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The Impact of FII Regulations in India

A Time-Series Intervention Analysis of Equity Flows

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Abstract

In this paper we examine the impact of the FII policy reforms on FII portfolio flows to the Indian stock markets. Given the volatile nature of capital flows to emerging markets seen in the early 1990s, FII investment in India, which began in January 1993, called for special regulatory attention. The promulgation of legislation pertaining to foreign investment in 1995 marked a watershed for FII flows to India, as it led to a significant increase in the level of FII equity inflows. We try to assess the impact on FII flows of several policy revisions related to FII investment during the period January 1999 to January 2004, through a multivariate GARCH regression model. Using techniques of time series intervention analyses we incorporate the effect of each individual policy intervention in a model that includes the two most important covariates of FII flows to India, namely stock market (BSE) returns and past FII flows. The range of policies considered encompasses liberalisation policies as well as restrictive ones taken to assure stability of flows. Our results strongly suggest that liberalisation policies have had the desired expansionary effect and have either increased the mean level of FII inflows and/or the sensitivity of these flows to a change in BSE return and/or the inertia of these flows. On the other hand, interestingly, the restrictive measures aimed at achieving greater control over FII flows also do not show any significant negative impact on the net inflows; we find that these policies mostly render FII investments more sensitive to the domestic market returns and raise the inertia of the FII flows.

Our results strongly suggest that liberalisation policies have had the desired expansionary effect and have either increased the mean level of FII inflows and/or the sensitivity of these flows to a change in BSE return and/or the inertia of these flows.

1. Introduction

Several developing countries opened up their economies to foreign portfolio capital flows in the late 1980s and early 1990s. Each of them did so in response to unique requirements of their domestic

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economies. In India foreign institutional investors (FIIs) have been allowed to invest in the domestic financial market since 1992. This decision to open up the Indian financial market to FII portfolio flows at that point in time was influenced by several factors such as the complete disarray in India's external finances in 1991 and a disorder in the country's capital market.[1] Aimed primarily at ensuring non-debt creating capital inflows at a time of an extreme balance of payment crisis and at developing and disciplining the nascent capital market, foreign investment funds were welcomed to the country. FII inflow to India grew many times from US$0.18 million (net, monthly) in January 1993 to about US$400 million within a year's time. Needless to mention, the nature and growth of such a flow called for special regulatory attention and legislation pertaining to foreign investment inflow was promulgated and revised periodically to ensure a steady growth of foreign portfolio capital inflow into the Indian securities markets.

The *on-off* nature of flow of funds to emerging markets, exhibited during the 1990s, is now regarded as a key characteristic of the international financial market.[2] Findings of several studies on FII flows to emerging equity markets over the world have shown the importance of financial market infrastructure such as the market size, market liquidity, trading costs, information dissemination, and legal mechanisms relating to property rights, etc. in attracting foreign portfolio investments into the emerging markets.[3] These apart, the need for harmonisation of corporate governance, accounting, listing and other rules with those followed in international financial centres as well as strengthening of securities markets' enforcement has also been stressed for improving competitiveness in attracting foreign portfolio investment inflow.[4] It has been noted that FII flows are perceived to be major drivers of stock markets in India (as well as in other developing

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[1] Measures to integrate Indian markets with those of the rest of the world were taken following the recommendations of the Rangarajan Committee on Balance of Payments and an Expert Group on Foreign Exchange Markets in India headed by O.P. Sodhani.

[2] As pointed out by IMF, WEO, 2002.

[3] Applying a panel data approach on bilateral gross cross-border equity flows between 14 countries, during 1989-96, Portes and Rey, 2000, find that asset flows depend on market size in both source and destination country as well as trading costs, in which both information and the transaction technology play a role. Garibaldi *et al* (2002) analysing capital flows to 25 European transition economies showed that FPI was volatile and concentrated in a handful of countries (notably Russia). Regressions showed that the presence of a financial market infrastructure and property rights indicator were the only significant explanatory variables for FPI. Claessens *et al* (2002) analysing data from 77 countries, find that factors such as shareholder protection and the quality of local legal systems which make it easier for investors to buy shares and firms to list in public markets play a prime role in determining the degree of integration with international capital markets.

[4] Classens *et al*, 2002.

countries) and, more importantly, that a sudden reversal of such flows may harm the stability of the domestic capital market. As the link of the Indian markets with their global counterparts has become more synchronised in recent years, there seems to have arisen a need for having a close vigil since such synchronisation always enhances the chance of a contagion. Although so far FII flows to India seem to be caused by rather than being a cause of national stock market returns,[5] policy liberalisation and regulatory supervision are thought to be of prime importance for sustaining such flows.

The present paper is part of a consolidated research effort that we have been making to assess the nature of FII flows to India. Earlier in Mukherjee, Bose and Coondoo (2002), we tried to identify the major covariates of FII flows to India and then in Mukherjee and Coondoo (2004), we examined the nature of volatility of such flows. The objective of the present paper is to examine the impact, if any, of the FII policy reforms on FII portfolio flows to the Indian stock markets. Here we use the method of intervention analysis of time series econometrics to find out whether introduction of (each of a chosen set of) regulations resulted in any significant structural break and shift in the time path of FII flow to India. It may be mentioned here that the method of intervention analysis, which has been used to study consequences of various regulatory changes in monetary and foreign exchange policy, legal statutes, etc., has not yet been applied to any study on the effect of regulations on FII inflows. India can obviously be the starting point for such a study, because the reform process has progressed here in several discrete steps over time thus creating an appropriate data set for such an analysis.

As regards the steps of analysis, we have first tried to ascertain whether the institutionalisation of the FII regulations in late 1995 has led to any significant upward shift in the level of monthly FII net inflows. This is done using the Chow test for identification of a structural break in the given time series of FII flows. Next, we examine the effects of a few major FII policy changes on the FII flows. For this latter exercise we use a multivariate GARCH model and estimate this model using the daily FII inflow data available from January 1999. The rest of the paper is organised as follows: In Section 2 the major FII policy changes are enumerated and the data set used briefly described. In Section 3 the FII flows during the period prior to the introduction of FII regulations in 1995 are compared with those of the post-regulation period. Section 4 explains the method of intervention analysis used. Section 5 presents the results of the intervention analysis based on a GARCH model. Finally, some conclusions are drawn in Section 6.

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[5] Chakrabarti, 2001; Mukherjee *et al*, 2002.

2. The Data Set

Regulatory Information

FII flows to India formally began in September 1992 under the foreign portfolio investment (FPI) scheme, when the *Guidelines for Foreign Institutional Investment* were issued by the Government of India. In November 1995, the Securities and Exchange Board of India (SEBI)[6] enforced the Securities and Exchange Board of India (Foreign Institutional Investors) Regulations, 1995 (henceforth, referred to as SEBI FII Regulations) to regulate matters relating to FII investment flows. At present, investment by FIIs is jointly regulated by this and Regulation 5(2) of the *Foreign Exchange Management Act* (FEMA), 1999.[7] The SEBI regulations require FIIs to register with the SEBI and also obtain approval from the Reserve Bank of India (RBI) under the FEMA for securities trading, operating foreign currency and rupee bank accounts and remitting and repatriating funds. In the entire process of FII registration and regulation, the SEBI acts as the nodal authority and once SEBI registration has been obtained, an FII does not require any further permission for trading securities or for transferring funds into or out of India.[8] The SEBI FII Regulations and RBI policies are amended and modified from time to time in response to the gradual maturing of the Indian financial market and changes taking place in the global economic scenario. Such modification, needless to mention, is required to be done to ensure quantitative as well as qualitative improvements in the portfolio flows through the FII route, as India has to compete with other Asian nations and other emerging markets of the world for global capital inflows.

In India, FII investment (in shares and debentures) started in January 1993. FII regulations by the SEBI were first introduced on November 14, 1995 in the form of the SEBI FII Regulations. Over the years, the SEBI and the RBI together, through a variety of measures, are trying to improve the scope, coverage and quality of FII investment. These measures include (a) widening the array of instruments in which FIIs are allowed to trade, (b) expanding the list of the types of funds that can be registered as FIIs in India and the entities on behalf of whom they can invest, (c) raising the caps for FII investment in different sectors and companies, (d) easing the norms for FII registration, reducing procedural delays, lowering fees, etc., and (e) mandating stricter disclosure norms, etc. A summary of the major regulatory changes relating to FIIs along with their reference dates is presented in *Table 1*. The hypothesis underlying the present empirical analysis is essentially

In the entire process of FII registration and regulation, the SEBI acts as the nodal authority and once SEBI registration has been obtained, an FII does not require any further permission for trading securities or for transferring funds into or out of India.

[6] Empowered by the Securities and Exchange Board of India Act, 1992.

[7] According to Notification No. 20 dated May 3, 2000.

[8] So long as the FIIs purchase and sell on a recognised stock exchange and subject to prescribed limits; all non-stock exchange sales/purchases require RBI permission.

that both strengthening of the regulatory infrastructure by the SEBI and the RBI on the one hand and further liberalisation and easing of regulatory curbs for FIIs at various time points in history on the other have had a positive impact on the flows to the national stock markets.

The Data on FII Investment

The FII inflow data used for our analysis are described in *Box 1*. It may be noted that since variation of FII flows is essentially a short run phenomenon, ideally a high frequency data set (say, daily data) on FII flows should be used for studying the impact of policy changes. As daily data on FII flows to India are available only for the period from January 1999 onwards, we have limited most of our analysis to post-1998 years as use of averaged monthly data could blur the true effects of FII policy changes on the FII flows.

The hypothesis underlying the present empirical analysis is that both strengthening of the regulatory infrastructure and further liberalisation and easing of regulatory curbs for FIIs at various time points have had a positive impact on the flows to the national stock markets.

BOX 1: Data Series and Sources

FII *net* Inflows: Monthly FII inflows into the Indian equity and debt markets; this is the difference between the purchases and sales of FIIs in the respective markets. *Source*: website of the SEBI, www.sebi.gov.in. (Available from January 1993 onwards.)

FIINM: Monthly FII inflows into the Indian equity market. *Source*: website of the SEBI, www.sebi.gov.in. (Available from January 1993 onwards.)

FIIN: Daily series on FII net equity flows. *Source:* website of the SEBI, www.sebi.gov.in. (Available from January 1999 onwards.)

BSE Sensex : The 30 share BSE stock price index; daily closing values. Source: website of the Mumbai Stock Exchange, www.bseindia.com.

Estimated Series

FIIN(-1) : FIIN with a single day's lag.

BSERET: Month-wise return on the BSE Sensex, calculated as the excess of the logarithm of the average index value in a particular month over the logarithm of the average index value in the previous month.

BSER: Daily returns on the BSE Sensex, calculated as the excess of the logarithm of the index value on a date over the logarithm of the index value on the previous day.

BSER(-1): BSER with a single day's lag.

The Dummy Variables Series

D1: Time dummy variable for the constant term;

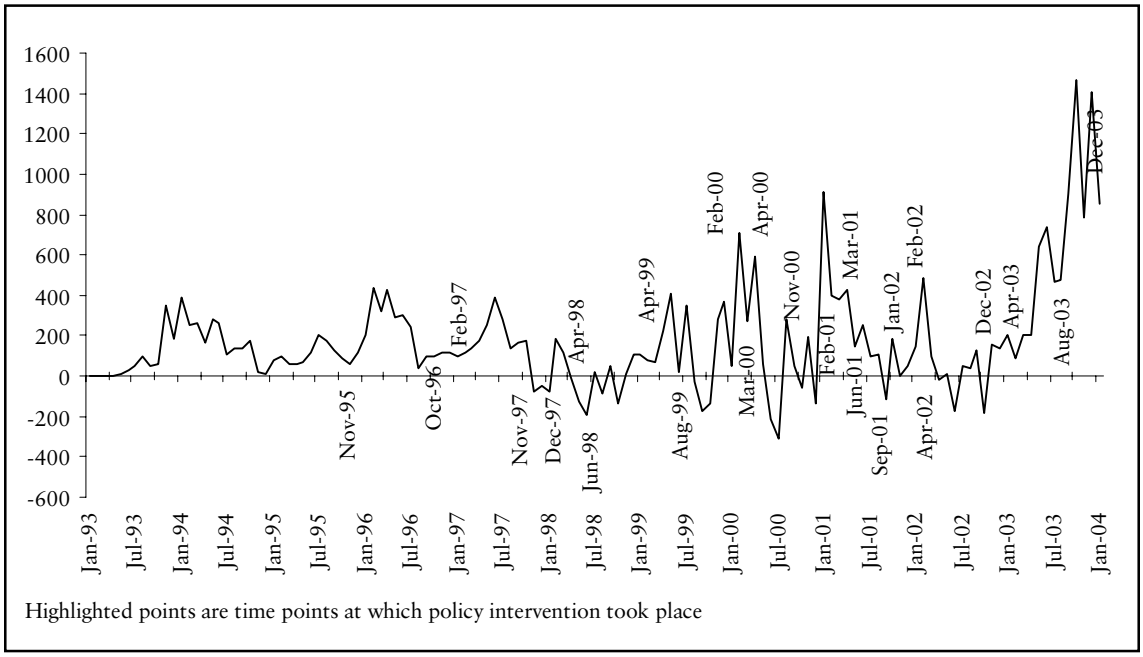
D2FIIN(-1): Composite time dummy variable for FIIN(-1);

D3BSER(-1): Composite time dummy variable for BSER(-1);

D1, D2, D3 = 0, prior to intervention & D1, D2, D3 = 1 post-intervention. (Here intervention means a policy change by the SEBI/RBI/government as described in *Table 1*, Panel B below.)

To give an idea of the effect of all policy changes on the FII flows, we present in *Table 1* and *Chart 1* the movement of monthly FII *net* inflows, juxtaposing this movement with the sequence of regulatory policy changes that have taken place during the period under consideration. To facilitate a closer look into the phenomenon, we show in *Charts 2.1–2.2* the over time growth paths of FII equity and debt flows into India during January 1993 to January 2004.[9]

CHART 1
Net Monthly FII Inflows into IndianStock Markets
(USD Million)



Highlighted points are time points at which policy intervention took place

Note: FIIs were allowed to invest in the Indian capital market securities from September 1992, however investment by them were first made in January 1993. The data till December 1998 relate to investment in equity only, as the Indian gilts market was opened up for FII investment in April 1998 and investments were made from January, 1999.

[9] Our later analysis, however, is based only on FII net *equity* flows and we ignore the FII debt flows, which are not too significant.

TABLE 1
Chronology of important regulations related to FIIs

Panel A : 1995 to 1998

Nov-95	SEBI empowered by the Securities and Exchange Board of India Act, 1992 institutionalised the FII regulations, known as the Securities and Exchange Board of India (Foreign Institutional Investors) Regulations, November 14, 1995, allowing Pension Funds, Mutual Funds or Investment Trusts, incorporated outside India; any Asset Management Company or Nominee Company, Bank or Institutional Portfolio Manager, established or incorporated outside India and proposing to make investments in India on behalf of broad based funds any Trustee or Power of Attorney holder, incorporated or established outside India, and proposing to make investments in India on behalf of broad based funds to apply for FII status to carry out trading in equities and debentures listed on the Indian stock exchanges.
Oct-96	University fund, endowments, foundations or charitable trusts or charitable societies were considered eligible for being registered as FIIs;
	FIIs were allowed to invest in unlisted companies;
	Equity share investment on own account and on behalf of sub-accounts increases to 10 from 5 per cent, of total capital issue of a company.
	Custodians asked to become members of the clearing houses/ clearing corporations of the stock exchange(s) and participate in the clearing and settlement process through the clearing house/clearing corporation for all securities.
Feb-97	Proprietary funds were included as eligible FIIs (for FII and sub-account)
Nov-97	SEBI allowed institutional investors, FIIs, stock brokers, stock exchanges etc. to make use of the facility of warehousing of trades.
Dec-97	FIIs mandated to meet certain criteria of proving to be a fit and proper person.
	Mandatory for FIIs having securities of Rs.10 crore or more, as on the latest balance sheet date, to settle their transactions only through dematerialised securities from January 15, 1998.
Apr-98	The gilts market was opened up to FII investment. Investments in Treasury bills and dated Government Securities were allowed within the overall approved debt ceilings.
	Stock lending permitted through an approved intermediary in accordance with stock lending scheme
Jun-98	FIIs allowed to invest in unlisted companies through the 100 per cent debt route
	FIIs asked to tender their securities directly in response to an open offer made in terms of the SEBI (Substantial Acquisition of Shares and Takeovers) Regulations, 1997;
	FIIs allowed to buy and sell derivative (index futures) contracts traded on a stock exchange;
	FIIs permitted to trade in derivatives without requiring to take or give delivery;

. . . continued on following page

Transactions among FIIs with respect to Indian stocks would no longer require the post facto confirmation from RBI;

Process of approval of sub-accounts of registered FIIs simplified.

Trigger point limit for investments in Indian companies by FIIs/ NRIs/OCBs under the portfolio scheme was raised by 2 percentage points;

ADs were to be permitted to provide forward cover to FIIs in respect of their fresh investments in India, in equity, effective June 12, 1998. ADs were to be allowed to extend forward cover facility to FIIs to cover the appreciation in the market value of their existing investments in India. The amount eligible for cover would be the (i) difference between the market value of their investments as at the close of business on June 11, 1998 (converted at the RBI reference rate of Rs.42.38 per US Dollar) and the market value of investments at the time of providing the cover converted at the current rate; or (ii) fresh inflows (including reinvestments of cash balances lying in the accounts of the FIIs at the close of business on June 11, 1998) since June 11,1998, whichever is higher. ADs were given the option of extending the cover fund-wise or FII-wise according to their operational feasibility. The same facility was extended to NRIs/OCBs for their portfolio investments, effective June 16, 1998.

Panel B : 1999 onwards

16-Apr-99 In respect of investments in the secondary market, FIIs were allowed to participate in open offers in accordance with take-over codes; in case of an open offer by a company to buy-back its securities, the FIIs may sell the securities held by it to such company in accordance with the SEBI (Buy-Back of securities) Regulations,1998.

24-Apr-99 Cut-off date for providing forward exchange cover to FIIs in respect of their equity investment was changed from June 11, 1998 to March 31,1999 and Authorised Dealers (ADs) were permitted to provide forward exchange cover to FIIs to the extent of 15 per cent of their outstanding equity investment as at the close of business on March 31, 1999, as well as for the entire amount of any additional investment made after March 31, 1999. Existing forward contracts booked in accordance with earlier instructions are allowed to continue even if the amount thereof exceeded 15 per cent of the value of investment as on March 31, 1999. The RBI would also consider requests from FIIs for additional limits on case by case basis after the eligible limits have been fully utilised.

29-Feb-00 A domestic portfolio manager or domestic asset management company were made eligible to be registered as a foreign institutional investor to manage the funds of sub-accounts, provided the applicant is an approved asset management company or a registered portfolio manager and that the approval or registration is valid and no disciplinary proceeding is pending before the Board against such applicant.

In case of foreign corporates or individuals, investing in equity, each of such sub-account (*substituted for* all sub accounts together) shall not invest more than 5% of the total issued capital, within the aggregate limit of 24%, of the company in which such investment is made.

Non-resident Indians (NRIs) and overseas corporate bodies (OCBs)

. . . continued on following page

	registered with RBI shall not be eligible to invest as sub-account or as foreign institutional investor.
28-Mar-00	Any person aggrieved by an order of the Board made, on and after the commencement of the Securities Laws (Second Amendment) Act, 1999, (i.e., after 16th December 1999), under these regulations may prefer an appeal to a **Securities Appellate Tribunal** having jurisdiction in the matter. The SAT replaces the Central Government for this purpose.
24-Apr-00	Indian companies (other than banking companies) including those which have already enhanced the aggregate ceiling from the normal level of 24% to 30% were permitted to enhance the aggregate ceiling on FII investment up to 40% of the issued and paid-up capital.
28-Nov-00	SEBI simplified the procedures for FIIs permitting them to execute clients' orders immediately and do the registration later within a day or two. The move will help the FIIs to proceed with execution of requests of clients, who are mostly from outside the country without waiting for SEBI clearance for each transaction.
28-Feb-01	Increase in the ceiling for investment by FIIs from 40% to 49% with the approval of the shareholders through a special resolution in the General Body Meeting. FIIs were initially allowed to invest in a company under the portfolio investment route up to 24% of the paid up capital of the company. This was previously allowed to be increased to 40% with the approval of the General Body of the shareholders by a special resolution.
20-Sep-01	In consultation with the Government, RBI permitted Indian companies to increase the FII investment limit up to the sectoral cap/statutory ceiling, as applicable.
27-Feb-02	FIIs permitted to trade in all exchange traded derivative contracts; FII portfolio investments will not be subject to the sectoral limits applicable for FDI except in specified sectors.
10-Dec-02	Every applicant eligible for grant of a certificate under Regulation 7 shall pay a registration fee of US$ 5,000 [reduced from "US $ 10,000].
28-Aug-03	Regulation 7A introduced mandating that a foreign institutional investor holding a certificate shall, at all times, abide by the Code of Conduct as specified in in *Third Schedule*.
17-Dec-03	It has now been decided to permit SEBI registered FIIs/ sub-accounts of FIIs to buy/sell equity shares/debentures of Indian companies (excluding companies engaged in the print media sector), units of domestic mutual funds,dated Government Securities and Treasury Bills through stock exchanges in India at the ruling market price, invest / trade in exchange traded derivative contracts, and also to buy/sell shares and debentures etc. of listed/unlisted companies otherwise than on stock exchange at a price approved by SEBI/ Reserve Bank as per terms and conditions prescribed in the Annexure. For the purpose of FII investment, Government Securities would include dated securities of both Government of India and State Governments of all maturities and Treasury Bills of Government of India. Investment in Government dated securities and Treasury Bills by FIIs may be made either in the primary market (at the auction/ floatation) or in the secondary market.

Source: www.sebi.gov.in; www.rbi.org.in & www.finmin.nic.in

CHART 2.1
Net Monthly FII Inflows into Stock Markets
(USD Million)

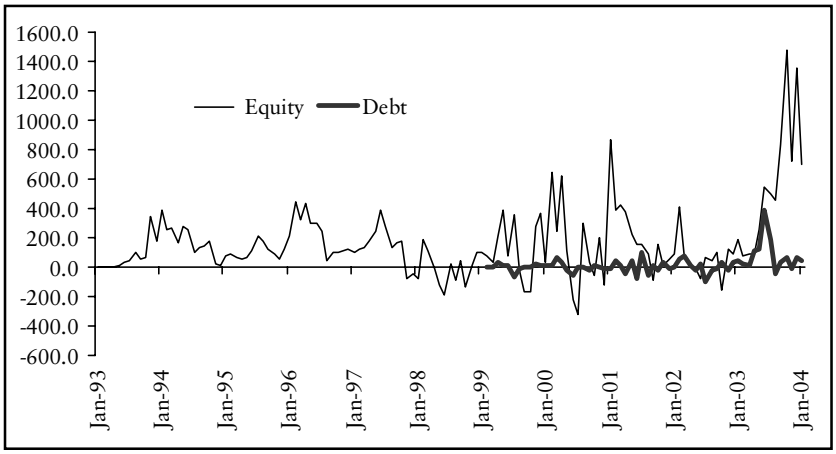
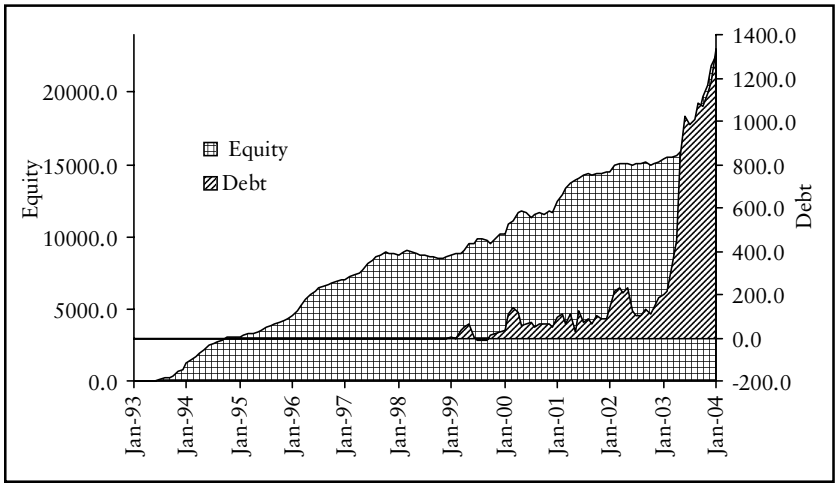


CHART 2.2
Cumulative Net Monthly FII Inflows into Stock Markets
(USD Million)



3. The Pre- and Post-FII Regulation Periods

The SEBI FII Regulations, introduced in mid-November 1995, formally set forth in detail:

- Conditions and procedures for grant or renewal of certificates to FIIs (and their sub-accounts) permitting them to operate directly in the Indian stock market. (This includes the eligibility criteria for being permitted to be registered as an FII in India; verification of whether it is legally permissible for the applicant to invest in securities outside the country of its incorporation; whether the applicant has been registered with any statutory authority in that country; and whether any legal

proceeding has been initiated by any statutory authority against the applicant.)
- Conditions for and restrictions on investment, which include the type of instruments an FII is allowed to invest in, and the applicable caps or ceilings in respect of different types of instruments (or sectors), etc.
- General obligations and responsibilities, which include appointment of a domestic custodian; appointment of a branch of a bank approved by the RBI for opening of foreign currency denominated accounts and special non-resident rupee accounts; maintenance of proper books of accounts, records, etc.
- Procedure for action in case of default and suspension/cancellation of certificate.
- The fees and taxes to be paid.
- Provisions for appeal in case of any grievances.

It is obviously of interest to see whether the introduction of the SEBI FII Regulations had any immediate repercussions on FII equity investments, causing a major gap between the pre- and post- regulation flows. We use the monthly data series of FII *net* equity inflows (FIINM) to study this impact. However, in the post-regulation period, the Asian currency crisis had a very strong negative effect on global capital flows, particularly to emerging Asian economies. In order to filter out this effect, we compare our pre-regulation period with the post-regulation period up to the beginning of the Asian crisis (which is taken to be up to June 1997[10]). Comparing the monthly inflows prior to the introduction of the SEBI Regulations with the corresponding post-regulation (pre-Asian crisis) period inflows, it is easy to see that the average (and median) monthly inflows during these two sub-periods were quite different, with the post-regulation period having a much higher average (and median) inflow [*Table 2*, Panel A]. An *equality of means test* confirms that the difference between the means (and medians) of the two sub-periods are indeed statistically significant [*Table 2*, Panel B],[11] with the post-regulation period experiencing much higher flows on an average. Next we consider the result of a *Chow break point test*, which helps us detect any significant shift in the flows immediately after the introduction of the SEBI FII Regulations. To carry out this test, we regress the monthly net equity flows (FIINM) (for the

Comparing the monthly inflows prior to the introduction of the SEBI Regulations with the corresponding post-regulation (pre-Asian crisis) period inflows, it is easy to see that the average (and median) monthly inflows during these two sub-periods were quite different.

[10] On July 2, 1997 the Bank of Thailand announced a managed float of the baht and called on the IMF for *technical assistance*; the announcement effectively devalued the baht by about 15-20 per cent as it ended at a record low of 28.80 to the dollar. This is taken to be a trigger for the East Asian crisis *(Chronology of the Asian Currency Crisis and its Global Contagion*, Nouriel Roubini's webpage; www.stern.nyu.edu/globalmacro).

[11] Though the standard deviations of the two periods are not significantly different, note that the volatility, indicated by the coefficient of variation, is much less for the post regulation period.

54-month preceding the Asian crisis) on returns on the BSE Sensex (BSER).[12] The result of the Chow test strongly suggests existence of a structural break in the time series data on FII flows under consideration

TABLE 2
Impact of the SEBI FII Act, November 1995 on *net* Monthly Inflows of FIIs
Sample period: January 1993 to June 1997

Panel A

FIINM	*PREREG*	*POSTREG*
Mean	118.55	210.19
Median	93.41	174.44
Maximum	393.24	440.4
Minimum	0.09	41.57
Std. Dev.	102.77	122.51
CV	86.7%	58.3%
No. of. months	35	19

Panel B

Test for Equality of Means Between Series PREREG & POSTREG

Method	*df*	*Value*	*Probability*
t-test	52	2.924	0.005
Anova F-statistic	(1, 52)	8.548	0.005

Test for Equality of Medians between Series

Method	*df*	*Value*	*Probability*
Wilcoxon / Mann-Whitney		2.790	0.005

Test for Equality of Variances between Series

Method	*df*	*Value*	*Probability*
F-test	(34, 18)	1.421	0.432

Panel C

Regression of FIINM on BSERET

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Probability*
C	146.971	14.635	10.042	0.000
BSERET	772.367	218.009	3.543	0.001
R-squared	0.198			
Adjusted R-squared	0.182			
F-statistic	12.552			
Durbin-Watson stat	0.871			

Chow Breakpoint Test: 1995:12

F-statistic	4.45	Probability	0.017
Log likelihood ratio	8.839	Probability	0.012

The result of the Chow test strongly suggests existence of a structural break in the time series data on FII flows under consideration at the time point of the introduction of the SEBI Regulations in November 1995.

[12] In our earlier analysis BSRET was found to be the single most important determinant of FII flows to Indian stock markets.

at the time point of the introduction of the SEBI Regulations in November 1995 [*Table 2*, Panel C], thus confirming that the introduction of a comprehensive set of laws to govern FII flows had definitely helped to attract more foreign portfolio investment flows into the country until the onset of the Asian financial crisis.

4. Application of Intervention Analysis

Since January 1, 1999 the SEBI has made available daily data on FII flows. We use this data set to carry out a more detailed investigation of the effect of post-January 1999 policy changes, using the technique of intervention analysis [*Box 2*]. Briefly, this technique is designed to measure whether an exogenous shock at a point in time results in a significant change in the pattern of over time movement of a variable in the post-shock period[13,14] [See Box and Tiao, 1975 and also Enders, 1995]. For the present study, we have selected a set of 10 FII regulations and tried to see if these regulations have significantly affected the time path of FII portfolio flows to India. The regulatory changes considered are listed in Panel B of *Table 1*.[15]

It may, in principle, be difficult to segregate the pure and partial impact of a regulation on FII flows, because there may be other external events, particularly those taking place in the global markets, which simultaneously affect FII activities.

It should be noted that it may, in principle, be difficult to segregate the pure and partial impact of a regulation on FII flows (FIIN), because there may be other external events, particularly those taking place in the global markets, which simultaneously affect FII activities. For setting the econometric model for the present study, we have taken note of the results of our previous research where it was found that other than its own autoregressive effect (i.e., dependence on own lagged value (FIIN(-1)), the single most important determinant of FII flows to India is one period lagged returns of the domestic stock market (BSER(-1)). Since other factors like the US and world stock price movements, volatility of return in different markets and domestic real and financial variables etc. have minor effects on FII flows to India (Mukherjee *et al*, 2002), these are not considered here. Now, to factor out the possible effects of these variables so that the partial effect of regulation on FIIN can be examined reasonably, we have performed the intervention analysis exercise using a multivariate regression set-up (in which these non-regulation variables are included along with the regulation variable(s)).

[13] The nature of change may be of various kinds—a shift (upward or downward) in the level, a change in the time rate of change of the value of the variable, addition of a trend element that was not there before, or a mixture of some or all of these.

[14] Intervention analysis has been widely used in legal studies, to look at the impact of introduction of certain legislation—see for example, Sridharan *et al*, 2003 and Nelson, 2000; in environmental studies to determine damages caused by certain natural calamities etc.; and also in economic studies to examine effects of changes in monetary policy or exchange rate interventions by Central banks as in Doroodian and Caporale, 2001; Watanabe and Harada, 2001; Hali *et al*, 2003.

[15] We ignore the announcement on December 17, 2003, as we had very little data in the post-intervention period to study its effect.

BOX 2: Intervention Analysis

In the analysis of business, economic, environmental or legal data, it is often of interest to determine the effects of interventions or exogenous events (either experimental or random in nature) such as shocks (the oil crisis, natural calamities); policy initiatives (a change in fiscal/monetary/exchange rate policy, restrictions on capital flows or the implementation of certain pollution control measures or penal codes); or other exogenous changes (war participation, electoral outcomes) that occurred at some known time points.

In performing the analysis, one takes into account:

- the dynamic characteristics of the intervention
- the dynamic structure or serial dependence of the observations.

Intervention effects may be of several forms; it could be abrupt or gradual, permanent or temporary. A pulse intervention is used to capture single special events in a time period such as a special holiday or a strike. Such events may cause outlying observations within the time series and the pulse regression variable can take such observations outside the general model. Alternatively, a step intervention enables breaking the single time series into two distinct segments with two different overall means, one consisting of all pre-intervention observations and the other consisting of all post-intervention observations. Here the value of the level of the time series instantly changes at the time point when the intervention takes place, and the level change is permanent after the intervention. The step intervention is introduced in the model to capture events such as the introduction of new policy measures or changes in regulations.

Effects of interventions may be manifested as:

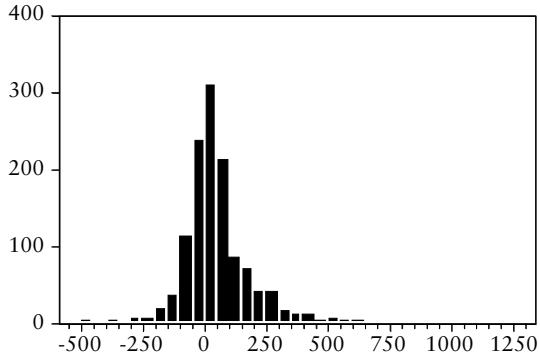
- change in the levels,
- change in the trend, or
- more complex patterns, in the time series of interest. In general, the intervention function consists of two components: the rate of growth or decay in the level of the time series after the impact, and the initial impact of an event on the time series, which is an estimate of the difference between the pre- and post-intervention levels of the series.

The analysis of intervention in a time series focuses on a test of the null hypothesis, that is, did the intervention have an impact on the time series? Usually, a dummy explanatory variable is used to model possible unusual behaviour and then the hypothesis that the parameter associated with this dummy variable is zero, is tested. Rejecting this hypothesis provides evidence that the unusual event or the intervention had an impact. In sequential intervention analysis one applies intervention analysis at each point in the series; if there are *k* known interventions at different time points, the method is to estimate the parameters involved in the *k* interventions jointly with the parameters in the noise model.

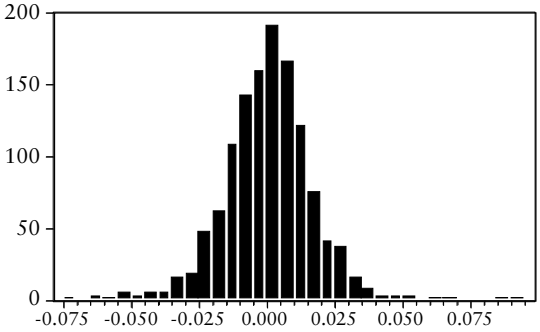
Summary descriptive statistics of the individual variables is presented in *Table 3*. An idea of the immediate impact of the policy announcements on the FII flows may be had from the charts presented in the *Appendix*. These charts depict the pattern of daily FII flows for a

TABLE 3
Some descriptive statistics of the daily FII flows and Returns on BSE Sensex
Sample period: 1st January 1999 to 30th January 2004.

Panel A: Descriptive statistics



Series: FIIN	
Sample 1 1257	
Observations 1257	
Mean	50.14503
Median	30.10000
Maximum	1267.100
Minimum	-509.5000
Std. Dev.	136.3235
Skewness	1.422465
Kurtosis	11.61894
Jarque-Bera	4314.642
Probability	0.000000



Series: BSER	
Sample 1 1257	
Observations 1257	
Mean	0.000445
Median	0.001140
Maximum	0.092510
Minimum	–0.074230
Std. Dev.	0.016725
Skewness	–0.117141
Kurtosis	5.857408
Jarque-Bera	430.5052
Probability	0.000000

Panel B: Cross-correlations

	FIIN	*FIIN(-1)*
FIIN	1	0.34
FIIN(-1)		1

	FIIN	*BSER(-1)*
FIIN	1	0.24
BSER(-1)		1

	FIIN(-1)	*BSER*
FIIN(-1)	1	0.06
BSER		1

Panel C: Unit root tests

Variable	*ADF statistic*	*Order of integration*
FIIN	-12.9	I(0)
BSER	-19.9	I(0)

Critical value of ADF statistic is -3.44

Panel D : Pairwise Granger Causality Tests

Null Hypothesis:	*Value of the F-Statistic at different lags*			
	1	*3*	*5*	*7*
BSER does not Granger Cause FIIN	67.878*	31.4733*	23.1737*	17.9174*
FIIN does not Granger Cause BSER	3.9329#	2.26469##	2.40385#	1.76564##

* / # / ## denotes rejection at 1% / 5% / 10 % level of significance, respectively.

two-month window (viz., the months preceding and immediately following a regulation announcement) for each of the 10 announcements.

In the next step, we perform the formal intervention analysis. Let us briefly explain the set-up. Since we specify FIIN to depend on FIIN(-1) and BSER(-1), the basic regression equation will have three parameters, viz., an intercept (measuring the mean level of FII flows) and two slope coefficients corresponding to the quantitative explanatory variables. The coefficient of FIIN (-1) is supposed to indicate the *inertia of FII flows* while that of BSER(-1) measures the *sensitivity of FII flows to variation in stock market return*. Now, an intervention will act like a *structural change* and to capture the possible *shifting* effect of the intervention, we define a *time dummy variable* (say, D) that takes a value *zero* for all time points preceding the time point of the intervention and a value *unity* for the time point of intervention and all time points following it. The intervention is likely to make the coefficients of the basic regression equation for the pre- and post-intervention periods different. To model this possibility, we specify all the three basic regression parameters to be (linear) functions of D. Thus, the regression equation incorporating an intervention will have six parameters, viz., the intercept and those relating to D, BSER(-1), FIIN (-1), DxBSER(-1) and DxFIIN(-1).[16] Finally, to capture the volatility of FIIN present in the data set,[17] we specify the equation disturbance term to be of the GARCH form.[18] Thus, our intervention analysis is essentially based on a multivariate regression model with GARCH errors [See Bollerslev, 1986]. In the actual empirical exercise a GARCH (1,1) specification is found to be adequate for the given data set.[19] Under the null hypothesis that an intervention has no significant effect on FIIN, all the parameters associated with the time dummy and pseudo dummy variable(s) will be zero. Conversely, if at least one of these coefficients turns out to be statistically significant, that will be indicative of a significant effect of the intervention.[20,21] In this context it may be mentioned that typically

Our intervention analysis is essentially based on a multivariate regression model with GARCH errors. In the actual empirical exercise a GARCH (1,1) specification is found to be adequate for the given data set.

[16] Henceforth we refer to DxBSER(-1) and DxFIIN(-1) as pseudo dummy variables.

[17] Mukherjee *et al* (2004) document evidence of significant volatility in the daily data on FII flows for India.

[18] A generalised autoregressive conditional heteroskedasticity (GARCH) framework provides an efficient parametric way of modelling uncertainty in high frequency econometric time series, where some time periods are riskier than others; that is, the expected value of error terms at some times is greater than at others. The GARCH (1,1) model is specified such that the error variance at any time point is conditional on the immediate past information on the error terms.

[19] In all the cases the GARCH (1,1) coefficients are found to be significant. This indicates that the volatility in the daily flow data has been captured by the specified model.

[20] To keep things simple, we have justifiably assumed that the introduction of these policy changes does not lead to any increase in the long term volatility of the flows, and we have thus not introduced intervention dummy variables in the GARCH terms of the error variance equation.

[21] We have actually done a forward step-wise GARCH model estimation.

intervention analysis is used to estimate the long run effect of a single one-point shock (in the form of implementation of a policy/regulation, say) given to an autoregressive variable.

Here the intervention analysis has been done following two different approaches. In one approach, we examine the estimated effects of individual regulations, taking one regulation at a time (i.e., as if there was just one regulation during the entire sample period) and this more or less matches with the conventional form of intervention analysis. In the other approach, we examine sequentially the impact of the series of regulations to see which regulations might have dominated in terms of their impact on the FIIN. In other words, suppose the effect of the first regulation effected at time point *t1* is found to be statistically significant. We then bring in the second regulation made at a subsequent time point, *t2* say, into the analysis. The GARCH model is expanded by introducing another time dummy variable corresponding to the second regulation and this expanded model is estimated. If at least one coefficient associated with the latter set of time dummy and pseudo dummy variables turns out to be significant, the second regulation is taken to have a significant marginal effect on the FIIN. Otherwise, the second regulation is dropped in the subsequent analysis. The process is repeated until all the regulations have been considered.

Overall every regulation, taken individually, has either increased the mean level of FII inflows and/or the sensitivity of these flows to a change in BSE return and/or the inertia of these flows.

5. Some Important Results

Analysis of Individual Interventions

The results of the intervention analysis based on the first approach are presented in *Table 4*. These results are based on the daily data set for the sample period January 1, 1999 to January 30, 2004. All the 10 regulations are considered in this and the subsequent sequential analysis of interventions. As may be noted from *Table 4*, the individual effect of each of these regulations turns out to be statistically significant in the sense that at least one of the coefficients of the three time/pseudo dummy variables is significant in every case. Further, in no case the estimated coefficient of a time/pseudo dummy variable is significantly negative. This suggests that *overall* every regulation, taken individually, has either increased the mean level of FII inflows and/or the sensitivity of these flows to a change in BSE return and/or the inertia of these flows. Let us next try to juxtapose these results with the nature of the regulations.

The first intervention of April 1999 actually encompasses two policy modifications. In April 1999, the SEBI allowed FIIs to participate directly[22] in open offers of companies for buying back their securities.[23]

In this, at each step we have included one additional regressor and seen if the inclusion leads to a statistically significant improvement in the result. We have chosen the final models considering regression diagnostics like AICs, adjusted R-squares, etc.

[22] Instead of going through domestic stock brokers.

[23] In accordance with the SEBI (Buy-Back of Securities) Regulations, 1998.

At the same time, in keeping with the policy of gradual liberalisation of the capital account, the RBI permitted authorised dealers in the foreign exchange market to provide forward exchange cover to FIIs.[24] These policy measures were taken at a time when the domestic market had turned bearish due to a reversal of market optimism for several reasons (viz., the imposition of economic sanctions by the US, downgrading by

TABLE 4
Results of the GARCH (1,1) model for testing of intervention effects

Policy Intervention	*Apr-99*	*Feb-00*	*Mar-00*	*Apr-00*	*Nov-00*	*Feb-01*	*Sep-01*	*Feb-02*	*Dec-02*	*Aug-03*
D1, D2, D3= 0 if t< 1 otherwise	*24th April '99*	*29th Feb '00*	*28th Mar '00*	*24th Apr '00*	*28th Nov '00*	*28th Feb '01*	*20th Sep '01*	*27th Feb '02*	*10th Dec '02*	*28th Aug '03*
Coefficients, std errors and z-statistics										
C	–	**16.78**	**17.65**	**18.98**	**26.51**	**26.43**	**25.87**	**18.86**	**27.24**	**26.69**
	–	5.76	5.64	5.61	2.40	2.40	2.55	3.69	2.24	2.24
	–	2.91	3.13	3.38	11.06	11.00	10.14	5.12	12.14	11.94
D1	**29.22**	**15.14**	**13.98**	**12.14**	–	–	–	**27.48**	–	**99.81**
	2.35	6.09	5.94	5.90	–	–	–	3.93	–	24.60
	12.44	2.48	2.35	2.06	–	–	–	6.99	–	4.06
FIIN(-1)	**0.30**	**0.29**	**0.30**	**0.30**	**0.21**	**0.22**	**0.22**	**0.29**	**0.20**	**0.23**
	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.03	0.04	0.03
	10.51	10.70	10.74	10.81	3.95	4.52	4.74	10.79	5.74	7.99
D2FIIN(-1)	–	–	–	–	**0.16**	**0.14**	**0.20**	–	**0.27**	**0.14**
	–	–	–	–	0.06	0.06	0.06	–	0.06	0.10
	–	–	–	–	2.50	2.36	3.33	–	4.62	1.40
BSER(-1)	–	**965.81**	**904.19**	**891.85**	**1092.40**	**1132.58**	**1107.77**	**1398.87**	**1378.92**	**1543.00**
	–	249.80	248.35	246.40	218.43	211.65	195.16	157.10	157.97	150.02
	–	3.87	3.64	3.62	5.00	5.35	5.68	8.90	8.73	10.29
D3BSER(-1)	**1857.14**	**1155.20**	**1272.51**	**1330.45**	**1075.22**	**1010.72**	**1729.12**	**1752.82**	**2691.93**	**2821.05**
	174.56	325.55	324.77	325.32	326.79	324.19	345.58	316.17	498.81	1061.13
	10.64	3.55	3.92	4.09	3.29	3.12	5.00	5.54	5.40	2.66
Variance Equation										
C	**206.67**	**193.27**	**193.24**	**195.07**	**195.23**	**195.75**	**191.05**	**126.18**	**189.48**	**220.04**
	48.84	46.23	45.97	46.23	46.57	46.72	45.94	39.92	47.35	51.01
	4.23	4.18	4.20	4.22	4.19	4.19	4.16	3.16	4.00	4.31
ARCH(1)	**0.08**	**0.08**	**0.08**	**0.08**	**0.07**	**0.07**	**0.07**	**0.09**	**0.08**	**0.08**
	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	8.26	8.24	8.22	8.23	8.12	8.14	7.97	8.20	7.96	8.27
GARCH(1)	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.92	0.92	0.92
	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	91.37	93.02	93.52	93.63	96.92	96.76	101.77	94.54	92.41	87.76
Regression diagnostics										
R-squared	0.16	0.17	0.17	0.17	0.18	0.17	0.19	0.18	0.21	0.24
Adjusted R-squared	0.15	0.16	0.16	0.16	0.17	0.17	0.19	0.17	0.21	0.23
F-statistic	46.9	35.3	36.0	36.0	38.2	37.4	43.0	39.0	48.7	48.7
Durbin-Watson statistic	2.11	2.12	2.12	2.12	2.14	2.12	2.17	2.14	2.17	2.22

[24] Initially to the extent of 15 per cent of their outstanding equity investment, with consideration of additional limits on case by case basis after the eligible limits have been fully utilised.

international rating agencies, the difficulties faced by the US-64 Scheme of the UTI, and the recent crises surrounding the South-East Asian markets, Russia and Brazil). It seems that the introduction of these policies, as was to be expected, led to an upward shift in the level of FII flows. Further, as data would show, in the post-intervention period, BSE returns showed a remarkable recovery with the BSE Sensex crossing the 6000 mark. Coincidentally, FII investments increased by over Rs. 2,800 crore in February 2000. These two facts together may be supportive of the increased sensitivity of FII flows to variations in BSE returns that the estimates suggest.

The results show both a significant rise in the average level of flows post-February 2000 and a rise in the sensitivity of FII flows to BSE returns in the post-intervention period.

The second intervention was made in February 2000. With a view to making the membership of the FII category realistic, the SEBI allowed those domestic portfolio managers operating as agents/sub-agents of FIIs to be registered as FIIs themselves. Further, foreign corporates and foreign individuals with a high net worth were permitted to invest in India through registered FIIs. At the same time NRIs and OCBs were banned from registering as FIIs or as sub-accounts.[25] The expected effect of these changes seems to be clearly reflected in our results.[26] The results show both a significant rise in the average level of flows post-February 2000 and a rise in the sensitivity of FII flows to BSE returns in the post-intervention period, thereby suggesting that inclusion of foreign corporates and individuals, and permission to eligible domestic fund managers to function as FIIs have had the desired expansionary effect on the net inflows and the possible negative effect of precluding NRIs and OCBs did not dominate.

The intervention of March 2000 involved amendments of the SEBI FII Act, 1995 by which the Securities Appellate Tribunal (SAT) replaced the Central Government as the appellate body for FIIs for resolving FIIs' grievances against SEBI orders.[27] *A priori* this initiative should bring about greater convenience and confidence to the FIIs so far as making investment in India was concerned. The estimated results for this regulation seems to have picked up this expected effect. The next intervention—that of April 2000, which permitted Indian non-bank companies to raise their aggregate ceiling on FII investment up to 40 per cent of their issued and paid-up capital, from the previous limit of 24 per cent (30 per cent in some cases)—also provided stimulus to FII flows.[28]

[25] As non-residents (NRIs) and overseas corporate bodies (OCBs) were allegedly bringing in hot money into the market which could have potentially destabilising effects.

[26] From this point onwards the constant term, and lagged FII flows and BSE returns are always significant.

[27] Previous rules were repealed and substituted by new Securities Appellate Tribunal (Procedure) Rules, 2000, which provide for appeal to Securities Appellate Tribunal instead of Central Government from any order of the SEBI passed after December 16, 1999.

[28] It should be pointed out here that since these two regulations were made in quick succession, the positive marginal effect of the latter may have got confounded with that of the former in our results.

In November 2000, some procedures for FIIs were simplified by the SEBI, permitting them to immediately execute clients' orders and do necessary paper work for registration later within a day or two. The move was aimed at facilitating the FIIs to promptly do the transactions on behalf of their clients without waiting for SEBI clearance for each transaction. This was followed by the intervention of February 2001, in which the RBI increased the ceiling of FII investment in companies from 40 to 49 per cent. As our results show, the effects of these two interventions are qualitatively somewhat different from those of the earlier ones. These seem to have significantly raised, not the average level, but the inertia of the FII flows (which suggests that day-to-day fluctuations became less sharp from this time onward). The estimated effects of the next intervention of September 2001 are found to be qualitatively very similar in nature to those of the previous two mentioned just above; this regulation also involved an upward revision of the FIIs' sector-specific investment caps.

In February 2002, the sectoral limits of FII portfolio investments were removed, except for some specific sectors.[29] FIIs were also given permission to trade in all exchange-traded derivative contracts. This enhancement was very important because earlier FIIs were allowed to trade only index futures contracts in the derivatives segment of the NSE and the BSE. FII investments in spot equities could be expected to rise once they were given the scope to hedge their positions in a liquid derivatives market.[30] These announcements, as the results suggest, increased both the average level of flows and the sensitivity to BSE returns of the flows keeping the degree of inertia of the pre-intervention period unaffected. The effect of the next intervention in December 2002, when the SEBI halved the FII registration fee from US$10,000 to US$5,000, left the average level of flows unaffected but raised the degree of inertia.

Finally, the last of the 10 interventions, viz. that of August 2003, was made at a time when both the global and the domestic stock markets were booming and the domestic market was experiencing a

In February 2002, the sectoral limits of FII portfolio investments were removed, except for some specific sectors. FIIs were also given permission to trade in all exchange-traded derivative contracts.

[29] Ministry of Finance, 2002.

[30] In fact, the investment of $4.021 billion (Rs. 18,865.20 crore) made by FIIs in the calendar of 2003 is the highest since they were permitted to invest in Indian equities in 1993 [the previous record high by FIIs was in 2001 when they invested $2.84 billion (Rs. 13,292.70 crore)] and the sharp spurt in FII investment in the last half of 2003 is largely attributed to the increased arbitrage play by FIIs, between the cash and the derivatives market. This is in spite of the fact that the position limits applicable to FIIs are a major stumbling block to increased foreign participation; each FII's gross exposure in an index product is restricted to the higher of 15 per cent of the open interest or Rs. 100 crore and the limit for single stock products is 20 per cent of the market wide limit or Rs. 50 crore, whichever is lower. Since an FII having a large exposure to Indian markets can only hedge its position to the extent of the restrictive limit specified, several FIIs prefer to leave their positions unhedged rather than hedge a small portion of the portfolio. Besides, these limits were laid down in early 2002 when the depth and liquidity in the markets were low and could now be revised [Chitale, 2003].

Finally, the last of the 10 interventions, viz. that of August 2003, was made at a time when both the global and the domestic stock markets were booming and the domestic market was experiencing a high level of FII inflow.

high level of FII inflow. The SEBI announced stricter disclosure norms for FIIs by adding *Regulation 7A* to the SEBI Act that directed the FIIs holding registration certificates to abide by the code of conduct specified in the newly added *Third Schedule*. This schedule encompasses such matters as exercise of diligence and independent professional judgement; and maintenance of confidentiality in respect of trades, to ensure observance of good corporate policies and corporate governance. It also requires FIIs to avoid fraudulent and manipulative transaction, suppression of facts in documents, reports or information furnished to the Board, price rigging, and insider trading or passing of price sensitive information. The estimated effect of this intervention is qualitatively different from those of the previous ones in the sense that in this case *all* the regression coefficients turned out to be positive (except that of the lagged FIIN which was positive but not significant). Thus, in this case the average level of flow, sensitivity of flow to changes in market return and inertia of flow all tended to rise in the post-intervention period. Such a result may appear somewhat counter-intuitive. That is because this is an intervention essentially aimed at disciplining FII behaviour and therefore one would normally expect it to generate a negative impact on the FII flows. The hefty FII inflows that followed in the post-intervention period in this case are perhaps suggestive of positive effects of improved governance.

Sequential Analysis of Interventions

As already mentioned, in the analysis of individual interventions discussed above the effect of successive regulations may get confounded and hence the effect of a specific regulation may not get reflected accurately in the results of the analysis of individual interventions. Essentially for this reason we perform the sequential analysis of interventions explained earlier. The results of this analysis are presented in *Table 5*. The results for six different stages of analysis are reported in this Table. As already explained, the number of regulations considered increases in successive stages from two in the first stage to seven in the sixth and final stage. The first three of the 10 regulations (viz., those of April 1999, February 2000 and March 2000) have not been included in the sequential analysis.[31] Thus the first intervention considered is that of April 2000. In what follows, we explain the results that we have obtained.

In *Stage 1*, we consider the intervention of April 2000 together with the policy to expedite the process of transaction made by FIIs announced in November 2000. As the results show, the former interven-

[31] There have been a series of policy announcements in a short span of time within April 1999 to April 2000, and if we try to examine the joint effect of these, the multicolinearity problem arises. Hence, we begin with the April 2000 regulation announcement as the first intervention, assuming that it shows the cumulative effects of the three previous interventions.

tion that increased the limit of FII investment to companies raised the sensitivity to stock market return variation whereas the latter one that offered quicker processing facilities for FII transactions led to a greater inertia of FII flows. No significant effect on the average level of flow however is observed. In the next stage, i.e., *Stage 2*, the model is expanded by adding to it the February 2001 intervention (viz., a further increase of the maximum FII investment to a company to 49 per cent of paid-up capital). It may be seen that while the impact of the April and November 2000 interventions remains significant, the marginal effect of the February 2001 intervention is that it raises the average level of FII flows. However, this impact is not highly significant.

In *Stage 3*, the September 2001 intervention that allowed Indian companies to increase their FII investment limit up to the sectoral cap/statutory ceiling, as applicable, is added to the model. This inclusion brings about a few changes in the result of the preceding stage. First, the effect on inertia of FIIN flows of the November 2000 intervention is superseded by a corresponding effect of the September 2001 regulation. Second, in addition to the April 2000 intervention, the sensitivity of FII flows to BSE returns now gets affected by the September 2001 intervention as well. Finally, the positive effect of the February 2001 intervention on the average level of FII flows now disappears. The marginal effect of the September 2001 intervention thus comprises accentuation of both the return-sensitivity and inertia of FII flow.

Next, the intervention of February 2002 is added in *Stage 4* of the analysis. This relates to the grant of further access to the derivatives market to the FIIs, thus giving them a better opportunity to hedge their risk involved in participation in the Indian stock market. Inclusion of this intervention keeps the results of the previous stage more or less unchanged with one modification, viz., the latest regulation is seen to induce a significant upward shift in the average level of FII flows. In *Stage 5*, the December 2002 intervention is included in the model. This intervention of a substantial fee reduction for FIIs is seen to have a strong and significant effect. It is seen to supersede the effects of the September 2002 regulation on the sensitivity to market returns and inertia of FII flows. It may also be noted that the effects of the April 2000 and February 2002 interventions continue to be significant at this stage. In the final stage (i.e., *Stage 6*) we include the last of the regulatory change that we have considered, viz., that of August 2003, which sought to enforce disciplinary codes by imposing stricter disclosure norms to FIIs operating in India. This inclusion brings in two changes in the results—the effect on the inertia of the December 2002 regulation gets eliminated and the effect of the last intervention on the average level of FII flows is seen to be positive and significant.

The final form of the estimated GARCH regression model of stage 6 includes only four of the 10 interventions considered in the analysis. These are the regulations of April 2000, February 2002, December 2002 and August 2003. While the April 2000 and December

It may be seen that while the impact of the April and November 2000 interventions remains significant, the marginal effect of the February 2001 intervention is that it raises the average level of FII flows. However, this impact is not highly significant.

TABLE 5
Results of the expanded GARCH (1,1) model for sequential testing of intervention effects

Stages	*Variables*	*Coeffi-cient*	*Std. Error*	*z-Stat-istic*	*P-values*	*Adj R-squared*	*Regrsn. Std. Error*	*Durbin-Watson stat*	*F-stat-istic*
Stage 1:	***Includes interventions on 24th Apr-00 & 28th Nov-00***								
	C	26.74	2.37	11.3	0				
	FIIN(-1)	0.21	0.05	4.0	0.0001				
	BSER(-1)	869.13	245.42	3.5	0.0004				
	D3BSER(-1)_APR00	1361.70	336.44	4.0	0.0001				
	D2FIIN(-1)_NOV00	0.16	0.06	2.6	0.0108				
						0.18	123.54	2.15	40.2
	Variance Equation								
	C	198.88	46.24	4.3	0				
	ARCH(1)	0.07	0.01	8.3	0				
	GARCH(1)	0.92	0.01	99.4	0				
Stage 2:	***Includes interventions on 24th Apr-00, 28th Nov-00 & 28th Feb-01***								
	C	21.02	4.95	4.2	0				
	FIIN(-1)	0.22	0.05	4.2	0				
	BSER(-1)	904.91	253.06	3.6	0.0003				
	D3BSER(-1)_APR00	1327.24	335.48	4.0	0.0001				
	D2FIIN(-1)_NOV00	0.13	0.06	2.1	0.0386				
	D1_FEB01	8.95	5.56	1.6	0.1076				
						0.18	123.66	2.14	34.9
	Variance Equation								
	C	193.02	45.94	4.2	0				
	ARCH(1)	0.08	0.01	7.9	0				
	GARCH(1)	0.92	0.01	93.6	0				
Stage 3:	***Includes interventions on 24th Apr-00, 28th Nov-00, 28th Feb-01& 20th Sept-01***								
	C	26.23	2.51	10.4	0				
	FIIN(-1)	0.22	0.05	4.7	0				
	BSER(-1)	861.70	246.11	3.5	0.0005				
	D3BSER(-1)_APR00	687.41	438.13	1.6	0.1167				
	D2FIIN(-1)_SEP01	0.19	0.06	3.3	0.0010				
	D3BSER(-1)_SEP01	1277.16	459.90	2.8	0.0055				
						0.19	122.64	2.17	38.1
	Variance Equation								
	C	190.63	45.35	4.2	0				
	ARCH(1)	0.07	0.01	8.1	0				
	GARCH(1)	0.93	0.01	102.9	0				

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Stages	*Variables*	*Coeffi-cient*	*Std. Error*	*z-Stat-istic*	*P-values*	*Adj R-squared*	*Regrsn. Std. Error*	*Durbin-Watson stat*	*F-stat-istic*
Stage 4:	***Includes interventions on 24th Apr-00, 28th Nov-00, 28th Feb-01, 20th Sept-01 & 27th Feb-02***								
	C	19.14	3.71	5.2	0				
	FIIN(-1)	0.24	0.05	5.1	0				
	BSER(-1)	930.13	229.30	4.1	0				
	D3BSER(-1)_APR00	600.26	415.16	1.4	0.1482				
	D2FIIN(-1)_SEP01	0.12	0.06	2.0	0.0437				
	D3BSER(-1)_SEP01	1300.84	432.39	3.0	0.0026				
	D1_FEB02	24.03	4.12	5.8	0				
						0.19	122.84	2.15	33.4
	Variance Equation								
	C	134.51	39.81	3.4	0.0007				
	ARCH(1)	0.08	0.01	8.0	0				
	GARCH(1)	0.92	0.01	97.8	0				
Stage 5:	***Includes interventions on 24th Apr-00, 28th Nov-00, 28th Feb-01, 20th Sept-01, 27th Feb-02 & 10th Dec-02***								
	C	21.12	3.67	5.8	0				
	FIIN(-1)	0.23	0.04	6.2	0				
	BSER(-1)	930.36	222.99	4.2	0				
	D3BSER(-1)_APR00	935.78	323.21	2.9	0.0038				
	D1_FEB02	19.20	4.32	4.4	0				
	D2FIIN(-1)_DEC02	0.20	0.06	3.2	0.0014				
	D3BSER(-1)_DEC02	2232.07	521.62	4.3	0				
						0.21	121.42	2.17	37.4
	Variance Equation								
	C	140.65	40.21	3.5	0.0005				
	ARCH(1)	0.08	0.01	8.1	0				
	GARCH(1)	0.92	0.01	95.1	0				
Stage 6:	***Includes interventions on 24th Apr-00, 28th Nov-00, 28th Feb-01, 20th Sept-01, 27th Feb-02, 10th Dec-02 & 28th Aug-03***								
	C	20.60	3.65	5.6	0				
	FIIN(-1)	0.25	0.03	9.3	0				
	BSER(-1)	927.91	222.01	4.2	0				
	D3BSER(-1)_APR00	938.25	321.89	2.9	0.0036				
	D1_FEB02	19.05	4.07	4.7	0				
	D3BSER(-1)_DEC02	2179.52	478.77	4.6	0				
	D1_AUG03	114.07	16.98	6.7	0				
						0.23	119.48	2.19	43.2
	Variance Equation								
	C	145.30	41.19	3.5	0.0004				
	ARCH(1)	0.09	0.01	8.2	0				
	GARCH(1)	0.92	0.01	92.0	0				

2002 interventions are seen to increase the sensitivity of FII flows to change in BSE returns, the effects of the other two interventions are essentially on the average level of FII flows. In this context, it may be mentioned that the policy of enhancing FII investment limits from the initial 24 per cent to 40 per cent of a company's paid-up capital that was implemented in April 2000 was rather important, as this helped increase the sensitivity of FII flows to BSE returns (i.e., a smaller increase in market return would now bring in a much larger volume of FII investment). Of course, this has a volatility implication as well, because a small decline in market return would result in a greater withdrawal of FII investment from India.

The policy of enhancing FII investment limits from the initial 24% to 40% of a company's paid-up capital that was implemented in April 2000 was rather important, as this helped increase the sensitivity of FII flows to BSE returns.

The policy of expanding the opportunities for FIIs to hedge their exposures through all exchange traded derivative products of February 2002 also proves to be a major one, as it has had a long term impact on FII flows through a significant rise in the level of inflows in the post-intervention period. The decision to halve the FII registration fee in December 2002 also seems to have generated a sustained positive effect on the FII flows by increasing the sensitivity to stock market return of such flows. Finally comes the policy of augmented governance of FII flows of August 2003 the effect of which is estimated to be a jump in the level of flows in the post-intervention period. This could very well be due to the upsurge in global FII activity in the last half of 2003, but we may reiterate that it shows that stringent laws did not in any way dissuade FIIs from coming in to the Indian equity market so long as the Indian stock markets offered them good returns on their investments. In fact, ceteris paribus, an assurance of qualitatively better investments (guaranteed by efficient governance) can very well help the FII flows to India to swell.

6. Concluding Observations

In this paper, we have attempted to estimate the quantitative impact of certain regulatory policy decisions relating to FII investment in India using the technique of intervention analysis of time series econometrics. The analysis is essentially based on a multivariate GARCH regression model estimated on a set of daily data on domestic stock returns and FII investment flows. Ten policy interventions made at different time points in the period January 1999 through January 2004 have been considered in the analysis. We have examined whether or not these interventions had any significant effect on the average level of FII flows, their sensitivity to Indian stock market return and their own inertia. The analysis is performed in two steps. The effect of individual policy has been examined separately in the first step. In the second step, the effects of these policies have been examined sequentially in six stages, adding one new policy to the analysis at every stage.

As our results indicate, in the pre-Asian crisis period the introduction of a comprehensive set of regulations relating to FIIs in the

form of the SEBI FII Regulations of 1995 introduces a structural break in the time series of flows in the form of an upward shift in the average level of FII flows in the post-regulation period. Our results also help to evaluate the impact of liberalisation as well as strengthening of policy framework for FII flows in the post-Asian crisis period. We find that the liberalisation policies that expanded the membership of FII categories and their scope of investment in the Indian market, enhanced sectoral and individual caps, made provision for hedging FIIs' risk of making investment in the Indian stock markets by allowing them to enter the foreign exchange and derivatives market, and made procedural simplifications and fees reduction, seem to have a significant expansionary effect on net inflows. Measures to improve the SEBI/RBI's control over the FII investments like banning of NRIs/OCBs and mandating stricter disclosure norms also do not show any significant negative impact on the net inflows. On the whole, we find that these policies mostly render FII investments more sensitive to domestic market returns and raise the inertia of FII flows.

So far studies on determinants of FII flows to India have not considered the effects of policy changes on such flows. Through the present study we have attempted to fill up this gap. Our quantitative results may be useful in judging the possible effect of similar policy changes on FII flows in future. We may however point out that in the present analysis we have bypassed the issue of possible simultaneity in the impact of regulations on the FII flow variable and BSE returns, since we have considered here only those policy changes that are likely to have an impact on FII investment alone and not on the stock market return. However, as there is a mild evidence of bi-directional causality between returns on the BSE stock index and FII net inflows [see *Table 3*, Panel D], which was possibly caused by the recent heightened FII inflows due to the upsurge in global equity markets[32] , the issue of simultaneity should be brought into the analysis. In a way this paper sets the base for similar analyses that may be designed to examine the impact of regulatory changes in the stock market which also may affect FII activity that may be called for in future in view of the strong emphasis on development of local securities market made by the IMF for stabilising flow of funds to emerging markets[33] . Given the fact that one of the objectives behind inviting foreign portfolio flows was to streamline and help develop the domestic stock market, it would be beneficial to gauge how far the regulatory bodies' endeavour to develop the capital market with certain policies cause debilitating or enhancing effects on long term flows of foreign portfolio capital.

In the pre-Asian crisis period the introduction of a comprehensive set of regulations relating to FIIs in the form of the SEBI FII Regulations of 1995 introduces a structural break in the time series of flows in the form of an upward shift in the average level of FII flows in the post-regulation period.

[32] Particularly after mid-2003. Note that earlier we had found evidence of only unidirectional causality running from BSE returns to FII and not *vice versa* (Mukherjee *et al* 2002).

[33] IMF, *GFSR*, April 2004.

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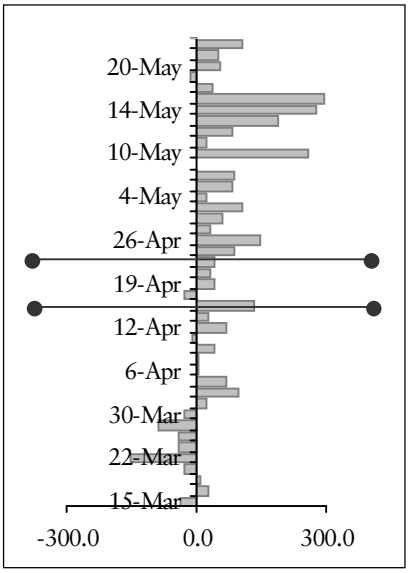
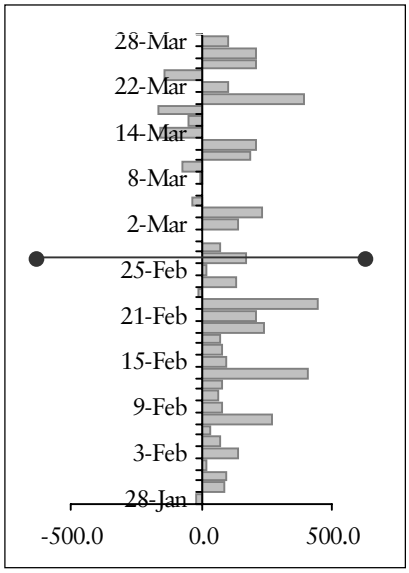
Appendix: Daily FII equity flows in a 2-month window around the intervention dates (FIIN) (*Rs. crore*)

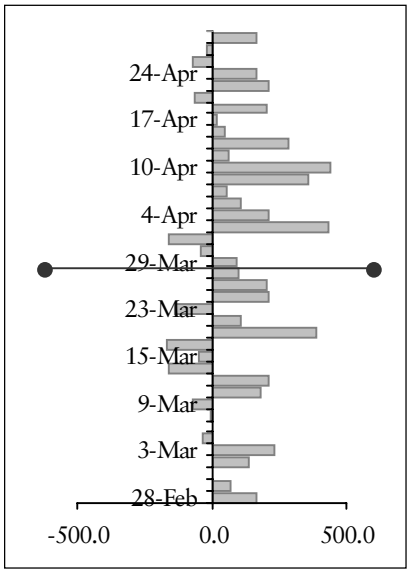
16th and 24th April, 1999



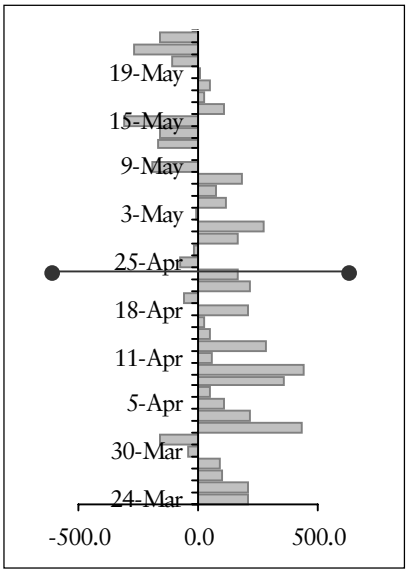
29th February, 2000



28th March, 2000



24th April, 2000



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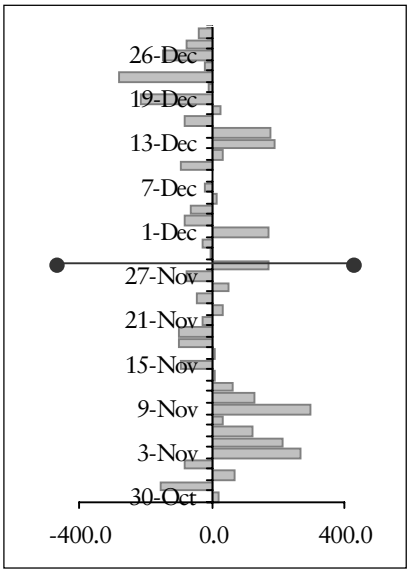
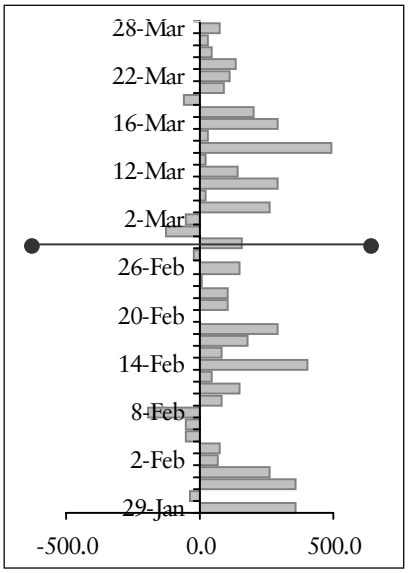
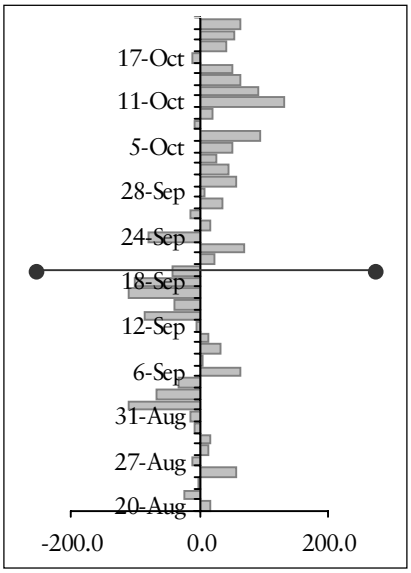
28th November, 2000



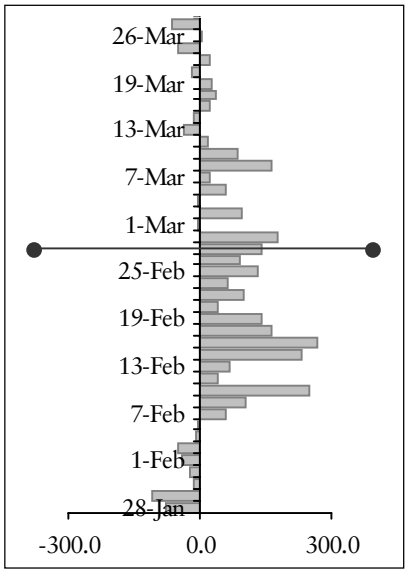
28th February, 2001



20th September, 2001



27th February, 2002



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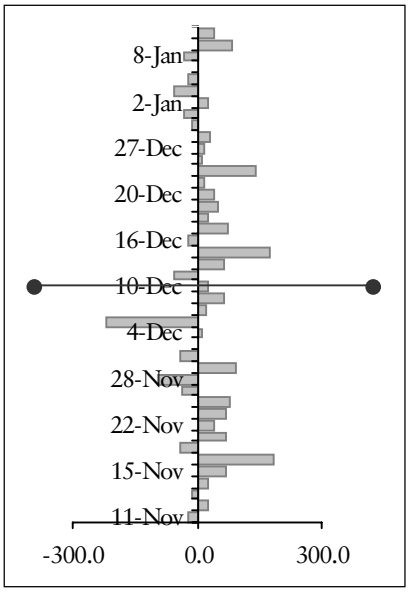
10th December, 2002



28th August, 2003