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Nonresident Deposits in India:
In Search of Return?

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Abstract

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This paper analyzes trends in the accumulation of NRI (nonresident Indian) deposits and investigates the determinants of these inflows. It finds that monthly deposit flows have been quite stable since the 1991 crisis; nevertheless, there have been occasions when monthly flows turned negative in the short run, coinciding with adverse domestic or external events. Econometric analysis shows that the NRI deposits are influenced by standard risk and return variables. In particular, NRI deposits respond positively to changes in relative interest rates on NRI deposits and LIBOR; negatively to political and geopolitical uncertainties, such as the government resigning in mid-term, and tensions on India's borders; and negatively to adverse external events, such as the Asian crisis.

Contents   Page

I. MOTIVATION AND INTRODUCTION

Since the 1980s, nonresident Indians (NRIs) have placed large amounts of funds on deposit with the Indian banking system. Such inflows have provided India with a valuable source of foreign exchange. In November 2003, NRI deposits totaled US$32.5 billion, which is about one-sixth of the size of deposits of residents with commercial banks. Most of the NRI deposits are repatriable, and in mid-2003, once account is taken of two foreign-currency bonds issued exclusively to NRIs—the Resurgent India Bond (RIB) in 1998, and the India Millennium Deposit (IMD) in 2000—NRIs held 60 percent of India's external debt that was owed to private creditors.[2]

NRI deposit taking gained momentum in the 1980s in conjunction with the increasing number of Indians going to work overseas, particularly in the Gulf countries. So as to draw their savings back to India, the government formulated NRI deposit schemes that made deposits fully repatriable and that offered attractive interest rates. The deposits were made subject to concessionary reserve ratios and liquidity requirements, and the Reserve Bank of India (RBI) assumed the exchange rate risk on foreign currency-denominated accounts. However, the schemes proved to be vulnerable during the 1991 balance of payments crisis, when outflows of deposits compounded the pressure on the external accounts (Acharya, 2001). As a result, steps were taken to enhance the stability of the deposits by switching the composition toward rupee denominated accounts and by reducing the repatriable component (RBI, 2000). The exchange risk on foreign currency deposits was shifted back to the banks.

Since the 1991 crisis, NRI deposit inflows have continued to be substantial, although their relative importance in the external accounts has declined. The past decade has witnessed rapid growth in information technology exports and inward foreign investment and India's foreign reserve position has become increasingly comfortable. The authorities have responded by linking the interest rates offered on NRI foreign currency deposits more closely to the London interbank offered rate (LIBOR); by giving the banks flexibility to set interest rates on rupee deposits; and, from April 2002, by making all new deposits fully repatriable.

Despite the significance of NRI deposits for India's balance of payments, there has been relatively little research to date on their determinants or stability. Given the size of the amounts on deposit, as well as the often-heard argument that outflows from NRI accounts exacerbated the 1991 crisis, there is a need for more research in this area. This paper analyzes trends in the accumulation of NRI deposits and investigates the determinants of these inflows. It finds that monthly deposit flows have been quite stable since the 1991 crisis, with standard deviations comparable to portfolio equity inflows into India, which are themselves of fairly low volatility. Nevertheless, there have been occasions when monthly flows of deposits have turned negative. Such incidents have coincided with clearly identifiable adverse domestic or external events, but the effects have tended to be short lived.

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[2] The RIB was repaid upon maturity in August 2003.

The paper also analyzes the determinants of NRI deposits in a simple ordinary-least-squares (OLS) framework. Econometric analysis shows that interest rate changes on NRI deposits and LIBOR are determinants of deposit inflows. This implies that the generally higher level of Indian interest rates has been a factor behind the strength of NRI deposits. Evidence is found of withdrawals from foreign currency deposits at the time of the two extraordinary bond issues—the RIB and the IMD—both of which offered high interest rates. This supports the finding that NRI deposits are interest sensitive.

The regression results also confirm that NRI deposits are affected by political and geopolitical uncertainties, such as the government resigning in mid-term, or tensions on India's borders. In addition, deposits seem to be vulnerable to contagion from regional turbulence, such as occurred during the Asian crisis.

The paper is organized as follows: Section II discusses trends in NRI deposits. Section III describes the data and methodology used in the econometric exercise, and Section IV presents the econometric results. Section V concludes.

II. TRENDS IN NONRESIDENT INDIAN (NRI) DEPOSIT FLOWS

A. Pre-Crisis

NRI deposits were first introduced in February 1970. The initial scheme was a rupee-denominated account, the Nonresident (External) Rupee Account (NRE), with repatriable principal and interest. In November 1975, a foreign currency denominated deposit facility, the Foreign Currency Nonresident Account (FCNRA) was added. This deposit was also repatriable and was made attractive to the banks through the RBI assuming the exchange rate risk. Nevertheless, the two schemes got off to a slow start (Figure 1). By March 1980, NRE deposits had risen to only US$850 million, while the FCNRA scheme had attracted less than US$200 million.

In the 1980s, inflows into NRI deposits accelerated, with the FCNRA schemes enjoying particularly rapid growth. These inflows coincided with the widening of the current account deficit, and the need for increased borrowings on commercial terms. About half of the nonconcessional debt inflows during the decade was external commercial borrowing (ECB); the other half came from NRI deposits. By March 1990, the stock of NRI deposits had grown to US$12.4 billion, of which 70 percent was foreign-currency denominated (Figure 2). The preferences of depositors for foreign currency deposits reflected the favorable interest rates on such deposits, together with the lack of exchange rate risk. FCNRA accounts were an attractive source of funding for the banks because the RBI assumed the exchange rate risk, and because NRI deposits tended to have a less onerous Cash Reserve Ratio (CRR) and Statutory Liquidity Requirement (SLR) than deposits raised domestically. Figure 3 shows that the takeoff of NRI deposits in the early 1980s coincided with a reduction in the CRRs applicable to these accounts.

B. Post-Crisis

The balance of payments crisis in the early 1990s was associated with some outflow of NRI deposits. The amount outstanding under the NRERA and the FCNRA schemes fell by US$904 million during fiscal year 1991–92.[3] The crisis revealed a number of vulnerabilities in the NRI deposit system. To begin with, the deposits were fully repatriable and thus free to leave upon maturity. Moreover, while about three-quarters of deposits at that time were of longer than one year maturity (RBI, 2000), deposits could be closed prematurely subject to an interest rate penalty and early encashment may have intensified the pressures on the external accounts.[4] Moreover, as the rupee depreciated, the RBI began to sustain large losses on account of the exchange rate guarantee.

In the wake of the crisis, the authorities made a number of changes to the deposit schemes. In June 1992, a new rupee-denominated scheme, the Nonresident Nonrepatriable (NRNR) account was introduced, which allowed the repatriation of interest income only. Deposits under this scheme were exempted from SLR and CRR requirements. In May 1993, a new repatriable foreign-currency scheme, the FCNRB, was introduced, which differed from the FCNRA in that the banks were made to bear the exchange rate risk themselves. The FCNRA scheme was closed to new deposits with effect from August 1994, and by 1997, all remaining balances had been repaid.

In the period since the 1991 crisis, NRI deposits have continued to accumulate. During the 1990s, inflows under the FCNRB scheme were almost sufficient to offset the FCNRA repayments, while there were net inflows of US$10 billion during the decade under the rupee schemes. Over the last few years, the pace of NRI deposit accumulation has accelerated, and average inflows have exceeded US$2 billion per annum.[5] At the same time, foreign reserves have grown rapidly. With the external position increasingly comfortable, efforts have recently been made to reduce the interest rates on NRI deposits, and to subject NRI deposits to the same CRR and SLR as resident deposits (Figures 4 and 5). In addition, in April 2002, the NRNR scheme was discontinued and all new NRI deposits were made fully repatriable (Box 1).

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[3] This seems a relatively mild impact, although were monthly data available for the crisis period, they might show a larger outflow during the course of 1991–92.

[4] Mohanty, Kapur and Sahoo (2000) note that the ability to encash deposits before maturity endows depositors with a put option. As a result, the deposits are effectively short-term debt.

[5] Inflows of NRI deposits further accelerated in 2003/04 (fiscal year ending March), with net inflows totaling about US$4 billion during April 2003–November 2003. However, a significant portion of these funds will have been recycled from maturing RIBs.

C. Properties of NRI Deposits

- **Currency composition.** As a result of the post-crisis changes, the share of foreign currency denominated deposits in total NRI deposits has fallen from 70 percent in 1990 to 32 percent in August 2003. The net inflow of foreign-currency deposits since 1994—the sample period considered in Section III below—has been negligible.

- **Repatriable component.** The post-crisis measures led to the repatriable component of NRI deposits declining from 100 percent in March 1990 to 69 percent by March 2000. However, the discontinuation of the NRNR scheme from April 2002 has caused the repatriable component of deposits to rise back to 91 percent by August 2003. This proportion will eventually increase to 100 percent once the outstanding NRNR deposits mature.

- **Stability.** In terms of standard deviations, monthly inflows of rupee deposits, foreign currency deposits and foreign portfolio investment into India (FII flows) all have similar volatility. However, as noted above, the post–1994 series for monthly inflows into foreign currency deposits has a very small mean, and thus a much higher coefficient of variation than either rupee deposits or FII equity flows (Table 1).

- **Effects of economic and political events.** In Table 2, the effects of selected major economic and political events on net deposit flows are calculated. These include the government resigning midterm, tensions on the border with Pakistan, credit rating downgrades, the Asian crisis, and substantial increases in the prices of oil. Net monthly deposit inflows are found to be affected by these events, but the magnitude and duration of the effects appear to be small.

- **Seasonality.** NRI deposit flows seem on average to be higher at the beginning of the year than at the end of the year (Figure 6). To test whether this seasonal effect is statistically significant, we estimate some simple regressions, with net deposits flows (total, foreign currency and rupee deposits) regressed on two time dummies-Time1, which takes a value 1 for the months of January–April, and Time2 which takes a value 1 for September–December, and zero for other months. Results indicate a significant beginning of the year effect,[6] which seems to be present even after controlling for various one-off events (Table 3). We also estimate regressions with separate dummies for each month. Results for specific months (not reported) show that the inflows are strongest in March and April.

Effects of alternative bond schemes. To counter pressure on foreign reserves following the imposition of sanctions after the nuclear tests, a Resurgent India Bond was issued in August 1998. The RIB, which raised US$4.2 billion, was targeted exclusively at the NRI

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[6] A similar pattern in the flow of portfolio investment to India was attributed by Gordon and Gupta (2003) to year-end bonuses and portfolio rebalancing, and it is possible that some of the same factors are at play in the flow of NRI deposits.

community and paid an interest rate of 7¾ percent on U.S. dollar deposits. A second scheme, the Indian Millennium Deposit, raised US$5.5 billion in October and November 2000. The IMD offered an interest rate on U.S. dollar deposits of 8½ percent.[7] There were negative monthly flows of NRI deposits at the time of both bond issues. The RIB seems to have had a particularly pronounced impact on foreign currency deposits, which fell by US$600 million during the month it was issued (Table 2 and 3).

III. DATA AND METHODOLOGY

Monthly data on foreign currency deposits are consistently available from April 1980–March 1991, and from March 1994–November 2003, and monthly data on rupee deposits are available for the period April 1980–November 2003. However, since only limited data are available for some of the possible explanatory variables for the remaining period, the analysis in the paper is restricted to the period March 1994–December 2002.

Previous research on NRI deposits has been conducted by Mohanty, Kapur and Sahoo (2000). In comparison to that study, this paper considers a more comprehensive set of possible determinants of NRI deposits and a slightly longer data period. Moreover, Mohanty *et al* (2000) find a strong link between NRI deposits and foreign exchange reserves, which they ascribe to the comfort factor that depositors derive from the level of reserves. However, as they recognize, there is a potential for simultaneity in this relationship, and the regressions below instead use instruments such as sovereign ratings and dummies for political and geopolitical events to capture credit risk.

A. Regression Framework

The basic regression framework used in the analysis is:

$$\text{NRI}_t = c + \alpha \, \text{Int}_t + \sum_i \beta_i X_{it} + \varepsilon_t, \quad \varepsilon_t \approx N(0, \sigma^2), \quad t = 1, 2, .., T \qquad (1)$$

where NRI_t refers to net deposit flows in month t, Int_t refers to the relevant interest rate variable in month t, and X_{it} refers to the i-th non-interest explanatory variable in month t.

Dependent Variables

The dependent variable is net monthly inflow of deposits, all of which are measured in U.S. dollars. Separate regressions are estimated for four different variants of NRI deposit flows:

(i)   Foreign currency-denominated deposits: FCDEP = FCNRA + FCNRB

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[7] A precursor to these schemes was the India Development Bond issued to NRIs during the crisis in 1991. This bond raised US$1.6 billion and was repaid in 1996.

(ii)   Rupee denominated deposits: REDEP = NRE + NRNR.

(iii)   Rupee-denominated repatriable deposits: NRE

(iv)   Total deposits: TOTDEP = FCDEP + REDEP

Explanatory Variables

In choosing explanatory variables, we make the hypothesis that deposit flows result from a portfolio choice by NRIs. The interest rates on the various deposit schemes are therefore determinants of the level of NRI deposits, and since we are explaining flows, changes in the interest rates are included as explanatory variables in the regressions. To capture relative returns, the returns on alternative investment opportunities open to NRIs such as equities are added. Since the riskiness of holding deposits should affect inflows, variables to proxy for Indian sovereign and geopolitical risk are also included. The wealth levels of NRIs are likely to influence their savings and should be an additional determinant of NRI deposits. However, NRI wealth is difficult to measure. As an imperfect measure, an oil price variable is used to capture the wealth of NRIs based in Gulf countries.

Interest Variables

For a large part of the sample period, interest rates on NRI deposits (DOLINT and NREINT) were controlled and thus were a policy variable that could be altered in response to the strength of NRI deposit flows.[8] They are thus potentially endogenous to the deposit flows, and using contemporaneous interest rate changes may give biased results. However, the lag in collecting data on NRI deposits makes it likely that any policy response to deposit flows also occurs with a lag, rather than contemporaneously. It thus seems legitimate to include contemporaneous interest rate changes in the regressions. The CRR and SLR are other policy variables available to increase the attractiveness of NRI deposit collection to banks. The CRR, in particular, was changed quite frequently during the sample period.[9]

The m-o-m change in interest rates on dollar deposits (DOLINTC) and the m-o-m change in LIBOR (LIBORC) are highly correlated. The same holds to a lesser extent for the change in interest rates on rupee deposits (NREINTC) and the change in LIBOR. Thus changes in interest differentials seem more appropriate than changes in interest rates as

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[8] NREINT is the return on rupee deposits and is calculated in US dollar terms using the interest rate on NRE deposits of up to one year, less the depreciation of the rupee over the previous 12 months.

[9] By contrast, the SLR applicable to NRI deposits has not been changed very often. The SLR on NRE deposits was 30 percent in the first half of the 1990s compared to 38 percent for domestic rupee deposits. However, since 1997, the SLR on both has been set at 25 percent (RBI, 2000).

explanatory variables. The equation for foreign-currency deposits includes the change in the difference between the interest rate on dollar deposits and LIBOR, while the rupee deposit equation includes the change in the differential between interest rates on rupee deposits and LIBOR.

The expected return on rupee deposits depends on the expected path of the exchange rate. By contrast, the NREINT variable discussed above, is calculated as an ex post return. To capture expectations, the current month-on-month percentage change in exchange rate is therefore also included as an explanatory variable. However, since deposit inflows are denominated in dollars in the rupee deposit equation, the contemporaneous exchange rate depreciation will be correlated with the left hand side variable as a result of a valuation effect. More generally in all the equations there will also be an endogeneity issue, since the exchange rate is in turn likely to be affected by deposit flows. The month-on-month exchange rate change is therefore lagged by one month (LEXCC).

Non-Interest Variables

Before committing funds, NRIs might be expected to look for possible signs that the banks taking their deposits may experience repayment difficulties, particularly with regard to deposits denominated in foreign currency. A dummy variable is thus used for downgrades in India's sovereign rating (RATING), as well as for political events such as the government resigning midterm (GOVT), and for geopolitical events such as the nuclear tests, the Kargil war, and the Indo-Pakistan stand off in mid–2002 when travel advisories were issued by several countries (GEOPOLT).

Evidence shows that the capital flows to emerging markets are susceptible to financial crises in other emerging markets. In the case of India, portfolio inflows slowed during the Asian crisis, but were not affected by crises in other emerging markets (Gordon and Gupta, 2003). In order to test for similar effects on the flow of NRI deposits, dummy variables are introduced for the Asian crisis (ASIA), and for crises in emerging markets outside Asia.

Since equities are an alternative place for the NRI community to put their savings, higher stock market returns may imply a smaller flow of deposits. The monthly return on the Dow Jones Industrial Average is therefore a possible explanatory variable (DOWC), with the expected sign of the coefficient being negative. However, there may an offsetting effect to the extent that changes in the Dow imply a wealth effect for NRIs. The return on the Bombay Stock Exchange is also included (BSE). Again, however, it is difficult a priori to predict whether the sign of the coefficient on this variable should be positive (since local stock market returns are likely to vary inversely with perceived country risk) or negative (since like the Dow, the BSE is an alternative investment opportunity).

An attempt is made to capture the wealth of NRIs using an oil price variable. Since many expatriate Indians are located in the Gulf, the prosperity of that region will affect the flow of their funds back to India. However, it is possible that the deposit flows respond only to large swings in oil prices, so an oil-shock dummy is experimented with which takes a

value one if the oil price increase exceeds ten percent over the previous month (OIL10). The robustness of the results to an oil price increase of five percent is also checked.

Additional dummy variables take account of the effects of the Resurgent India Bond (DUMRIB), and India Millennium Deposit (DUMIMD) on deposit flows. To reflect possible seasonality in the data for NRI deposits, dummies (Time1, Time2) are added to capture beginning and end of year effects. Finally a dummy variable (DUMNRNR) is included in the NRE deposit equation to account for the effect of discontinuation of NRNR scheme on inflows of NRE deposits.

B. Tests for Unit Roots

The time series properties of the dependent and independent variables were analyzed by estimating the following equation for each variable:

$$W_t = c + \rho W_{t-1} + \upsilon_t, \quad \upsilon_t \approx iid\ N(0, \sigma^2), \quad t = 1, 2, ..., T \qquad (2)$$

and testing for the null hypothesis, $\rho=1$, against the alternative hypothesis $\rho \neq 1$. The results are presented in Table 4. Since most of the series are in percentage terms, the series are found to be I(0) and the null hypothesis of a unit root is rejected in favor of the alternative hypothesis.[10]

C. Correlation Coefficients

In order to get an insight into the bivariate associations between the dependent and independent variables, we first look at the correlation coefficients (Table 5). We find that:

- In a number of cases, such as the interest rate series, correlations between potential explanatory variables are significantly different from zero. In such cases, we either do not include all of these variables simultaneously in the regression equation, or, as in the case of the interest rate series, include their differences.

- Foreign-currency deposit flows are negatively correlated with the Asian crisis and the issuance of RIB, and positively associated with domestic stock returns.

- Rupee deposit flows are associated negatively with LIBORC (and hence DOLINTC), exchange rate depreciation, the Asian crisis, and geopolitical risks.

- Repatriable rupee deposits are correlated negatively with LIBORC (and DOLINTC and REINTC) and the Asian crisis.

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[10] See Hamilton (1994). The tests used are Augmented Dicky-Fuller and Phillips-Perron.

- As expected from these associations, total NRI deposit flows are found to be associated negatively with LIBORC (and DOLINTC), the Asian crisis, domestic political and geopolitical uncertainty, issuance of RIB, and positively with the return on BSE.

IV. ECONOMETRIC RESULTS

Multivariate regressions mostly confirm the bivariate associations noted above. In our regression analysis, a general specification is first estimated which includes all the variables. Then the variables with the least significant coefficients are dropped. Results reported in Tables 6–9 are for a subset of the equations estimated using the parsimonious set of regressors. The results of the baseline regression specification are reported in Column I of each table. We also conduct sensitivity analyses which reveal most of the results to be robust. The results of these alternative specifications are reported in subsequent columns.

A. Interest Variables

Regression results indicate a positive association between NRI deposit flows and the change in the differential between NRI deposit rates and LIBOR. The coefficient on this interest rate variable is more significant for rupee deposits than for foreign currency deposits, perhaps reflecting that foreign currency deposit rates have tended to be very similar to LIBOR.[11]

The finding of interest rate sensitivity is supported by the behavior of deposits at the time the extraordinary bonds were issued. In particular, the floating of the RIB seems to have led to some diversion of foreign-currency deposits into these high interest bonds. In the foreign currency deposit equation and total deposit regression, the coefficient of the variable DUMRIB is negative, and significant at the 1 percent level.[12] By contrast, the coefficient of the variable DUMIMD is negative in many specifications, but insignificant. In the rupee deposit regressions, both dummies have coefficients insignificantly different from zero.

In addition to changes in interest rate differentials, we also include the changes in the interest rates themselves separately in the regressions. However, since the NRI deposit rates are highly correlated with LIBOR, because of the multicollinearity, the coefficients on deposit interest rate variables, though of the right sign, are not significant. We also estimated specifications using the levels of interest rate differentials, rather than changes, but the results were found to be broadly similar.

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[11] If we include lagged changes in the interest rate differentials in the regressions, the coefficients are not found to be significant.

[12] The significance of the RIB dummy raises the question of whether the interest rates paid were too high, which is a criticism that has been made of these schemes. On the other hand, the amounts raised were extremely large relative to the size of the estimated coefficient on DUMRIB (Table 8), suggesting that the proceeds were mostly new money.

We also checked the significance of concessionary CRRs—which are effectively interest rate subsidies—but it did not appear to be a major factor explaining deposit inflows. The coefficient on the CRR differential—defined as the difference between the CRR applying to NRI deposits and the CRR applying to resident deposits—is negative, as would be expected, but not significant (results not reported).[13]

B. Non-Interest Variables

Domestic political uncertainty is found to be associated with a reduced inflow of foreign currency deposits in some of the specifications. The coefficient on GOVT is significant at the 10 or 15 percent level. The variable is mostly insignificant in the regressions for rupee deposits. What seems to matter more for rupee deposit flows is the uncertainty associated with geopolitical risks. The coefficient of this variable is negative and significant at 5 percent or higher levels in the regressions for rupee deposits. In the regressions for NRE deposits, the coefficient on the GEOPOLT variable is positive and significant at 10 or 5 percent levels (Table 8). This result implies that while on average total inflow of rupee deposits has been smaller amidst geopolitical uncertainties, the latter are also associated with a shift from nonrepatriable into repatriable rupee deposits. This seems like rational behavior by depositors.

NRI deposit flows are found to have been affected adversely by the Asian crisis, but not by crises elsewhere in the world. The coefficients on ASIA for both foreign currency and rupee denominated deposits are negative and significant at the usual significance levels. The coefficient of a dummy variable for major crises in Mexico, Russia, Turkey, Brazil, and Argentina that occurred during the sample period is negative, but insignificant (results not reported). As noted, similar findings have been made for inward portfolio investment into India.

The period of the Asian crisis was marked by tumultuous political events in India. These included the Gujral Government resigning in November 1997, and the nuclear tests in May 1998. To test for the possibility that the ASIA dummy is picking up the effects of these domestic events, we drop the ASIA dummy from the regression equations. The coefficients of the variables GOVT and GEOPOLT are found to be somewhat more significant for this specification, but otherwise the results (nor reported) are mostly unchanged.

Rupee deposit flows are found to be associated negatively with exchange rate depreciation, but the coefficient is not significant (results not reported). This is puzzling given that the bivariate correlation between rupee deposits and the lagged exchange rate is strongly negative. However, it is also clear from Table 5 that rupee depreciation is positively correlated with the Asian crisis and domestic political events. Since these variables are both associated negatively with rupee deposit flows, it seems likely that including them in the REDEP regression is taking away the significance of the exchange rate variable.

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[13] This contrasts with Mohanty *et al* (2000) who find a significant effect of a dummy variable for periods when concessionary CRRs applied.

Ratings downgrades do not appear to discourage NRI deposits. The coefficient of the credit rating downgrade variable in the foreign currency deposit equation is positive and marginally significant, and negative, but insignificant, in the rupee deposit equations. This result is at odds with the finding in Gordon and Gupta (2003) that credit downgrades are associated with smaller portfolio flows into India. However, that foreign portfolio investors (FIIs) rely more on the views of foreign ratings agencies than do expatriate Indians (NRIs) is perhaps not surprising. The finding is also consistent with Kaul's (2000) observation that India' sovereign risk is something that worries institutional investors but not retail investors.[14]

Large swings in oil prices seem to be important in determining the flow of foreign currency deposits, but not the flow of rupee deposits. This asymmetry is difficult to explain. If higher oil prices do make NRIs better off, it is difficult to see why the wealth effects should apply to foreign-currency and not rupee deposits. Thus it seems likely that the oil price variable is capturing some other effect.

Stock market returns do not appear to be important influences on deposit inflows. While foreign currency deposits are found to be associated positively with the returns on the BSE, the coefficient in the rupee deposit equation is not significantly different from zero. Moreover, the return on foreign stock markets (DOWC) is not found to be associated significantly with either foreign-currency or rupee deposit flows.

Finally, as expected, the dummy DUMNRNR, has a positive and highly significant coefficient in the NRE deposit equation (last Column in Tables 7 and 8). In addition, as noted earlier, we find a seasonal effect in the flow of NRI deposits: deposits are on average higher in the first four months of the year than during the rest of the year.[15]

C. Chow Test

The profound changes in the world since the events of September 11, 2001 raise doubts about the stability of parameters estimated for a sample period that spans this event. For example, post-September 11, there have been fundamental changes in banking practices across the world—such as stricter applications of "know your customer" policies—that may have had an influence on NRI deposit inflows. This period has also seen the dollar weakening sharply against the euro, which has led to upward pressure on many emerging

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[14] Based on his experience at Citibank, Kaul (2000, pg 355) argues that NRI depositors are not much concerned with credit risk and that NRIs do not perceive "…any kind of sovereign risk when they put their money into India….(they say) this is my parent country, I understand the way India works". However, Kaul notes that NRIs still tend to be very interest rate sensitive.

[15] Despite increasing migration to the United States during the 1990s, we do not find a time trend to be significant in the regressions. By contrast, the data on private transfers (remittances) to India for the 1990s do appear to have a positive and significant trend.

market currencies including the Indian rupee. We conduct a Chow Test to test for a structural break since September 2001 but accept the null hypothesis of no structural break. However, this finding is qualified by the caveat that there are rather few observations in the sample since September 2001.

V. Conclusions and Suggestions for Future Work

This paper analyzes the features and determinants of NRI deposits into India. NRI deposits gained popularity in the 1980s and were an important means of financing India's current account deficits in the period leading up to the country's 1991 balance of payments crisis. The outflows from the deposits during that episode subsequently led to the schemes being modified to impart a bias toward attracting nonrepatriable and rupee-denominated inflows. A measure of the success of these changes is that whereas dollar-denominated deposits rose little in the 1990s, rupee-denominated schemes enjoyed rapid growth.

During the past decade, NRI deposits have shown considerable stability, with standard deviations quite low, comparable to those on portfolio equity inflows into India, which are themselves of fairly low volatility. Though deposit flows have on occasion turned negative. Such incidents have coincided with adverse domestic or external events, but the effects have tended to be short lived.

The econometric analysis in the paper finds that the flow of NRI deposits responds positively to an increase in the difference between interest rates on these deposits and LIBOR. Deposits flows are also found to be vulnerable to domestic uncertainties such as instability in government and geopolitical tensions, and external events such as the Asian crisis. Moreover, nonresident investors are found to substitute away from NRI deposits if schemes yielding higher interest rates, such as the Resurgent India Bond, are simultaneously on offer.

The paper shows that deposits have provided a substantial and stable source of foreign exchange, but it also finds them to be influenced by standard risk and return variables. Thus, although NRI deposits have provided valuable support to India's balance of payments during a number of episodes of market turbulence in the period since the 1991 crisis, they do not reduce the importance of maintaining stable economic conditions and a sound policy stance.

There are several interesting questions related to the sources and determinants of NRI deposits that have not been addressed in this paper. For example a study of the geographical composition of the deposits might provide a better understanding of the external shocks that would affect the inflow of NRI deposits. In addition to bank deposits, the savings of NRIs also return to India in the form of remittances. It would be interesting to jointly analyze these two inflows, since they probably share some common determinants.

Box 1. Regulations Governing NRI Deposits

February 1970: Rupee-denominated account—the Nonresident (External) Rupee Account (NR(E)RA)—was introduced. This provided for repatriation of both principal and interest.

November 1975: Foreign currency denominated deposit facility—the FCNRA—was added. These deposits were also repatriable and were made attractive to the banks through the RBI assuming the exchange rate risk.

November 1990: A nonrepatriable scheme, the FC(B&O)D, was introduced which was open to both foreigners and NRIs. The scheme was terminated in July 1993.

June 1991: A new foreign currency scheme, the FCON was introduced. Its distinguishing feature was that the principal was not repatriable.

June 1992: A nonrepatriable rupee-denominated scheme, the NR(NR)D, introduced. Banks allowed to fix interest rates on these deposits.

May 1993: A new repatriable foreign currency scheme, the FCNRB, was introduced, which differed from the FCNRA in that the banks were made to bear the exchange rate risks themselves

May 1994: The maximum interest rate on rupee deposits reduced to 10 percent (the same as on domestic deposits).

August 1994: FCNRA scheme was closed to new deposits with effect from August 1994. By 1997, all remaining balances had been repaid

October 1994: The maximum interest rate on rupee deposits was further reduced to 8 percent (2 percentage points below the ceiling on domestic deposits).

October 1995: The maximum interest rate on rupee deposits increased to 12 percent.

April 1996: Interest rates on term deposits with maturity of two years or higher freed.

April 1997: Interest rates on term deposits with maturity of one year or higher freed; interest rates on FCNR(B) permitted to be determined by the banks subject to ceilings.

September 1997: Interest rates on deposits of all maturity freed.

October 1997: FCNR (B) deposits to be offered at LIBOR of the relevant currency and maturity.

April 1998: FCNR (B) deposits of maturity of one year or higher to be offered at 50 basis points above LIBOR and lesser maturity deposits to be offered at 25 basis points below LIBOR.

October 1999: Minimum maturity of foreign currency deposits raised from six months to one year.

April 2002: FCNR(B) deposits with 1–3 years maturity to be offered at LIBOR/swap rates for respective maturities/corresponding maturities minus 25 basis points.

April 2002: No fresh deposits to be accepted under NRNR scheme, overdue NRNR deposits not to be renewed, may be credited to the NRE accounts. If the NRNR deposits holder does not hold NRE account, he may be allowed to repatriate the maturity proceeds of the NRNR deposits outside India.

July 2003, September 2003, October 2003: Ceiling on interest rates on NRE deposits fixed at 250 bps, 100 bps, and 25 bps above the LIBOR, respectively.

Box 2. **Data Sources and Construction of Variables**

Variable Name	Construction of Variable	Source
FCDEP, REDEP, NRNR, NRE, TOTDEP	NRI deposits denominated in foreign currency (FCNR(A)+FCNR(B)), rupee deposits (NRE+NRNR), NRNR deposits, NRE deposits, and total NRI deposits (FCDEP+REDEP), all expressed in U.S. dollars	RBI Bulletins
Explanatory variables		
DOWC	Month-on-month percentage return in Dow Jones.	Yahoo.com
LIBOR (LIBORC)	12-month LIBOR in U.S. dollars (m-o-m change in LIBOR)	IFS
Emerging Market Crises, ASIA	Dummy takes a value 1 for the months in which crises occurred in, Mexico, Russia, Turkey, Brazil. ASIA is Asia crisis specific.	Constructed using IFS exchange rate data
OIL	Dummy takes a value one when oil prices increase over the previous month by at least 10 percent.	Staff calculations using data from IFS
DOLINT, NREINT (DOLINTC, NREINTC)	Interest rates on FCNR deposits of 1–2 year maturity, on NRE deposits (converted to dollar terms), of up to one year maturity (m-o-m change in DOLINT, NREINT)	RBI, and ICICI. Extrapolated for some of the missing observations.
DUMRIB, DUMIMD,	Dummy variables take a value one for the months when Resurgent India Bond, India Millennium bond was floated	Constructed
DUMNRNR	Dummy variable takes a value one for April 2002 onwards, when NRNR deposits were discontinued.	Constructed
BSE	Month-on-month percentage return in BSE index in dollar terms	Handbook of Statistics, RBI
LEXCC	Month-on-month percentage change in exchange rate with respect to U.S. dollar, lagged by a month.	IFS
GOVT	Dummy equals 1 in the month during which the central government resigned midterm and the following month	Dow Jones Newswire
GEOPOLT	Dummy takes a value 1 for the months of Kargil war, nuclear tests, and border stand off in summer 2002.	Dow Jones Newswire
RATING	Dummy equals one for the month in which the rating/outlook is revised down, and the following month	Constructed using information from S&P, Moody's
CRRFD, CRRRD	Difference between the CRR on resident deposits and CRR on nonresident foreign currency deposits, or nonresident rupee deposits	RBI
TIME1; TIME2	Dummy takes a value 1 for the months of January–April; for September–December	Constructed

Figure 1. Nonresident Indian (NRI) Deposits
(In millions of US dollars)
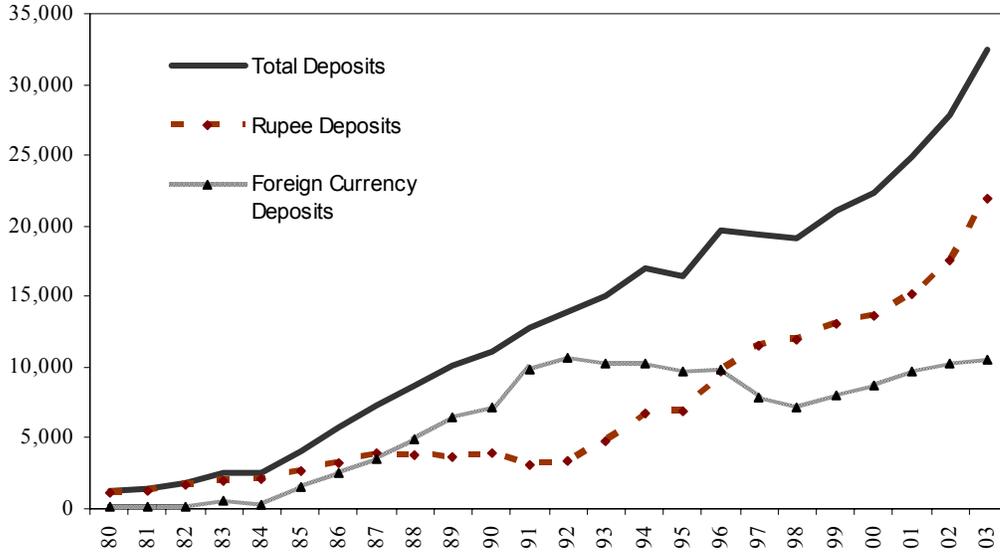
Source: Reserve Bank of India (RBI)

Note: Data are end-December except for 1991-92 (end-March) and 2003 (end-November).

**Figure 2. Share of Foreign Currency and Repatriable
Deposits in Total Deposits**
(In percent)
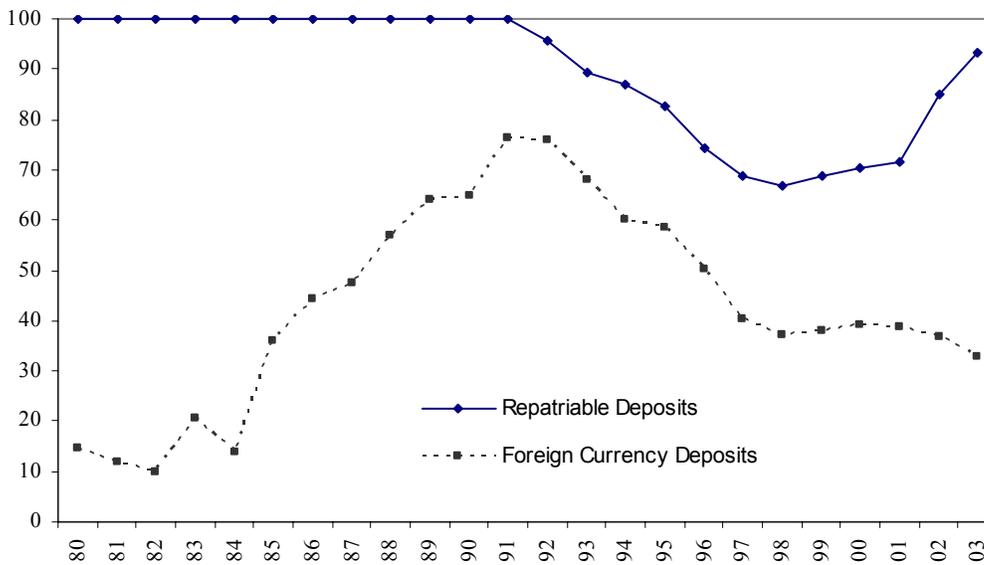
Source: Authors calculations using RBI data.

Note: Data are end-December except for 1991-92 (end-March) and 2003 (end-November).

Figure 3. Pre-Crisis Cash Reserve Ratios
(In percent)
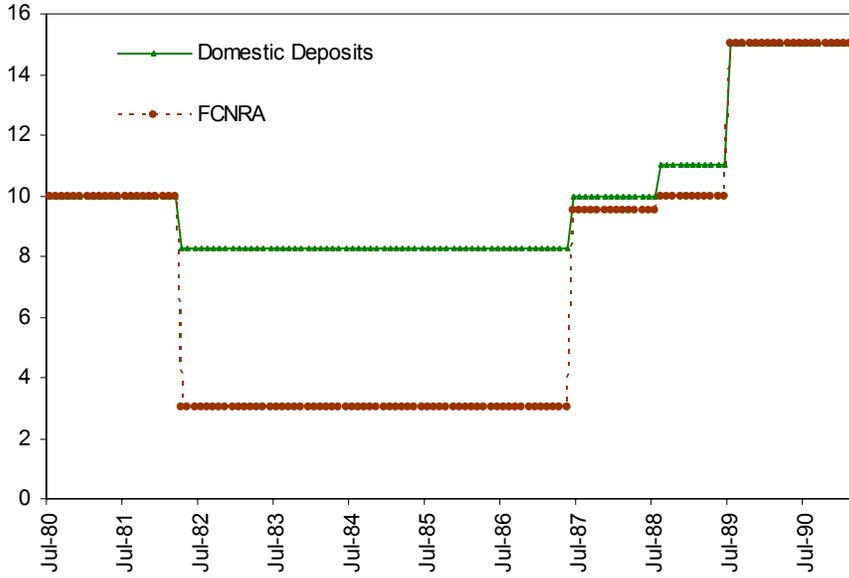
Source: RBI

Note: FCNRA is Foreign Currency Nonresident Account (FCNRA).

Figure 4. Post-Crisis Cash Reserve Ratios
(In percent)
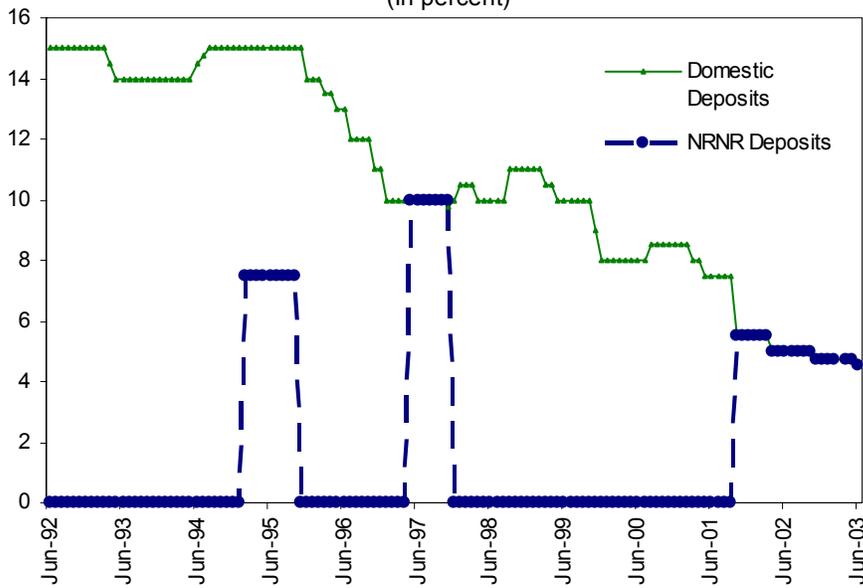
Source: RBI

Note: NRNR is Nonresident Nonrepatriable account.

Figure 5: Interest Rates on Dollar Deposits and 12-Month LIBOR
(In percent)
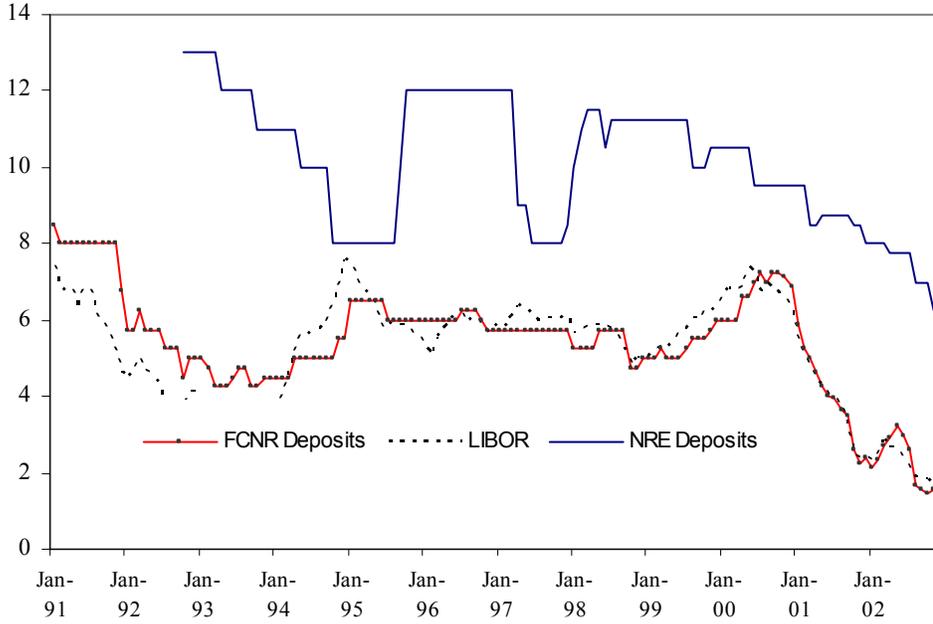
Sources: RBI and ICICI Bank

Notes: Interest on FCNR deposits for maturity of 1–2 years, on NRE deposits for maturity of 6–12 months, and 12–month London interbank offered rate (LIBOR) rates.

Figure 6: Average Monthly Flows of NRI Deposits
(In millions of US dollars)
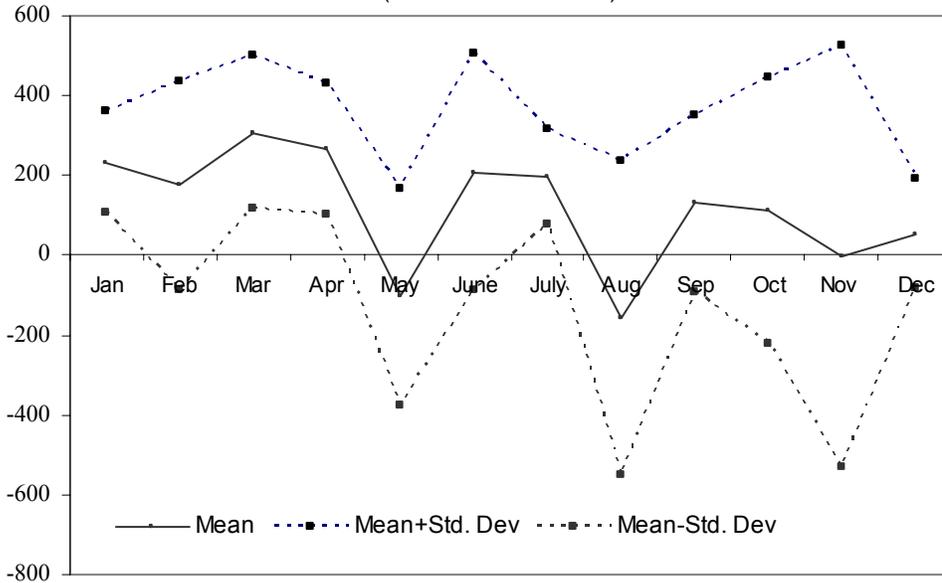
Sources: RBI and authors' calculations.

Table 1. Volatility of NRI Deposits and
Foreign Portfolio (FII) Flows into India

	Mean (In million of U.S. dollars)	Standard Deviation	Coefficient of Variation
Rupee deposits	116	189	1.6
Foreign currency deposits	-1	176	125.7
FII equity flows	137	188	1.4

Sources: RBI and authors' estimates.

Notes: Data for foreign currency deposits and rupee deposits are from 1994:4–2002:12, and the data for FII equity flows are for 1994:4–2001:10. FII denotes foreign portfolio investment into India.

Table 2. Monthly NRI Deposits Flows During Specific Events

(Monthly averages; in millions of U.S. dollars)

	Foreign Currency Deposits	Rupee Deposits
Overall mean (105)	-1	116
Asian crisis (12)	-113	-25
RIB float (1) Aug. 1998	-603	76
IMD float (2) Oct–Nov 2000	74	-34
Government falls (8)	-100	39
Elections (6)	74	111
Border tensions (10)	1	-26
Nuclear tests (1) May 1998	-241	-504
Rating downgrades (10)	1	43
Oil shock (10)[1]	84	172

Source: Authors' estimates.

Notes: Data for foreign currency deposits and rupee deposits are from 1994:4–2002:12. Number of months for which the averages have been taken are given in parentheses. RIB denotes Resurgent India Bond. IMD denotes India Millennium Deposit.

1/ An oil shock is identified as a 10 percent increase in the price of oil over previous month.

Table 3. Seasonality in Flow of NRI Deposits

	Total Deposits		Foreign Currency Deposits		Rupee Deposits	
Constant	17.97	(.37)	-19.3	(-.70)	61.9**	(2.02)
Time1	222.0 ***	(3.24)	84.9**	(2.14)	118.8***	(2.67)
Time2	50.9	(.76)	3.7	(.096)	48.5	(1.12)
DUMRIB	-239.8*	(-1.64)	-264.3***	(-3.1)		
DUMNRNR	217.1**	(2.18)				
Number of observations	105		105		105	
R^2, Adj. R^2	0.16, 0.13		0.15, 0.12		0.07, 0.05	

Source: Authors' estimates.

Notes: *, **, and *** indicate significance at 10, 5, and 1 percent levels, respectively.

Table 4. Unit Root Tests of Dependent and Independent Variables [1][2]

	Augmented Dickey-Fuller	P Value	Phillips-Perron	P Value
TOTDEP	-3.4	0.01	-102.7	0.00
FCDEP	-1.7	0.4	-120.3	0.00
REDEP	-3.4	0.05	-92.5	0.00
NRE	-1.9	0.30	-96.1	0.00
DOLINT	-0.61	0.87	0.11	0.96
LIBOR	-0.17	0.94	-0.19	0.96
DOLINT-LIBOR	-3.1	0.03	-19.2	0.01
NREINT	-2.4	0.14	-41.8	0.00
EXCC	-3.8	0.00	-78.9	0.00
BSEC	-2.9	0.04	-100.1	0.00
DOWC	-6.0	0.00	-110.7	0.00
CRRFD	-2.9	0.04	-10.5	0.11
CRRRD	-2.4	0.15	-13.4	0.06

Source: Authors' estimates.

1/ The Phillips-Perron test allows for serial correlation and heteroscedasticity in the error term. The P value is the probability with which the null hypothesis of unit root can be accepted. The tests have been conducted including a constant, but no trend, in the regressions. For variables NRNRC and NREC the time period included in the regressions is 1994:4–2002:4, for all other variables it is 1994:4–2002:12.
2/ Unit root tests performed on interest rate levels.

Table 5. Correlation Coefficients Between Dependent and Independent Variables

	FC DEP	RE DEP	NRE	TOT DEP	DOL INTC	LIB ORC	NRE INTC	BSEC	L EXCC	RAT ING	OIL10	ASIA	GEO POLT	GO VT	DUM RIB	DUM IMD	DO WC	CR RFD
FCDEP	1.0																	
REDEP	0.37***	1.0																
NRE	0.31***	0.69***	1.0															
TOTDEP	0.81***	0.84***	0.61***	1.0														
DOLINTC	-0.01	-0.07	-0.12	-0.05	1.0													
LIBORC	-0.13	-0.07	-0.11	-0.12	0.47***	1.0												
NREINTC	0.33***	0.28***	0.16	.37***	-0.07	-0.16	1.0											
BSEC	0.21**	0.15	0.11	.22**	-0.04	0.11	0.10	1.0										
LEXCC	0.06	-0.19*	-0.19*	-0.09	0.04	-0.10	.68***	-0.03	1.0									
RATING	0.00	-0.13	-0.10	-0.08	-0.19*	-0.18*	0.08	-0.17*	0.10	1.0								
OIL10	0.13	0.10	0.05	0.14	0.18*	0.20**	-0.02	-0.03	-0.15	-0.12	1.0							
ASIA	-0.23**	-0.27***	-0.22**	-.30***	0.04	0.00	0.01	-0.10	.24***	0.19*	-0.14	1.0						
GEOPOLT	0.00	-0.25***	0.15	-0.15	-0.06	-0.01	-0.08	-0.00	0.05	.23**	-0.12	0.09	1.0					
GOVT	-0.16	-0.12	-0.15	-.17*	0.00	0.18*	-0.05	-0.04	0.18*	-0.09	0.00	0.12	0.03	1.0				
DUMRIB	-0.32***	-0.02	-0.07	-.20**	-0.15	-0.12	-0.01	-0.09	-0.08	.27***	0.08	-0.07	-0.06	-0.06	1.0			
DUMIMD	0.07	-0.09	-0.07	-0.01	-0.06	-0.11	0.03	-0.02	0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-.03	1.0		
DOWC	-0.05	0.05	-0.10	0.01	-0.09	0.00	-0.06	0.19*	-0.03	-0.01	0.00	0.04	-0.14	0.08	0.01	-.01	1.0	
CRRFD	-0.12	-0.24**	0.09	-.22**	-0.08	-.24**	0.06	-0.00	0.15	0.19*	-0.02	.32***	.29***	-0.05	0.16	-.12	0.03	1.0
CRRRD	-0.11	0.00	0.26***	-0.06	0.03	0.05	-0.07	0.00	-0.09	-0.13	-0.09	-0.00	0.12	-.21**	-.19*	-0.09	-.04	.19*

Source: Authors' estimates.

Notes: Correlation coefficients bigger than or equal (in absolute value) to 0.17, 0.20, and 0.25 (denoted by *, **, and ***) are statistically significant at 10, 5, and 1 percent levels respectively.

Table 6. Regression Results for Foreign Currency Deposits

	I	II	III	IV	V
C	-15.6 (-0.69)	-19.8 (-.87)	-16.2 (-0.72)	-14.6 (-0.64)	-18.4 (-0.83)
DOLINTC-LIBORC	40.7 (0.75)			37.9 (0.69)	63.5 (1.17)
(DOLINTC-LIBORC) lagged			-54.9 (-1.04)		
DOLINTC		-0.91 (-0.01)			
LIBORC		-104.9* (-1.54)			
ASIA	-38.7**** (-2.78)	-134.4**** (-2.71)	-133.2**** (-2.68)	-137.9*** (-2.75)	-129.7**** (-2.65)
OIL10	76.6** (1.62)	93.8** (1.94)	74.4* (1.64)	76.2* (1.60)	83.0** (1.79)
DOWC				-1.4 (-0.42)	
GEOPOLT	18.5 (0.34)	19.5 (0.36)	20.9 (0.38)	15.2 (0.27)	14.7 (0.27)
GOVT	-85.9* (-1.45)	-76.8 (-1.30)	-98.6** (-1.69)	-84.5* (-1.42)	-84.5* (-1.46)
RATING	93.9** (1.63)	79.9 (1.38)	91.2** (1.59)	94.1* (1.62)	114.5*** (2.00)
BSE					4.9*** (2.3)
DUMRIB	-328.7**** (-3.84)	-344.3**** (-4.03)	-329.2**** (-3.86)	-328.3**** (-3.8)	-321.2**** (-3.84)
DUMIMD	84.6 (0.91)	70.3 (0.76)	96.2 (1.04)	84.5 (0.91)	89.4 (0.99)
TIME1	84.6*** (2.49)	84.6*** (2.52)	84.5*** (2.53)	85.8*** (2.51)	78.4*** (2.36)
Numbers of observations R^2, Adj. R^2	105 0.28,.022	105 0.30, 0.23	105 0.29, 0.22	105 0.29, 0.21	105 0.32, 0.25

Source: Authors' estimates.

Notes: t- Statistics in parentheses; *, **, ***, **** indicate significance at 15, 10, 5, and 1 percent, respectively.

Table 7. Regression Results for Rupee Deposits

	I	II	III	IV	V
C	126.3**** (5.24)	1256.8**** (5.05)	125.9**** (5.17)	125.7**** (5.19)	110.8**** (4.54)
REINTC-LIBORC	35.3**** (3.98)		35.3**** (3.96)	34.5**** (3.82)	33.1**** (3.81)
REINTC		29.4**** (2.95)			
LIBORC		-39.6 (-0.58)			
ASIA	-102.0** (-1.89)	-140.7*** (-2.57)	-102.4** (-1.89)	-100.1** (-1.85)	-90.8** (-1.72)
OIL	-0.67 (-0.01)	23.8 (0.45)	-0.45 (-0.009)	1.44 (0.03)	-0.02 (-0.005)
DOWC			0.68 (0.19)		
GEOPOLT	-107.1** (-1.84)	-100.2** (-1.66)	-105.5** (-1.79)	-108.7** (-1.86)	-166.5**** (-2.69)
GOVT	-36.1 (-0.58)	-56.8 (-0.87)	-37.1 (0.59)	-37.9 (-0.60)	-21.3 (-0.35)
RATING	-2.05 (-0.03)	-51.8 (-0.81)	-47.5 (-0.77)	-41.5 (-0.66)	-19.6 (-0.32)
BSE				1.35 (0.58)	
DUMRIB	-88.5 (-0.96)	-14.4 (-0.15)	-.88.9 (-0.96)	-85.2 (-0.92)	-81.9 (-0.91)
DUMIMD	-93.2 (-0.95)	-124.1 (-1.21)	-83.1 (-0.94)	-91.9 (-0.93)	-78.6 (-0.82)
DUMNRNR					153.2*** (2.43)
TIME1	79.9*** (2.2)	79.9*** (2.2)	79.3*** (2.19)	78.3*** (2.16)	87.2*** (2.48)
Numbers of observations R², Adj. R²	105 0.30, 0.24	105 0.26, 0.18	105 0.30, 0.23	105 0.30, 0.23	105 0.17, 0.09

Source: Authors' estimates.

Notes: t- Statistics in parentheses; *, **, ***, ****, indicate significance at 15, 10, 5, and 1 percent, respectively.

Table 8. Nonresident (External) Rupee Account (NRE) Deposits

	I	II	III	IV	V
C	105.2**** (4.28)	105.1**** (4.20)	106.5**** (4.29)	104.6**** (4.23)	55.3**** (3.35)
REINTC-LIBORC	15.6*** (2.42)		15.3*** (2.36)	15.6*** (2.42)	12.7**** (3.04)
REINTC		17.4** (1.75)			
LIBORC		-63.7 (-0.96)			
ASIA	-97.3** (-1.78)	-116.9*** (-2.14)	-96.6** (-1.76)	-94.4** (-1.72)	-57.6* (-1.62)
OIL	9.53 (0.19)	22.9 (0.43)	9.20 (0.18)	11.05 (0.21)	8.37 (0.25)
DOWC			-1.87 (-0.53)		
GEOPOLT	124.4*** (2.09)	130.9*** (2.17)	119.9*** (1.99)	122.9*** (2.06)	-65.4* (-1.56)
GOVT	-79.9 (-1.26)	-83.7 (-1.3)	-77.4 (-1.2)	-81.1 (-1.27)	-29.2 (-0.70)
RATING	-68.7 (-1.09)	-82.9 (-1.29)	-67.9 (-1.08)	-63.3 (-0.99)	17.3 (0.42)
BSE				1.44 (0.62)	
DUMRIB	-77.1 (-0.82)	-46.8 (-0.49)	-75.9 (-0.81)	-75.3 (-0.80)	-63.2 (-1.04)
DUMIMD	-83.4 (-0.83)	-107.0 (-1.05)	-83.8 (-0.83)	-81.7 (-0.81)	-34.6 (-0.53)
DUMNRNR					492.6**** (11.6)
TIME1	5.07 (0.14)	14.7 (0.40)	6.5 (0.18)	3.98 (0.11)	30.9 (1.30)
Numbers of observations R^2, Adj. R^2	105 0.17, 0.09	105 0.16, 0.07	105 0.17, 0.09	105 0.18, 0.09	105 0.66, 0.62

Source: Authors' estimates.

Notes: t- Statistics in parentheses; *, **, ***, ****, indicate significance at 15, 10, 5, and 1 percent, respectively.

Table 9. Regression Results for Total Deposits

	I	II	III	IV
C	110.3**** (2.97)	108.6**** (2.99)	111.1**** (2.96)	107.8**** (2.92)
REINTC-LIBORC	49.7**** (3.64)		49.7**** (3.63)	46.3**** (3.37)
REINTC		59.9**** (4.14)		
LIBORC		-114.7 (-1.16)		
ASIA	-222.4**** (-2.69)	-276.0**** (-3.48)	-221.9**** (-2.66)	-214.9**** (-2.61)
OIL	68.9 (0.89)	113.9* (1.48)	68.5 (0.88)	77.2 (0.99)
DOWC			-1.05 (-0.20)	
GEOPOLT	-85.4 (-0.95)	-62.9 (-0.72)	-87.9 (-0.97)	-91.8 (-1.03)
GOVT	-116.2 (-1.21)	-130.4 (-1.39)	-114.6 (-1.18)	-123.2 (-1.29)
RATING	36.5 (0.37)	10.7 (0.12)	36.8 (0.39)	59.6 (0.63)
BSE				5.33** (1.50)
DUMRIB	-446.4**** (-3.14)	-341.7*** (-2.50)	-446.1**** (-3.13)	-433.2**** (-3.06)
DUMIMD	0.44 (-.81)	-57.1 (-0.39)	0.26 (0.002)	5.42 (0.04)
TIME1	3.98 (0.003)	165.6**** (3.07)	166.4**** (2.98)	159.4**** (2.89)
Numbers of observations R^2, Adj. R^2	105 0.35, 0.29	105 0.39, 0.33	105 0.35, 0.28	105 0.37, 0.30

Source: Authors' estimates.

Notes: t- Statistics in parentheses; *, **, ***, ****, indicate significance at 15, 10, 5, and 1 percent, respectively.

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