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DETERMINANTS OF FOREIGN INSTITUTIONAL INVESTMENT IN INDIA: THE ROLE OF RETURN, RISK, AND INFLATION

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The present study examines the determinants of foreign institutional investments (FII) in India, which by January 2003 almost exceeded U.S.$12 billion. Given the huge volume of these flows and their impact on the other domestic financial markets, understanding the behavior of the flows becomes very important, especially at a time of liberalizing the capital account. By using monthly data, we found that FII inflow depends on stock market returns, inflation rates (both domestic and foreign), and ex-ante risk. In terms of magnitude, the impact of stock market returns and the ex-ante risk turned out to be the major determinants of FII inflow. Unlike some of the other investigations of this topic, our study has not found any causative link running from FII inflow to stock returns. Stabilizing stock market volatility and minimizing the ex-ante risk would help to attract more FII, an inflow of which has a positive impact on the real economy.

I. INTRODUCTION

Foreign investment refers to investments made by the residents of a country in the financial assets and production processes of another country. After the opening up of the borders for capital movement, these investments have grown in leaps and bounds. The effect of foreign investment, however, varies from country to country. It can affect the factor productivity of the recipient country and can also affect the balance of payments. In developing countries there has been a great need for foreign capital, not only to increase the productivity of labor but also because foreign capital helps to build up the foreign exchange reserves needed to meet trade deficits. Foreign investment provides a channel through which developing countries can gain access to foreign capital. It can come in two forms: foreign direct

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investment (FDI) and foreign institutional investment (FII).[1] Foreign direct investment involves in direct production activities and is also of a medium- to long-term nature. But foreign institutional investment is a short-term investment, mostly in the financial markets. FII, given its short-term nature, can have bidirectional causation with the returns of other domestic financial markets such as money markets, stock markets, and foreign exchange markets. Hence, understanding the determinants of FII is very important for any emerging economy as FII exerts a larger impact on the domestic financial markets in the short run and a real impact in the long run. The present study examines the determinants of foreign institutional investment in India, a country that opened its economy to foreign capital following a foreign exchange crisis.

India, being a capital scarce country, has taken many measures to attract foreign investment since the beginning of reforms in 1991. Up to the end of January 2003, India succeeded in attracting a total foreign investment of around U.S.$48 billion out of which U.S.$12 billion was in the form of FII. These figures show the importance of FII in the overall foreign investment program. India is in the process of liberalizing its capital account, and this has a significant impact on foreign investment and particularly on FII, which affects short-term stability in the financial markets. Hence, there is a need to determine the push and pull factors behind any change in the FII, so that we can frame our policies to influence the variables that attract foreign investment. Also, FII has been the subject of intense discussion, as it is held to be responsible for having intensified the currency crises of the 1990s in East Asia and elsewhere in the world.

The present study aims to examine the determinants of FII in the Indian context. We attempt to analyze the effect of return, risk, and inflation, which in the literature are considered to be the major determinants of FII. The proposed relationship among the factors (discussed in detail later) is that inflation and risk in the domestic country and return in the foreign country adversely affect the FII flowing to the domestic country, whereas inflation and risk in the foreign country and return in the domestic country have a favorable effect on the flow of FII. In the next section we will briefly consider the existing studies of this topic. In Section III, we discuss the theoretical model. Section IV briefly assesses the trends in FII in India. The database and methodology adopted in this study are explained in Section V. In Section VI, we discuss the estimated results of the study, and appropriate conclusions are drawn in the last section.

[1] There is another concept called "foreign portfolio investments" (FPI), which is a broader one compared to FII. Foreign portfolio investments include FII and other components like GDR (Global Depositary Receipts), ADR (American Depositary Receipts), and off-shore funds and others. As the components in FPI other than FII are not dependent on market forces and they are not volatile, we consider only FII in this study.

II. LITERATURE REVIEW

There have been several attempts to explain FII behavior in India. All the existing studies have found that equity return has a significant and positive impact on FII (Agarwal 1997; Chakrabarti 2001; Trivedi and Nair 2003). But given the huge volume of investments, foreign investors can play the role of market makers and book their profits, that is, they can buy financial assets when the prices are declining, thereby jacking-up the asset prices, and sell when the asset prices are increasing (Gordon and Gupta 2003). Hence, there is a possibility of a bidirectional relationship between FII and equity returns.

Following the Asian financial crisis and the bursting of the info-tech bubble internationally in 1998/99, net FII declined by U.S.$61 million. This, however, exerted little effect on equity returns. This negative investment might possibly disturb the long-term relationship between FII and other variables such as equity returns, inflation, and so on. Chakrabarti (2001) has perceived a regime shift in the determinants of FII following the Asian financial crisis and found that in the pre–Asian crisis period, any change in FII had a positive impact on equity returns. But it was found that in the post–Asian crisis period, a reverse relationship has been the case, namely, that change in FII is mainly due to change in equity returns. This is a fact that needs to be taken into account in any empirical investigation of FII.

Investments, either domestic or foreign, depend heavily on risk factors. Hence, while studying the behavior of FII, it is important to consider the risk variable. Further, realized risk can be divided into ex-ante and unexpected risk. Ex-ante risk is an observed component and is negatively related to FII. But the relationship between unexpected risk and FII is obscure. Therefore, while examining the impact of risk on FII, one needs to separate the unobserved component from the realized risk. Trivedi and Nair (2003) have used only the realized risk.

Another possible determinant of FII is the operation of foreign factors such as returns in the source country's financial markets and other real factors in the source economy. So far, however, studies have found that both return in the source country stock market and the inflation rate have not exerted any impact on FII. Agarwal (1997) found that world stock market capitalization had a favorable impact on the FII in India.

A survey of the literature shows that existing studies do not account for volatility (the ARCH effect), which can be expected in most of the monthly financial time-series data. Yet given the increase in financial market integration, both domestically and in foreign financial markets, accounting for volatility is unavoidable. Further, the existing studies either do not incorporate risk in foreign and domestic markets or make use of realized risk, an approach that does not always yield robust results. This is because standard deviation/variance (realized risk variable) increases irrespective of the direction in which stock returns move, while movement of FII is determined by bull/bear phases. It is preferable, therefore, to divide the realized risk into ex-ante risk and unpredictable risk.

Since investment in stock markets is sentiment driven, and is affected more or less by everything, the crucial task is to identify a few critical determinants. This paper makes a modest attempt to explore the relation between FII and its pivotal determinants, for the particular case of India. More specifically, a few important variables believed to be affecting FII are chosen and then a theoretical model is built and empirically tested for India. The focus of this paper is the study of the critical determinants of FII, so as to provide a better understanding of FII behavior that helps while liberalizing the capital account. We hope that the study will be important from a policy perspective, as FII constitutes an important element for the smooth functioning of domestic financial markets.

III. THEORETICAL MODEL FOR FOREIGN INSTITUTIONAL INVESTMENT

To build the theoretical model, well-known "uncovered interest parity" (UIP) and "purchasing power parity" (PPP) conditions have been combined. To bring the model closer to reality, the assumption of equal riskiness in domestic and foreign assets (made under UIP) is relaxed. When there is both perfect capital mobility and equal risk of both home and foreign bonds, then home and foreign bonds are said to be perfect substitutes. Perfect substitutability of domestic and foreign bonds implies that the uncovered interest parity condition will hold on a continuous basis.

Let the rate of return to foreign investor by investing in domestic stock market be i_d and return in the same market i_f. By investing in the domestic market the foreign investor makes two investments, one being in the Indian stock market and the other in the Indian rupee. Accordingly, the overall return to the investor can be divided into a return on the stock and a return on the investment in the rupee. If the foreign investor subsequently sells the rupee at the end of the period, the return on the foreign currency would be i_c and this can be presented as $i_f = i_d + i_c$.

If we consider the nominal exchange rate as rupees per U.S. dollar, e, initially only expectations can be formed with regard to the exchange rate movement, hence

$$i_f = i_d - E(\dot{e} / e),$$

where $E(\dot{e} / e)$ is the expected rate of change in value of the rupee against the dollar. This equation represents the uncovered interest parity condition. Uncovered interest parity dictates that the expected rate of depreciation of the rupee-dollar exchange rate is equal to the interest rate differential between Indian and U.S. stocks.

Now we incorporate the PPP condition, according to which the real exchange rate that is defined as the ratio of the two countries' price level, expressed in a common currency, should be equated to unity for all pairs of countries and at all times. This can be expressed as $e = QP_d / P_f$; where e is the nominal exchange rate, Q is the real exchange rate, P_d is the domestic price level, and P_f is the foreign price level. PPP theory also asserts that Q can be taken as exogenously determined ($Q = \bar{Q}$). Hence, $e = \bar{Q}P_d / P_f$ implying that over a period of time the exchange rate moves in proportion to movements in the ratio of price level, p_d / p_f. Taking log and differentiating with respect to time, we get $\dot{e} / e = \dot{p}_d / p_d - \dot{p}_f / p_f$. Hence, the changes in the exchange rate and $E(\dot{e} / e)$ would depend on the inflation rate differentials. Putting this result in the uncovered interest parity condition, we have

$$i_d = i_f + \pi_d - \pi_f, \tag{1}$$

where π is the inflation rate in respective countries.

Now, to be more realistic, we relax the assumption of equal risk for domestic and foreign assets under UIP. By dropping this assumption we have

$$i_d - i_f = E(\dot{e} / e) + \rho,$$

where ρ is risk premium. In other words, a large interest rate differential implies a market expectation of large exchange rate depreciation or currency risk. Risk averse investors expect higher returns for investing in relatively riskier assets and therefore the risk premium represents compensation to the investor for assuming risk. The above equation is modeled as

$$i_d - i_f = E(\dot{e} / e) + \sigma_d - \sigma_f,$$

where σ is a measure of dispersion (standard deviation) representing risk in respective countries. Hence, the return differentials depend on the inflation rate differentials and the risk premium. This can be represented as

$$i_d - i_f = \pi_d - \pi_f + \sigma_d - \sigma_f,$$

where we have drawn three domestic and three foreign variables affecting FII. In a functional form, it can be represented as

$$FII = f(i_d, i_f, \pi_d, \pi_f, \sigma_d, \sigma_f). \tag{2}$$

Briefly the signs for the coefficients of each variable and the rational for it are as follows:

$\frac{\partial FII}{\partial i_d} > 0$: Investors are believed to follow a higher return, hence when the return in the domestic market increases, FII flows to the domestic market.

$\frac{\partial FII}{\partial i_f} < 0$: Since FII follows higher returns, an increase in the return in the U.S. (foreign) market will induce investors to withdraw from the Indian (domestic) stock market to invest in the U.S. (foreign) market.

$\frac{\partial FII}{\partial \sigma_d} < 0$: Investors are considered to be risk averse, hence when risk in the domestic market increases they will withdraw from the domestic market.

$\frac{\partial FII}{\partial \sigma_f} > 0$: Considering investors as risk averse, when risk in the foreign (U.S.) market increases, investors will withdraw from the foreign (U.S.) market and invest in the Indian (domestic) market.

$\frac{\partial FII}{\partial \pi_d} < 0$: When inflation in the domestic country increases, the purchasing power of the funds invested declines, hence investors will withdraw from the domestic market.

$\frac{\partial FII}{\partial \pi_f} > 0$: Similarly, when inflation in the foreign country increases, the purchasing power of funds invested in the foreign country declines, causing institutional investors to withdraw from the foreign (U.S.) market and make investment in the domestic (Indian) market.

IV. FOREIGN INSTITUTIONAL INVESTMENT IN INDIA

India opened its stock market to foreign investors in September 1992 and since then has received portfolio investment from foreigners in the form of foreign institutional investment in equities. This has become one of the main channels of FII in India. In order to trade in the Indian equity market, foreign corporations need to register with the Securities and Exchange Board of India (SEBI) as foreign institutional investors. India allows only authorized foreign investors to invest in pension funds, investment trusts, asset management companies, university funds, endowments, foundations, charitable interests and charitable societies that have a track record of five years and which are registered with a statutory authority in their own country of incorporation or settlement. It is possible for foreigners to trade in Indian securities without registering as an FII but such cases require approval from the Reserve Bank of India (RBI) or the Foreign Investment Promotion Board (FIPB). Foreign institutional investors generally concentrate on the secondary market. The total amount of foreign institutional investment in India has accumulated to the formidable sum of over U.S.$12 billion as of January 2003.

V. DATA DESCRIPTION AND METHODOLOGY FOR VARIABLE CONSTRUCTION

To test the hypothesis entailed in the last section, we require data for returns, risk, and inflation in the domestic and the foreign economies, and data on FII flowing into the domestic economy (India). The United States is chosen as the foreign country to model FII inflow in India, because the United States is India's major trade partner and accounts for the largest proportion (42 percent) of FII flowing to India

(Chakrabarti 2001). Hence for purposes of analyzing FII flows into India, the United States can safely be used as a proxy for the rest of the world.

Year-on-year returns are calculated using monthly data on stock prices (return = $\log P_t - \log P_{t-12}$). The composite Bombay Stock Exchange Sensitive Index of major thirty companies (BSE Sensex) is used for Indian stock prices and the Standard & Poor's 500 Index (S&P 500) is used for U.S. stock prices. This study uses the S&P 500 because it is usually considered as the benchmark for U.S. equity performance. It represents 70 percent of all U.S. publicly traded companies. Part of the index's popularity arises from its close association with the largest mutual fund in the world, the Vanguard 500 Index Fund, and Spiders, the first exchange traded fund. The listed companies are highly diverse, spanning every relevant sector of the U.S. economy. The S&P 500 also tends to be the default when people discuss "index funds," since index funds based on other indices were not widely available until recently.

To capture risk, monthly standard deviations are computed from daily returns on composite BSE Sensex and S&P 500. We use ex-ante risk rather than realized risk, because realized risk represents a combination of ex-ante risk and unexpected risk. While FII may exhibit a negative relationship with predicted risk, its relationship with unanticipated standard deviation could be positive. Since the relative importance of ex-ante risk and unexpected risk can vary over time, the relationship between FII and realized risk can be obscure. The wholesale price index (WPI) is used to calculate year-on-year inflation in India, and the producer price index (PPI) is used to calculate inflation in the United States. Monthly data has been used from January 1994 to November 2002 inclusive. The first year (1993) is considered as a learning period for foreign investors and, hence, is not included in the estimation. The data sources are presented in the Appendix Table.

VI. DISCUSSION OF RESULTS

Before estimating equation (2), stationarity tests have been carried out on all the variables as it is expected that monthly financial variables contain unit root. By using the augmented Dickey-Fuller (ADF) test, we found that *FII*, *INF*, *RBSE*, *SDBR*, *SDSR*, and *RSP* are stationary in levels at the 5 percent level of significance. When accounted for structural break *IND* was found to be stationary with structural break in June 1995. This test has been implemented using the procedure suggested by Perron (1997) (see Table I and Figure 1).

A. *Predicting Risk*

Assuming agents form rational expectations, we use the ARMA model to estimate ex-ante risk. For predicting the *SDBR* and *SDSR*, by using autocorrelation functions (ACF) and partial autocorrelation functions (PACF), we have applied the

TABLE I

UNIT ROOT RESULTS BASED ON AUGMENTED DICKEY-FULLER TEST

Variable	Test Statistics	Critical Value[a]	Conclusion
FII	−2.96[b]	−2.86	No unit root
IND	−1.22[c]	−1.95	Unit root
INF	−4.81	−3.41	No unit root
RBSE	−3.77	−3.41	No unit root
RSP	−4.55	−3.41	No unit root
SDSR	−3.57	−3.41	No unit root
SDBR	−3.80	−3.41	No unit root

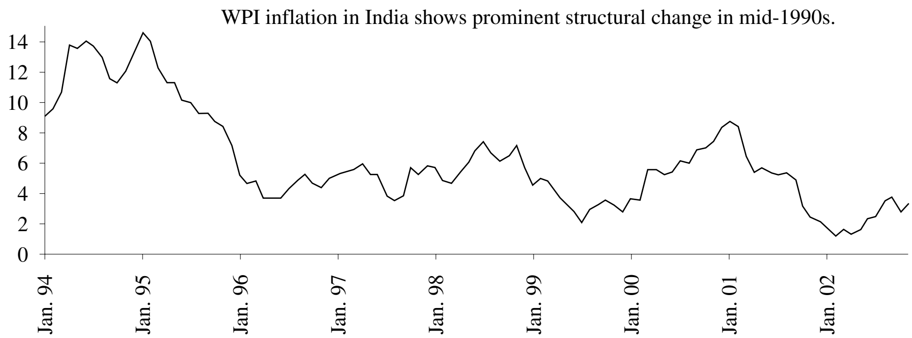
Note: The figure of *IND* shows a structural break in the mid-1990s, hence unit root test accounting for structural break (as suggested by Perron 1997) is used. The break period selected is August 1995, with α significant at the 5 percent level (t-statistic is −5.32) under the null hypothesis $\alpha = 1$. Hence null hypothesis of the presence of unit root could be rejected at the 5 percent level of significance.

[a] At 5 percent level of significance.

[b] Indicates the ADF model with constant and no trend.

[c] Indicates the ADF model with no constant and no trend.

Fig. 1. Structural Break in WPI Inflation



ARMA (1,1) model. Using respective models we estimated *SDBRF* and *SDSRF*, which capture the predictable component of risk (see Table II).

B. *Model for Foreign Institutional Investment*

In the case of financial variables, variances change over time and large (small) changes tend to be followed by large (small) changes of either sign. Episodes of volatility are generally characterized as the clustering of large shocks, to the dependent variable. The conditional variance function is formulated to mimic this phenomenon. In the regression model, a large shock is represented by a large deviation of the dependent variable from its conditional mean or equivalently a large positive

TABLE II

ESTIMATION OF EX-ANTE AND EX-POST RISK

A. Estimated ARMA (1,1) Model for *SDBR*
(Dependent variable: *SDBR*)

Variable	Coefficient	*t*-statistic
Constant	4.213882	8.106674
AR(1)	0.837326	7.307810
MA(1)	–0.735001	–3.973663

Note: $\bar{R}^2 = 0.25$, $DW = 1.8$, $AIC = 4.68$, $SC = 4.75$, F-statistic = 8.532626.

B. Estimated ARMA (1,1) Model for *SDSR*
(Dependent variable: *SDSR*)

Variable	Coefficient	*t*-statistic
Constant	2.780699	5.372204
AR(1)	0.973825	49.23967
MA(1)	–0.903801	–17.15734

Note: $\bar{R}^2 = 0.22$, $DW = 1.54$, $AIC = 3.02$, $SC = 3.09$, F-statistic = 19.57736.

or negative value of error term. In the ARCH regression model, the variance of the current error ε_i, conditional on the realized values of the lagged errors ε_{t-i} ($\forall i = 1, \ldots, q$) is an increasing function of the magnitude of the lagged errors, irrespective of their signs. Hence large errors of either sign tend to be followed by a large error to either sign. And similarly, small errors of either sign tend to be followed by a small error to either sign. The order of the lag q determines the length of time for which a shock persists in conditioning the variance of subsequent errors. The larger the value of q, the longer the episodes of volatility will tend to be.

Another point about which we have to be cautious when dealing with financial markets is the need to distinguish between "good news" and "bad news." Suppose there is bad news, which decreases the asset price. This in turn decreases the return, causing FII to withdraw from the market. On the other hand, if there is good news, asset prices will increase, thereby increasing return and causing FII to be attracted. However, the sensitivity with which investors withdraw is greater than the sensitivity with which they invest. Their speed to invest will be slower than their speed to withdraw, that is, they will be more cautious when investing than when withdrawing. This is due to their nature of being risk averse: they tend to react more vigorously to bad news than to good news, thus giving us asymmetry between the effects of good and bad news. To capture this phenomenon TARCH or threshold ARCH is employed to model FII.[2]

[2] Details regarding the TARCH method are provided in the Appendix.

Initially, we regressed *FII* on *IND*, *INF*, *RBSE*, *RSP*, *SDBRF*, and *SDSRF*. However, the Breusch-Godfrey Serial Correlation LM test showed the presence of autocorrelation in the model, hence the model was reestimated correcting for autocorrelation. In the reestimated model the ARCH effect was present, and so the ARCH(1) model was tried. Diagnostic tests, however, indicated a need to include more lags. Hence GARCH(1, 1) was tried. Then to account for the possible presence of asymmetry TARCH was estimated. The asymmetric component is found to be significant at the 1 percent level (see Table III).

Following is the estimated model,

$$
\begin{aligned}
FII = {} & \underset{(19.08)}{1{,}040} - \underset{(-17.48)}{30.47} \cdot IND + \underset{(8.20)}{13.48} \cdot INF + \underset{(5.10)}{513.87} \cdot RBSE - \underset{(-1.86)}{283.29} \cdot RSP \\
& - \underset{(-11.25)}{27.23} \cdot SDBRF - \underset{(-9.28)}{258.29} \cdot SDSRF - \underset{(-3.09)}{68.33} \cdot @SEAS\,(9,10,11,12) \\
& + \underset{(11.35)}{0.38} \cdot AR(1),
\end{aligned}
$$

z-statistic in parenthesis; $\bar{R}^2 = 0.41$.

Where

@*SEAS* (9,10,11,12) = 1 for September, October, November, and December,
= 0 otherwise.

TABLE III

TARCH Model for FII

A. TARCH Model for FII with Ex-post Risk

Variable	Coefficient	*z*-statistic
Constant	1,075.96	16.25967
IND	−39.49	−8.221859
INF	14.18	3.956205
RBSE	509.73	4.956298
RSP	−161.6	−0.821394
SDBRF	−10.21	−1.916466
SDSRF	−281.56	−10.59405
R_SDBR(−1)	2.72	0.635451
R_SDSR(−1)	−12.04	−1.323436
@*SEAS* (9,10,11,12)	−70.01	−2.982812
AR(1)	0.36	3.218964
Variance Equation		
Constant	91.87	0.491042
ARCH(1)	0.28	2.039822
(*RESID* < 0)·*ARCH*(1)	−0.36	−2.436942
GARCH(1)	0.93	11.66339

Note: $\bar{R}^2 = 0.41$, $DW = 2.01$, *F*-statistic = 4.509347.

TABLE III (Continued)

B. TARCH Model for FII without Ex-post Risk

RB = {[*BSE* – *BSE*(–12)] / *BSE*(–12)} • 100.

RP = {[*SP*500 – *SP*500(–12)] / *SP*500(–12)} • 100.

Variable	Coefficient	*z*-statistic
Constant	1,027.910	15.26023
RB(1)	0.891178	5.684420
RP(1)	–0.686685	–1.371845
IND	–32.95702	–12.51092
INF	14.53868	9.897712
SDBRF	–40.21529	–3.108909
SDSRF	–215.8137	–15.47786
DUMMY	450.0836	44.28399
@*SEAS* (9,10,11,12)	–100.6054	–10.22183
AR(1)	0.255029	12.72056
	Variance Equation	
Constant	138.9910	1.027395
ARCH(1)	–0.038941	–0.874708
(*RESID* < 0)·*ARCH*(1)	0.118197	4.553818
GARCH(1)	0.987229	15.29618

Note: $\bar{R}^2 = 0.58$, *DW* = 1.85, *F*-statistic = 9.630572.

Dependent variable: *FII$*

Variable	Coefficient	*z*-statistic
Constant	1,019.189	11.36049
RB(1)	0.762366	1.989010
RP	–0.601991	–0.681208
IND	–33.22675	–9.136085
INF	15.82170	4.124623
SDBRF	–37.04799	–2.552503
SDSRF	–218.3583	–7.417057
DUMMY	455.6259	4.041263
@*SEAS* (9,10,11,12)	–98.61025	–3.612730
AR(1)	0.247022	3.067463
	Variance Equation	
Constant	117.6193	0.767098
ARCH(1)	–0.055447	–1.096090
(*RESID* < 0)·*ARCH*(1)	0.123376	1.177632
GARCH(1)	1.003280	28.91751

Note: $\bar{R}^2 = 0.58$, *DW* = 1.84, *F*-statistic = 9.641499.

The conditional variance pertaining to positive shock or good news is

$$_{+}\sigma_t^2 = 159.56 + (0.2 - 0.32)\cdot ARCH(1) + 0.97\cdot GARCH(1),$$

or

$$_{+}\sigma_t^2 = 159.56 + 0.12\cdot ARCH(1) + 0.97\cdot GARCH(1),$$

and the conditional variance pertaining to negative shock or bad news is

$$_{-}\sigma_t^2 = 159.56 + 0.2\cdot ARCH(1) + 0.97\cdot GARCH(1).$$

This shows that investors react more vigorously to bad news than to good news.

The results show that the equity return in India (*RBSE*) is the main driving force for FII, and is significant at all levels. Ex-ante risk in the domestic stock market (*SDBRF*) adversely affects the inflow of FII to India and is highly significant. The domestic inflation rate (*IND*) has the hypothesized negative sign and is significant at all levels. This result is consonant with Agarwal (1997), who also found that the inflation rate adversely affects FII.

Returns in the foreign market (*RSP*) have the expected negative sign and are significant at the 5 percent level. In other words an increase in the returns in the U.S. stock market adversely affects the portfolio investment flow to India. Predictable risk in foreign markets (*SDSRF*) adversely affects FII flow to India and is highly significant in the model. The negative impact of *SDSRF* on FII flowing to India seems to be a pointer to the dominant position of the U.S. stock market. In other words when market sentiments in the United States are adversely affected, investors (including foreign institutional investors investing in India) try to withdraw their investment from the market. Inflation rate in the United States (*INF*) has a positive sign and is highly significant. This means that when inflation in the U.S. increases, FII flow to India also increases which is consonant with the theoretical model presented in the last section.

C. *Ex-post Risk*

As far as the ex-post risk is concerned, agents can only react to it after it has been observed, hence they can be expected to react with a lag. Ex-post risk represented by *R_SDBR* for the Indian stock market and *R_SDSR* for the U.S. stock market are insignificant in the model (with a lag), that is to say ex-post risk does not seem to be affecting foreign institutional investment flowing into India. This is because when the market goes bearish, selling pressure mounts, the stock prices decline, and monthly returns turn negative, thus demonstrating a negative relationship between FII and ex-post risk. On the other hand, when the market turns bullish (as was the case with the IT boom in the late 1990s), buying pressure leads to rallies in stock prices and monthly returns become positive, demonstrating a positive relation between FII and ex-post risk. Therefore the net impact of ex-post risk on FII depends on the number of bull/bear phases during the period concerned. In the case at hand, it is possible that various bull and bear phases have neutralized each other, hence ex-post risk does not seem to affect FII.

VII. CONCLUSION

This study has examined the determinants of foreign institutional investments in India. After the initiation of economic reforms in the early 1990s, the movement of foreign capital flow increased very substantially. This increase in capital movement could have a very significant impact on the domestic real economy. Hence there is a great need to monitor the behavior of these flows so as to minimize possible adverse impacts on the real economy. For this purpose, we need to be aware of the determinants of foreign capital, rather than what influences this capital to cross borders. The present study examines the determinants of foreign institutional investments in India. With the help of monthly data from January 1994 to November 2002, the study examines whether return and risk in the stock market and other real factors have any impact on the FII inflow into the country. Here we have taken risk as ex-ante risk instead of realized risk which, as an unpredictable part of risk, may not have any impact on FII behavior. Econometric estimates, using the TARCH procedure, show a positive association of FII with return on the Bombay Stock Exchange (BSE), inflation in the United States and negative association with inflation in India, return on S&P 500, ex-ante risk on the BSE, and ex-ante risk on S&P 500. Thus empirical estimates seem to be perfectly in consensus with the proposed theoretical model, except for ex-ante risk in the U.S. stock market, which adversely affects the FII flow to India. This could be due to the dominant position of the U.S. stock market. However, ex-post risk in either economy does not affect FII inflow to India. Unlike some other studies (Gordon and Gupta 2003), this study has not discovered any causation running from FII inflow to return in BSE. We have also studied the impact of news on the FII inflow and have found that FII reacts with greater sensitivity to bad news than to good news.

In conclusion, given that India is seriously contemplating liberalization of the capital account in the near future, there is a need first and foremost to stabilize movements in the domestic stock market. This market has undergone peaks and troughs since the economic reforms, mainly because of non-fundamental factors such as speculation, sentiments, manipulation of the institutions (which happened at the time of the big scam in 1993), and so on. Without stabilization, there might well be an adverse impact of these non-fundamental factors on FII behavior through its returns in the stock market, a development that could affect the real economy in the long run. Hence it would be necessary for the regulatory authority to contain incidences of secondary market manipulation, which have been rampant during the last decade.

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APPENDIX

ASYMMETRY IN ARCH MODEL

There is a potential importance in distinguishing between good and bad news as regards their effect on predicting volatility. One method for introducing asymmetry is by distinguishing the sign of the shock. One of the simplest is to separate positive and negative shock and allow them to have different coefficients in the ARCH/GARCH model.

TARCH or threshold ARCH was introduced independently by Glosten, Jaganathan, and Runkle (1993). The specification for the conditional variance is

$$\sigma_t^2 = \alpha_o + \alpha\varepsilon_{t-1}^2 + \gamma\varepsilon_{t-1}^2 d_{t-1} + \beta_1\sigma_{t-1}^2 ,$$

where $d_t = 1$ if $\varepsilon_t < 0$ and 0 otherwise.

In this model, negative error ($\varepsilon_t < 0$) and positive error ($\varepsilon_t > 0$), have differential effects on the conditional variance. Negative error has an impact of α, while positive error has an impact of $\alpha + \gamma$. If $\gamma \neq 0$, then the news impact is asymmetric. We have used EViews software for estimating this model.

APPENDIX TABLE

DATA SOURCES AND CONSTRUCTION OF VARIABLES

Variable	Description	Source
FII	Foreign Institutional Investment in India (U.S.$ million)	Reserve Bank of India, *Monthly Bulletin*
IND	Inflation in India based on WPI	Reserve Bank of India, *Handbook of Statistics on Indian Economy*
INF	Inflation in U.S. based on PPI	IMF, *International Financial Statistics*
RBSE	Return on composite BSE Sensex	Bombay Stock Exchange Web site
RSP	Return on composite S&P 500	Reuters
SDBR	Standard deviation of return on BSE Sensex	Bombay Stock Exchange Web site
SDSR	Standard deviation of return on S&P 500	Reuters
SDBRF	Forecasted standard deviation of return on BSE Sensex using ARMA model	
SDSRF	Forecasted standard deviation of return on S&P 500 using ARMA model	
R_SDBR	Unpredicted or ex-post risk (= *SDBR* – *SDBRF*) of BSE Sensex return	
R_SDSR	Unpredicted or ex-post risk (= *SDBR* – *SDSRF*) of S&P 500 return	