325453	374.347	364.333	4051.2	95.414	5486.8	1989:III
1989:IV	131904	49254	351494	367.287	357.7582	4091.5	96.333	5537.9	1989:IV
1990:I	136720	57273	353819	389.7	384.2206	4106.4	97.991	5660.4	1990:I
1990:II	142299	57048	371235	406.567	411.995	4121.1	98.986	5750.8	1990:II

Quarter	Z^{Ld}	Z^{Lp}	Z^*	G	G^e	m	CPI	y	Quarter
1990:III	148507	57235	405379	365.34	372.6346	4153.9	100.695	5782.4	1990:III
1990:IV	153694	60926	442068	382.297	364.0473	4155.8	102.328	5781.5	1990:IV
1991:I	153435	61393	462409	379.823	373.5957	4204.9	103.17	5821.9	1991:I
1991:II	158221	63221	472541	370.283	371.6197	4212.8	103.782	5892.3	1991:II
1991:III	163751	60291	495235	360.73	358.3635	4194	104.599	5950	1991:III
1991:IV	170451	56333	509327	357.733	351.6224	4208.2	105.389	6002.3	1991:IV
1992:I	179790	58228	539743	359.977	356.5283	4236.1	106.129	6121.8	1992:I
1992:II	184825	60017	556846	350.887	352.3937	4217.5	106.997	6201.2	1992:II
1992:III	190772	59667	544638	338.937	337.8931	4234.6	107.839	6271.7	1992:III
1992:IV	196546	62125	562370	345.597	340.7006	4219.2	108.604	6383	1992:IV
1993:I	204891	63568	573054	338.25	340.3711	4204	109.522	6444.5	1993:I
1993:II	211845	67671	576037	337.8	338.9079	4238.8	110.364	6509.1	1993:II
1993:III	221393	72733	614394	378.45	376.8058	4249.5	110.798	6574.4	1993:III
1993:IV	229464	85668	642568	354.95	368.3204	4280	111.563	6704.2	1993:IV
1994:I	243258	93789	672738	390.65	384.4572	4274.6	112.278	6794.3	1994:I
1994:II	251983	105643	690970	390.05	392.3298	4289.6	112.992	6911.4	1994:II
1994:III	261020	108807	702739	387.95	386.9391	4318.4	113.987	6986.5	1994:III
1994:IV	268758	115182	743580	384.25	378.3916	4354.1	114.523	7095.7	1994:IV
1995:I	275037	119211	765588	383.25	376.4832	4397.4	115.467	7149.8	1995:I
1995:II	282321	122212	841763	383.4	379.3097	4495.7	116.487	7204.9	1995:II
1995:III	292431	125334	878009	387.05	384.5521	4575.6	116.997	7309.8	1995:III
1995:IV	300603	134460	947509	384	382.4241	4617.4	117.559	7350.6	1995:IV
1996:I	310720	143584	941325	386.75	382.2332	4711.1	118.63	7467.5	1996:I
1996:II	321882	152820	967343	396.35	391.9752	4786.8	119.804	7607.7	1996:II
1996:III	333027	167295	1020503	382	381.9139	4854.4	120.441	7676	1996:III
1996:IV	343971	174457	1115804	379	371.8648	4952.4	121.309	7792.9	1996:IV
1997:I	359119	183672	1152543	369.25	362.9755	5049.4	122.125	7955	1997:I
1997:II	373106	198876	1186623	348.1	343.948	5140.7	122.61	8063.4	1997:II
1997:III	385633	211506	1244422	334.55	328.1386	5274.8	123.095	8170.8	1997:III
1997:IV	394242	219083	1300655	332.1	327.7895	5402.2	123.579	8254.5	1997:IV
1998:I	405870	221429	1341787	290.2	294.4783	5557	123.911	8384.2	1998:I
1998:II	414522	240573	1408349	301	293.4554	5682.6	124.574	8440.6	1998:II
1998:III	424267	241097	1375784	296.3	301.5025	5824.4	125.059	8537.9	1998:III
1998:IV	436141	242381	1376339	293.85	302.7213	5996.9	125.493	8681.2	1998:IV

I	W	i-Korea	i-MEXICO	S-Korea	S-Mexico	F-Korea	F-Mexico	n
0.002344	3984.103	15	11.835	0.00207	43.926	0.00207	45.455	2.683815
0.003216	4126.039	15	12	0.00207	43.941	0.00207	45.455	2.809972
0.003039	4268.779	15	12.335	0.00207	43.803	0.00207	45.455	3.305264
0.002202	4409.2	15	14.45	0.00207	43.844	0.00207	45.455	2.794504
0.003162	4598.317	16.5	17.485	0.00178	43.809	0.00175	45.455	3.174423
0.00283	4777.738	19.25	19.75	0.00168	43.811	0.00168	45.455	3.624244
0.003606	4957.49	19.75	20.035	0.00163	43.768	0.00163	43.478	3.19211
0.003357	5156.8	18	21.51	0.00154	43.483	0.00154	43.478	2.506929
0.004491	5232.88	16.5	25.32	0.0015	43.228	0.0015	43.478	3.37018
0.003458	5306.873	16	27.18	0.00147	42.574	0.00147	41.667	2.073307
0.003069	5386.558	16	29.65	0.00146	41.513	0.00146	41.667	2.757262
0.00412	5464.1	14.75	31.955	0.00145	40.335	0.00145	40	2.31179
0.003255	5604.173	10.875	32.96	0.00141	38.939	0.00141	29.412	1.666667
0.003115	5748.614	6.75	37.73	0.00137	30.616	0.00137	21.73	1.595292
0.003559	5884.46	5.125	46.395	0.00135	21.388	0.00135	14.085	1.640936
0.004132	6009.3	5	49.5	0.00134	14.974	0.00134	13.699	1.461682
0.003346	6152.644	5	53.865	0.00133	13.693	0.00133	9.804	0.296245
0.003163	6308.169	5	61.15	0.0013	9.813	0.0013	8.772	0.945138
0.004096	6468.873	5	59.995	0.00127	8.764	0.00127	7.937	0.794179
0.004166	6646.246	5	56.675	0.00126	7.935	0.00126	7.246	0.767351
0.004354	6731.596	5	53.375	0.00126	7.248	0.00126	6.667	0.749785
0.004969	6818.579	5	49.615	0.00125	6.671	0.00125	6.211	1.160427
0.006336	6907.819	5	48.285	0.00123	6.18	0.00123	5.78	0.954033
0.005795	6994.646	5	47.11	0.00122	5.758	0.00122	5.405	1.258013
0.005142	7209.176	5	47.39	0.00119	5.386	0.00119	5	0.747305
0.00615	7417.524	5	52.445	0.00115	4.988	0.00115	4.587	1.068432
0.006392	7623.253	5	60.085	0.00113	4.578	0.00113	3.65	0.977861
0.006359	7834.046	5	66.52	0.00112	3.672	0.00112	3.003	0.672855
0.005871	8055.025	5	72.005	0.00113	3.008	0.00113	2.364	1.069576
0.007308	8267.416	5	78.06	0.00113	2.371	0.00113	1.916	0.178198
0.007936	8465.845	5.5	84.62	0.00113	1.92	0.00113	1.504	0.486172
0.00816	8669.646	6.5	91.3	0.00115	1.511	0.00115	1.198	0.565582
0.006784	8777.231	7	94.3	0.00117	1.2	0.00117	0.98	0.21641
0.007038	8884.397	7	94.3	0.00121	0.978	0.00121	0.806	1.054345
0.007221	8992.274	7	94.275	0.00124	0.808	0.00124	0.685	0.70533
0.007596	9110.946	7	100.175	0.00125	0.686	0.00125	0.562	1.316273
0.00587	9322.373	7	116.9	0.0013	0.566	0.0013	0.446	0.830831
0.006014	9543.177	7	89.06	0.00136	0.445	0.00136	0.439	1.136349
0.006042	9769.499	7.25	44.335	0.00138	0.438	0.00139	0.439	1.166981
0.007674	9999.346	7.75	38.25	0.00144	0.438	0.00144	0.439	1.10777
0.006133	10267.52	8	38.25	0.00148	0.438	0.00148	0.431	1.015004
0.005814	10539	8	38.25	0.0015	0.43	0.0015	0.415	1.218289
0.005827	10809.69	8	35.57	0.0015	0.414	0.0015	0.4	1.460034
0.005567	11076.75	7.75	34.33	0.00149	0.399	0.00149	0.386	0.733498
0.006072	11132.35	7.25	38.11	0.00145	0.385	0.00145	0.372	1.530511
0.004553	11189.92	7	37.58	0.00141	0.372	0.00141	0.361	1.220573

I	W	i-Korea	i-MEXICO	S-Korea	S-Mexico	F-Korea	F-Mexico	n
0.004649	11243.89	7	30.53	0.0014	0.36	0.0014	0.351	1.05614
0.004755	11293.25	7	24.905	0.0014	0.35	0.0014	0.342	1.802764
0.004588	11631.45	7	22.155	0.00139	0.342	0.00139	0.338	1.141213
0.003496	11976.17	7	19.015	0.00138	0.337	0.00138	0.333	1.333066
0.004397	12329.71	7	16.15	0.00136	0.343	0.00136	0.329	0.867029
0.003761	12695.05	7	15.185	0.00133	0.327	0.00133	0.327	1.115952
0.00444	12872.94	7	14.495	0.00131	0.326	0.00126	0.327	0.532538
0.005136	13054.53	7	13.415	0.00128	0.326	0.00125	0.324	0.862026
0.005246	13236.19	7	14.855	0.00127	0.323	0.00124	0.324	0.557303
0.004907	13420.55	7	17.935	0.00127	0.323	0.00124	0.321	0.859181
0.00407	13633.49	6	19.11	0.001259	0.32	0.001259	0.31379	0.588053
0.004702	13845.83	5	17.605	0.001244	0.322831	0.001244	0.316621	1.004982
0.00573	14059.48	5	15.035	0.001236	0.32038	0.001236	0.31417	0.595889
0.005327	14288.35	5	13.32	0.001237	0.320739	0.001237	0.314529	0.72124
0.004197	14360.69	5	10.745	0.00124	0.321968	0.00124	0.315758	0.719655
0.004798	14436.4	5	11.91	0.001241	0.297637	0.001241	0.291427	0.589618
0.005749	14509.82	5	15.04	0.001252	0.294829	0.001252	0.288619	0.673324
0.005753	14587.55	5	14.6	0.001268	0.293772	0.001268	0.287562	0.779319
0.004287	15126.26	5	24.955	0.001296	0.187793	0.001296	0.181583	0.442904
0.00488	15650.4	5	41.865	0.001319	0.146681	0.001319	0.140471	1.046564
0.004754	16203.2	5	40.28	0.001301	0.158499	0.001301	0.152289	0.540393
0.003848	16762.25	5	36.5	0.001291	0.155775	0.001291	0.149565	0.759322
0.003294	17193.48	5	36.485	0.001278	0.130847	0.001278	0.124637	0.536484
0.003902	17639.76	5	28.295	0.001234	0.132487	0.001234	0.126277	0.965751
0.005316	18096.41	5	23	0.001218	0.131392	0.001218	0.125182	0.624273
0.004523	18565.15	5	21.945	0.001185	0.132672	0.001185	0.126462	0.731818
0.004252	19218.87	5	19.785	0.001115	0.127374	0.001115	0.121164	0.801639
0.004543	19907.77	5	16.355	0.001126	0.126735	0.001126	0.120525	0.673826
0.005496	20595.44	5	14.175	0.001093	0.12566	0.001093	0.11945	0.543739
0.005959	21296.15	5	12.92	0.00059	0.127879	0.00059	0.121669	0.550951
0.004986	21957.72	5	12.69	0.000723	0.123712	0.000681	0.117502	0.400213
0.006111	22588.91	5	12.405	0.000728	0.110611	0.000691	0.104401	0.339196
0.007522	23227.38	4	13.125	0.000719	0.098949	0.00071	0.092739	0.514711
0.006771	23885.45	3	15.105	0.000831	0.101368	0.000824	0.095158	0.246431

16. Pindyck, Robert S. and Daniel L. Rubinfeld, 1998, Econometric Models and Economic Forecasts, 4th Ed. McGraw Hill, New York.

17. Ruffm, R.J. and F. Rassekh, 1986, "The Role of Foreign Direct Investment in U.S. Capital Outflows." American Economic Review 76, 1126-37.

18. U.S. Department of Commerce, Survey of Current Business, various issues.

19. U.S. Department of Treasury, Bulletin, various issues.

20. U. S. President, Economic Report of the President, various issues.

21. World Bank, 2000, Global Development Finance, 2000. Washington, D.C

22. _____, World Development Report, various issues.