

India: Selected Issues

This Selected Issues paper for India was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on January 23, 2009. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of India or the Executive Board of the IMF.

The policy of publication of staff reports and other documents by the IMF allows for the deletion of market-sensitive information.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
700 19th Street, N.W. • Washington, D.C. 20431
Telephone: (202) 623-7430 • Telefax: (202) 623-7201
E-mail: publications@imf.org • Internet: <http://www.imf.org>

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

INDIA

Selected Issues

Prepared by Hiroko Oura, Andrea Richter Hume, Laura Papi, Magnus Saxegaard, Petia Topalova (all APD), Shanaka J. Peiris (MCM), and Alejandro Simone (FAD)

Approved by the Asia and Pacific Department

January 23, 2009

Contents	Page
I. India's Corporate Sector: Coping with the Global Financial Tsunami.....	2
A. Introduction.....	2
B. Accounting Ratio Analysis.....	4
C. Default Risk Analysis.....	9
D. Corporate Sector Health and Economic Growth.....	13
II. Causes and Consequences of Capital Flows to India.....	21
A. Introduction.....	21
B. The Determinants of Capital Flows.....	21
C. The Impact of Capital Flows on Investment and Asset Price Volatility.....	23
D. Conclusion.....	24
III. Exchange Rate Pass-through in India: A Non-Linear Study.....	26
A. Non-linearities in Exchange Rate Pass-through.....	26
B. Econometric Framework.....	26
C. Results.....	27
D. Conclusion and Policy Implications.....	28
IV. India's Experience with Fiscal Rules: An Evaluation and the Way Forward.....	33
A. India's Experience with Fiscal Rules.....	33
B. Strengths and Weaknesses of the Current Fiscal Rules Framework.....	36
C. The Way Forward.....	38

I. INDIA'S CORPORATE SECTOR: COPING WITH THE GLOBAL FINANCIAL TSUNAMI¹

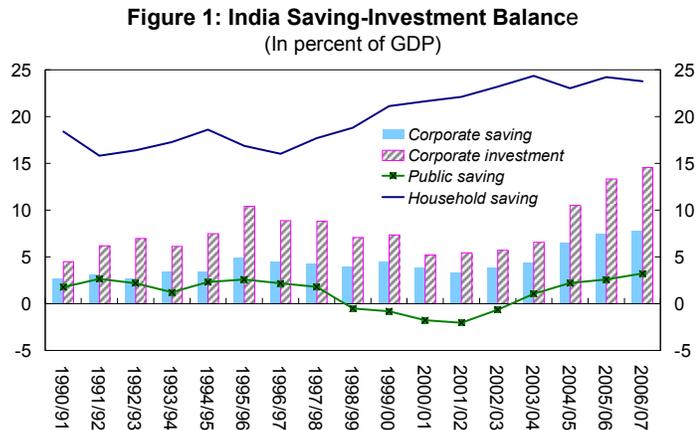
A. Introduction

1. **As is already obvious, the global financial crisis is unlikely to spare India's corporate sector.** The perceived impact as reflected in financial markets indicators is acute: the Sensex lost over 50 percent and the rupee depreciated 23 percent in 2008, a sharp turnaround from the buoyant trend observed in the preceding years. The perceived vulnerability of India's corporates

is also large. CDS spreads of some Indian firms have skyrocketed to some of the highest levels in emerging Asia. Despite the external origin of the financial crisis, the potential impact on India's corporate sector could be large as India has become increasingly integrated with the global economy in the past decade.

The impact on the corporate sector will, in turn, feed into India's

overall economic growth. For the past four years, growth has been fuelled by strong corporate investment supported by high profitability and increased reliance on domestic and foreign financing (Figure 1).²



Source: CEIC Data Company Ltd.

2. **In this paper, we assess the potential impact of the global crisis on the health of India's corporate sector.** Using firm-level data, we employ two distinct and complementary approaches in evaluating the current state and vulnerability of the corporate sector (Brooks and Ueda (2007)).

- The first approach relies on data from the balance sheets and income statements of about 7,000 listed and some unlisted firms to analyze the cross-sectional pattern and historical development of standard accounting ratios of corporate leverage, liquidity, and profitability. Stress tests of pre-crisis corporate balance sheets, with shocks to borrowing costs, the exchange rate, and profits (on the order of the changes already

¹ Prepared by Hiroko Oura and Petia Topalova.

² While Indian companies finance the majority of their investment using retained earnings, Oura (2008) finds that they had been increasing their use of external funds (including domestic bank and capital market financing as well as overseas financing) to finance considerably larger investment during the recent period of 9 percent economic growth. As a result, India's corporate sector is increasingly exposed to global financing conditions.

observed since the beginning of the current global crisis) shed light on the likely effect of worsening economic conditions on firms' financial health. This, in turn, can serve as an indicator of the prospective health of the banking system. This methodology is widely used in the literature (see for example Heytens and Karacadag (2001), Goldman Sachs (1998, 2000), Topalova (2004), and Jones and Karasulu (2006)) and has been shown to be reasonably accurate (ex-post) in foreshadowing corporate sector distress (Jones and Karasulu, 2006).

- The second approach is based on indicators that measure the risk of default, using an approach similar to the Black-Scholes-Merton (BSM) option pricing model. Compared to simple accounting ratios, default risk indicators have two main advantages: (i) they are forward-looking and (ii) they combine various dimensions of risk into a single statistic, which gives the overall impact on vulnerability from potentially offsetting changes. The theoretical default risk of a firm is computed from both its balance sheet and equity price data, under the assumption that equity market prices should incorporate investors' estimate of the company's default risk. This approach is especially useful when the analyzed firms do not have publicly traded derivative securities, or if their market prices are unreliable because of low liquidity.³ Chan-Lau and Gabelle (2005) suggest that the default risk indicators provided early signals of distress for some Asian crisis-hit countries in the late 1990s. We computed these indicators for over 2000 companies listed in the Bombay Stock Exchange, providing a much larger coverage than Moody's KMV for India, which monitors only about 100 firms.⁴

3. **Furthermore, we link corporate sector performance directly to overall investment and economic growth**, to estimate the likely impact of the global crisis. The lack of data on actual corporate bankruptcies and debt restructuring in India prevents us from relating corporate vulnerability indicators to actual firm distress.⁵ Yet, it is possible to

³ Chan-Lau (2006) provides an excellent survey of the techniques analyzing corporate default risks.

⁴ We thank Kenichi Ueda for providing the Matlab code used in the IMF's Corporate Vulnerability Utility (CVU) to estimate default risk indicators. While the CVU also provides BSM default risk indicators, the sample for India is smaller and the aggregated and annual nature of the data prevents us from updating indicators to incorporate the latest equity market information and from relating individual firms' default risks to economic activities. Unlike Moody's KMV, our default risk indicators are theoretical (risk-neutral) indicators, and hence not comparable to actual default frequency. Still, the trends and sensitivity of the estimated default risks capture how the health of the corporate sector evolves over time as well as the relative vulnerabilities of the companies it comprises.

⁵ Indeed, cases of corporate bankruptcy in India are extremely rare partly owing to the cumbersome legal framework. Bankruptcy procedures under the Sick Industrial Companies Act, which governs financial reorganization of distressed companies, continue to be time consuming and burdensome, owing to indefinite stays on creditors' claims. Liquidation under the Companies Act is even more complicated and long court delays
(continued...)

estimate the relationship between our vulnerability measures and economic activity. Historical data reveal that our vulnerability measures are indeed significant leading indicators of firm-level as well as macro-level investment and GDP growth. Using these statistical relationships, we can quantify the potential impact of the current global crisis on India's corporate sector health and future economic growth.

4. **Our analysis suggests that the ongoing global crisis could have a serious impact on the Indian corporate sector and near-term growth.** The significant volatility in the exchange rate, equity prices, and interest rates triggered by the global crisis, together with the decline in global economic activity and capital flows will weigh on India's firms. For a reasonable set of shocks (which have largely already happened) the number of firms facing problems in servicing their debt obligations could more than double. Despite fairly strong corporate sector balance sheets as of March 2008, lower equity prices and increased equity market volatility imply a much lower buffer against distress. The estimated economic growth impact could be over four percentage points; with GDP growth rate in 2007/08 at 9 percent, these estimates imply a deceleration to around 5 percent.

5. **The rest of the paper is organized as follows.** Section B describes the results from the analysis of accounting ratios. Section C presents the default risk analysis, while Section D explores the corporate vulnerability and growth nexus.

B. Accounting Ratio Analysis

6. **The data used in this analysis are from a firm-level database on India's corporate sector (Prowess), compiled by the Centre for Monitoring the Indian Economy (CMIE).** The database contains standardized balance sheet and income statement data of listed and unlisted companies, which account for about 70 percent of the economic activity in India's organized industrial sector. The sample size of non-financial firms ranges from about 2000 in the early 1990s to about 7000 for fiscal year 2007/08 (ending in March 2008, when the majority of companies file their annual reports). The database is substantially richer than global corporate sector databases, such as Worldscope, in terms of number of companies, coverage of smaller firms, and detail of information (for instance, foreign currency borrowing).

7. **India's non-financial corporate sector balance sheets appeared healthy as of March 2008.**⁶ According to a number of financial indicators, India's corporates were at their

are common. Since the early 2000s, out-of-court corporate restructuring mechanisms such as the Corporate Debt Restructuring forum and the SARFAESI Act (2002) have facilitated the restructuring of distressed assets. Unfortunately, data on corporate debt restructuring undertaken by banks are not publicly available.

⁶ In this section, we focus on the non-financial corporate sector as the stress tests in this section consider the impact of non-financial firms' distress on banks' non-performing loans.

strongest since the early 1990s. They also compared favorably with emerging market peers (Panel Figure 1).

- **Profitability:** Profitability and profit margins improved substantially during the recent economic growth upturn across the entire distribution of firms, supporting strong gains in corporate saving. The profitability of India's firms also stands out internationally. Based on the IMF's CVU, which uses the Worldscope database, the market capitalization weighted⁷ return on assets (ROA) for Indian companies in 2007 was 17 percent compared to 12 percent in emerging Asia and emerging America, 17 percent in emerging Europe, and 7-10 percent in developed economies.
- **Leverage:** Corporate leverage has declined substantially since the early 1990s. While firms increased their leverage somewhat recently, as ambitious investment outpaced retained earnings, the debt-to-equity and debt-to-asset ratios remain at comfortable levels by historical standards and in line with India's peers in emerging Asia and emerging America. The market capitalization weighted average of the debt-equity ratio is 0.6 for India, comparable to 0.6 for Asia and 0.8 for America in 2007 (CVU). The ratio for emerging Europe is lower at 0.4.
- **Foreign borrowing:** Despite a steady relaxation of restrictions on foreign borrowing, the use of such financing has been concentrated in a limited subset of large companies. In 2007/08, only 15 percent of the companies in the sample had borrowed from abroad, and the share of foreign debt in total debt by all companies in our sample was about 20 percent.
- **Liquidity:** High profit growth and declining interest rates provided ample liquidity to Indian firms. The interest coverage ratio (ICR)—defined as earnings before interest and taxes over interest expenses; and measuring the debt-servicing capacity for a firm—rose sharply in recent years across the distribution of firms and for private, foreign, and government-owned firms. Using the CVU, the market capitalization weighted average of ICR for India in 2007 was 100, much higher than the weighted average (10-50) in other emerging markets and in developed markets (around 20-60).

8. **While the state of the corporate sector in early 2008 appeared healthy, stress tests could uncover its vulnerability to various shocks.** In addition, since complete balance sheet data are available only annually, the stress-test framework can shed light on the impact of very recent financial market developments on firms' health. Following the standard

⁷ Market capitalization weighted averages are best suited for cross country comparisons. By assigning higher weights to the economically more important companies, the market cap weighted averages focus on systemic risk and mitigate cross country differences in coverage.

practice in the literature, firms with ICR below one, in other words, firms that are unable to generate enough cash to cover the interest payments on their debt, are classified as distressed or in theoretical default. Previous studies have demonstrated that stress tests on the ICR can effectively detect corporate sector distress: for instance, Jones and Karasulu (2006) illustrate that this framework would have flashed warning signs for the Korean corporate sector before the onset of the 1997 crisis, had it been used at the time.

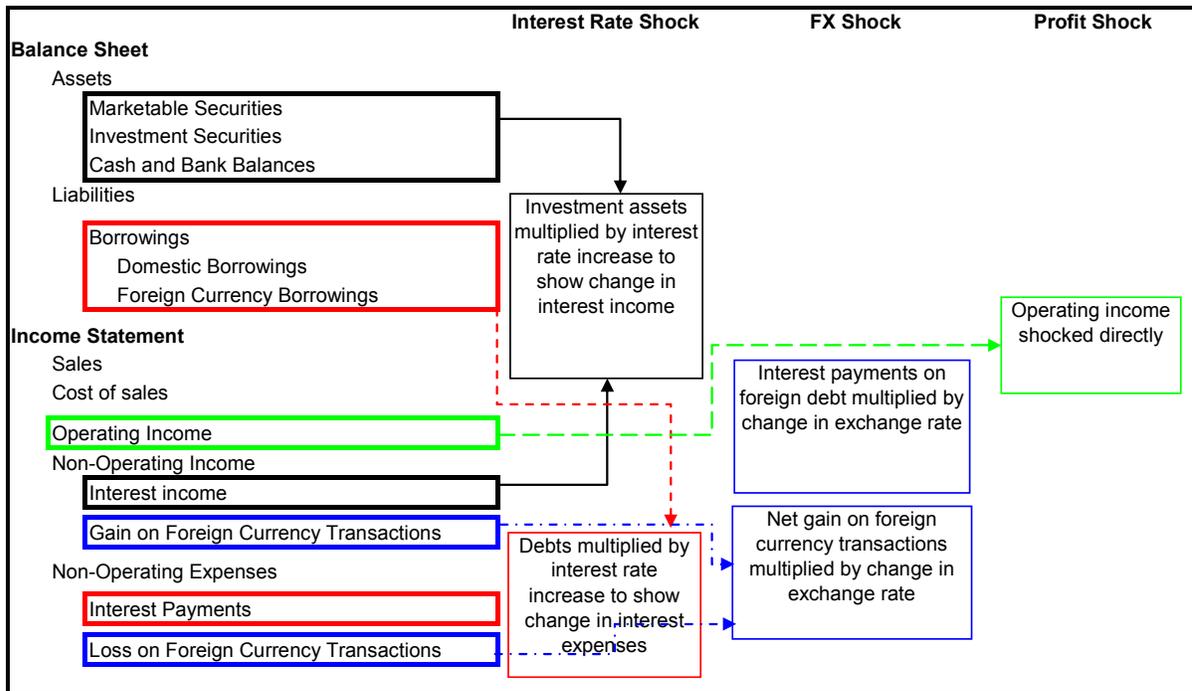
9. **Moreover, the weaker financial performance among firms as a result of various shocks can be linked to the financial system's asset quality.** If firms with ICR below 1 cannot find additional sources of funds, they are likely to delay interest payments, and if the delay persists, loans to those companies would eventually be classified as non-performing assets in banks' balance sheets. This corporate-financial link is important in India: almost half of the total borrowing of non-financial corporations come from domestic banks, and two-thirds of total non-food bank credit goes to the corporate sector (including commercial real estate and property developers). The remainder goes to the agricultural and household sectors in the form of personal and retail loans. As of March 2008, about 22 percent of the companies had an ICR below 1, accounting for 15 percent of the total debt of the companies in our sample. These numbers are much higher than the non-performing assets (NPAs) data reported by banks (the overall gross NPA ratio of scheduled commercial banks was only 2.4 percent). There are many reasons why the implied NPAs derived from ICRs differ from banking data NPAs.⁸ Having said this, the relative changes in the ICR could signal the future trend in NPAs. The correlation between the level of NPAs reported in banking sector data over the past 11 years and the implied NPAs estimated from the Prowess database is 0.78.

10. **We analyze the sensitivity of the corporate sector and the implied NPAs in the financial system to various macroeconomic shocks.** We consider four separate shocks (on domestic and foreign interest rates, the exchange rate, and profits) as well as the combined effect of the three shocks on the individual firms' balance sheet/income statement. The post-shock financial indicators are used to recalculate the interest coverage ratio of each firm (Figure 2). The figure below, which presents a stylized version of the balance sheet and income statement of a firm, depicts the channels through which each shock impacts the

⁸ First, ICRs do not necessarily account for all the resources that the companies have at their disposal to meet debt servicing obligations. For instance, companies may acquire additional funds from shareholders, take credits from other non-financial companies, draw down reserves, and sell assets. Therefore, as long as poor financing conditions do not persist for too long, the theoretical default may not translate into actual default and a rise in bank NPAs. Second, while credit to corporates accounts for a significant share in total bank credit, banks do lend to other sectors. Similarly, not all firm debt comes from banks. Third, loans that are restructured are not classified as NPAs according to RBI guidelines. Banking sector NPA data augmented for the restructured debt (or disposal of distressed assets) would likely be more closely related to our vulnerability measures; however such data are not publicly available. A study by Goldman Sachs (2000) points out that for Korea, Taiwan Province of China, and Thailand, the reported NPA ratios for the financial system were 18, 5, and 25 percent, respectively in 2000, while their implied NPAs calculated using ICR were 37, 16, and 44 percent, respectively.

financial condition of a firm. An increase in interest rates directly raises the firm's interest payments; however it also raises the returns on its financial assets, such as bank balances. A depreciation of the currency automatically inflates the foreign currency debt of the firm when expressed in local currency and raises the interest payments on foreign debt. However, it may also raise the income of the firm, depending on its net foreign currency exposure and currency composition of its revenues and costs. Finally, a decline in profits reduces the resources available to the firm to service its debt obligations.

Figure 2. The Effect of Shocks on Firm's Balance Sheet and Income Statement



11. **In an attempt to quantify the impact that the evolving crisis has already had on India's corporate balance sheets and financial sector asset quality, we consider shocks that are roughly equal to the observed change in relevant macroeconomic variables in 2008.** These shocks also correspond to approximately one standard deviation of the respective variables.

- For interest rate risk, we consider an increase in the domestic interest rate by 500 bps, and in the foreign interest rate by 700 bps corresponding to the observed increase (from the minimum to the maximum in 2008) in domestic commercial paper rates and the EMBI Global spread.
- For foreign exchange risk, we consider a rupee depreciation of 25 percent (the rupee depreciated by 23 percent in 2008).

- For earnings risk, we assume a decline in profits of 25 percent (the advance corporate tax payments in the 4th quarter of 2008, which registered a 22 percent y-o-y decline, suggest that this is a reasonable assumption for the likely impact of the crisis on corporate profits).

12. **Table 1 summarizes the results of the stress tests.** The first column shows the share of companies with ICR below one (bottom row), and the share of total corporate sector debt that is held by these “ICR below 1” companies (top row). For each shock, as well as the combined shocks, the table shows the resulting increase in the share of companies with ICR below one and in the share of implied NPAs. For example, a 500 basis points increase in the domestic interest rate raises the share of debt borrowed by companies with ICR below one by 8 percentage points, suggesting that the total implied NPAs in the banking sector would rise to 22.6 percent from a baseline of 14.6 percent observed in March 2008.

Table 1. India: Stress-Test Results on the Non-Financial Corporate Sector

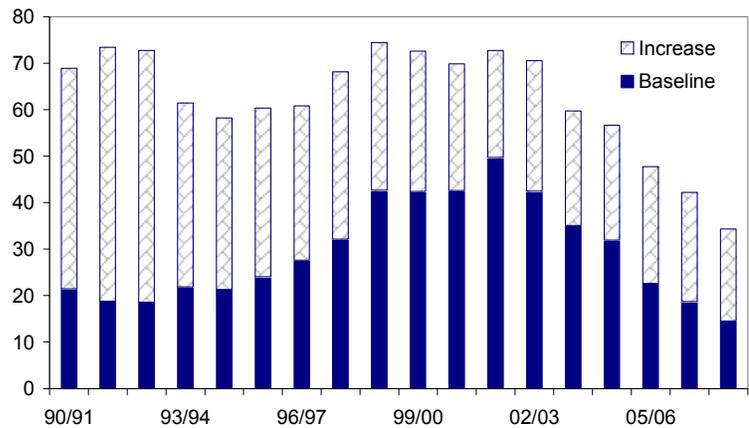
Baseline March 2008	Domestic Interest Rate Shock	Foreign Interest Rate Shock	FX Shock	Profits	Combined
	+ 500 bps	+ 700 bps	+ 25 percent	- 25 percent	
in percent	Changes from the baseline				
Share of debt of companies with ICR<1 in total corporate sector debt					
14.6	8.0	3.6	1.6	4.6	19.8
Share of the number of companies with ICR<1 in total number of companies					
22.1	12.6	1.0	0.1	5.9	21.3

The stress test highlights the following vulnerabilities.

- Indian firms seem to be more sensitive to interest rate shocks (especially the domestic rate) compared to rupee depreciation shocks. This is not surprising given that access to foreign borrowing is limited to a relatively small number of companies in the sample. This suggests a limited trade off in the nonfinancial corporate sector between lowering interest rate (injecting liquidity to stimulate the economy) and exchange rate depreciation (increasing foreign currency debt burden), and could simplify the task of balancing different objectives in the conduct of monetary policy.
- Banks’ credit portfolio could be significantly affected by the potential deterioration in the financial conditions of the corporate sector. The share of troubled debt owed by companies with insufficient earnings for debt service could more than double, under a very likely scenario with combined shocks of a magnitude already seen in 2008. This could mean that financial/banking sector stress testing should incorporate at least a doubling of non-performing loans as a baseline shock to credit quality, and more extreme shocks need to be considered in order to examine tail risks.

13. **While the doubling of troubled debt is worrisome, in a historical context India's corporate sector seems to be less vulnerable to extreme shocks than in the past (Figure 3).** First, as the ICR has improved since the late 1990s, the actual amount of implied NPAs declined (baseline scenario in Figure 3). Second, as balance sheets improved, the sensitivity to the combined shock seems to have diminished as well.

Figure 3. Share of debt of companies with ICR<1
Sensitivity to Combined Shocks, 1991-2008



C. Default Risk Analysis

14. **We estimate the BSM default probability and distance-to-default for each firm in our sample following the methodology adopted in the IMF's CVU.**

- Distance-to-default (DtD) measures the extent to which the firm's total assets (at market value) need to fall for a firm to default within a year. According to the methodology used in this section, a firm defaults when the market value of its assets falls short of its debt liability (namely, default barrier⁹), or alternatively, the market value of equity falls to zero. DtD-one-year-ahead is the difference between the market value of assets and debt adjusted for the expected change in firm assets and normalized by the standard deviation of the asset return. This implies that if the DtD takes on a value of 3, a firm has enough assets not to default as long as the asset return does not drop 3 standard deviations from its current level within one year.¹⁰
- The BSM default probability represents the theoretical probability of default one-year-ahead using the standard cumulative normal distribution and the DtD as a threshold. It is reported in a way that, if the reported DtD is three, the default probability becomes 50 percent. Both DtD and default probability depend on (1) how far away a firm is from its default barrier; and (2) how risky a firm's asset return is, measured by asset

⁹ Following the CVU, the default barrier includes short-term debt, one half of long-term debt, and interest payments.

¹⁰ Under the normality assumption for the asset returns in BSM, an event measuring 3 standard deviations from the mean is extremely rare, with cumulative density of one percent.

return volatility. Since the mean and volatility of the firm assets at market value are not directly observable, equity value and volatility are fed through the BSM option pricing formula to estimate those variables (see Brooks and Ueda (2007) for details).

15. **Both balance sheet and equity price data are from Prowess.** As we need equity price data, we focus only on listed companies, which amounted to about 2400 companies in 2007/08. Due to inadequate equity price data in the early 1990s, we estimate the BSM measures of default starting in 1993/94.

16. **In line with the trends observed in firms' accounting ratios, as of March 2008, corporate sector health according to the BSM default vulnerability measures was near historic heights.** DtD indicates that Indian firms were well cushioned to withstand large shocks: even a 3 standard deviation shock to assets would not cause firms (especially those with larger market capitalization) to default.¹¹ Looking at the more limited sample in the CVU, the market cap weighted average DtD for India stands at about 13½ in 2007, which is comparable to other emerging and developed markets.¹² The estimated default probability paints a similar picture, but it seems to accentuate the distress in the mid-1990s and early 2000s around the collapse of India's first investment boom and the recession after the bursting of the global tech bubble.

Figure 4: India: Distance to Default, non-financial firms
(In standard deviation of assets)

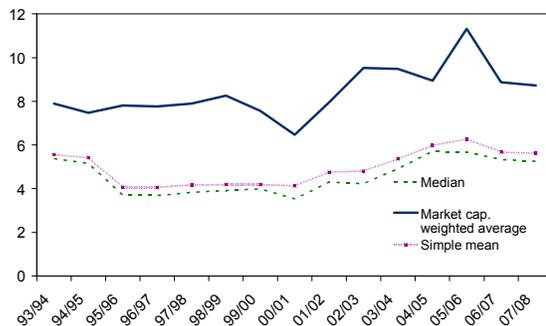
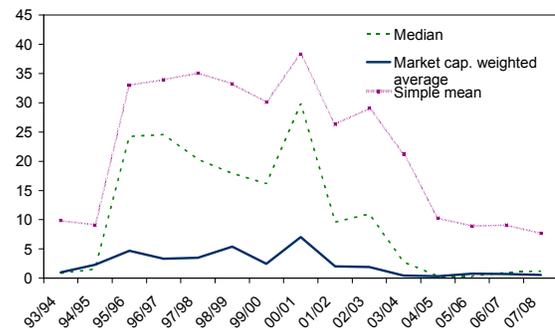


Figure 5: India: BSM default probability, non-financial firms
(In percent)



17. **The default risk indicators are reasonably correlated with India's macroeconomic and external conditions and exhibit some clear cross-sectional patterns.** Table A1 shows the contemporaneous correlation between the default risk indicators and various macroeconomic and firm-level characteristics, including financial data and industry and ownership information similar to those presented in Cavallo and Valenzuela (2007). As

¹¹ However, it should be noted that the BSM methodology depends on the normality assumption of asset returns. If the true return distribution has fatter tails, the likelihood of severe corporate distress could be larger than what BSM default risk indicators suggest.

¹² At the time of the Asian crisis in 1997, the market capitalization weighted average DtD for emerging Asia was about 7.

expected, a firm has lower default risk if it is larger, less risky (lower asset return volatility), and less leveraged, and has better growth opportunities. Younger firms seem less vulnerable as well. Compared to private individual (as opposed to group) firms, foreign firms seem to have lower default risk, while Indian private group companies or public sector companies seem to have higher default risk after controlling for their size. An upturn in GDP growth and inflation is associated with lower default risk in the corporate sector. Increases in global risk perception, as reflected in the VIX—a measure of the implied volatility of S&P 500—coincide with heightened default risk. While the exact mechanism underlying the observed correlation cannot be uncovered in the present analysis, the positive association may reflect spillover channels from world economic/financial conditions to India. Overall, the Indian corporate sector’s vulnerability seems to have moved in line with India’s macroeconomic and global conditions.

18. **The default risk indicators are also highly correlated with earnings-based measures of actual default.** DtD is positively correlated with ICR from the previous section after controlling for other firm specific characteristics, illustrating the underlying strong link between the theoretical model-based measures of default risks and accounting-based measures of default. However, the lack of actual bankruptcy data prevents us from translating theoretical (risk-neutral) default risk into real world default risk and testing the predictive ability of our measures for bankruptcies.

19. **Using the default risk indicators, we examine the potential impact of the rapid deterioration of the financial markets, which has been actually observed since March, 2008 on corporate sector health.** By feeding updated equity price and volatility data and March 2008 balance sheet data into the BSM option pricing model, we re-estimate the default risk indicators to capture the vulnerabilities reflected in recent equity price changes. In order to highlight the implication of the current global crisis at its deepest point, we take the lowest equity price for each company between January and November 2008. As an estimate of equity volatility, we used the highest annual standard deviation observed for each company since 1993/94. The choice of this measure is reasonable given that benchmark equity volatility according to VIX remains at historic heights.¹³ Furthermore, we consider the direct, first round impact of a 25 percent rupee depreciation, which is equivalent to the actual depreciation of the rupee vis-à-vis the U.S. dollar in 2008. A depreciation increases the domestic value of foreign currency debt and hence reduces the value of equity. If a firm has a relatively a small equity cushion, the shock immediately brings the equity value below 0, causing default right away.¹⁴

¹³ This approach could be considered as a sensitivity test similar to the stress tests of the previous section.

¹⁴ This is also a shorthand way to analyze the impact of a sharp depreciation. The BSM default risk analysis is built on the assumption that investors are pricing default risks—including the impact of depreciation—correctly (continued...)

20. The impact of combined shocks on the implied default risk could be significant.

Table 2 shows the impact of individual shocks on the rupee, equity valuation, and volatility, and then the impact of their combined shocks on the average DtD.¹⁵

- Despite the appreciable size of the shocks, exchange rate depreciation and equity valuation per se seem to have a limited impact on corporate vulnerability.
- The direct balance sheet impact of changes in the exchange rate seems to push only a small number of companies into immediate default. The impact on average default risk for the surviving companies is also relatively minor, consistent with the accounting ratio analysis.¹⁶
- The large impact of shocks to equity volatility seems to reflect the importance of the risk factor reflected in equity volatility in explaining the potential rise in corporate vulnerability. The implied decline in DtD is extremely large in a historical context: in the high volatility scenario, the average DtD would reach historical lows, registering the largest annual decline. Nonetheless, firms still appear to have good equity cushions against additional shocks.
- Combining all types of shocks (Combined Shock B) would lead to a particularly large increase in vulnerability. However, this could be an overestimate as the impact of the rupee depreciation could be already reflected in equity valuations and volatility. Therefore, we focus on Combined Shock A to investigate the link between corporate sector health and economic activity.¹⁷

in equity prices. A fuller analysis of the impact of depreciation could include a factor analysis linking equity prices and the exchange rate: an exchange rate shock could be translated in terms of equity valuation and volatility shocks, and then fed into default risk indicator calculations. Furthermore, a volatile exchange rate is likely to require relaxing the normality assumption in the benchmark BSM model, and would require modifying the pricing model as in Chan-Lau and Santos (2006). Having said this, our simple analysis can still give some idea about how the direct impact of rapid depreciation compares to what is implied by actual changes in equity prices and volatility, and whether an exchange rate depreciation is cause for worry or not.

¹⁵ As discussed in the next section, the simple average DtD seems to be the best predictor for macroeconomic performance.

¹⁶ However, our analysis does not include losses owing to derivatives and other contingent liabilities, which could underestimate the overall rupee depreciation impact.

¹⁷ All the analyses maintain the same expected returns from assets as in the baseline. Adjusting expected returns in line with what is implied by the shocks would further increase the impact.

Table 2 Scenario: Distance to default, non-financial firms

	Immediate default 1/ number	Shock size % of asset std. mkt. Cap. Weighted avg. 2/	Actual as of March 2008 3/ (a)	Post shock 3/ (b) Simple average DtD	Impact 3/ (b-a)
25% rupee depreciation since Mar. 08	4	-0.1%	5.6	5.6	0.0
Minimum equity price, Jan-Nov 08	0	-97.5%	5.6	5.3	-0.3
Historical high volatility	0	-1.4%	5.6	3.9	-1.7
Combined shock A (equity value and vol.)	0	-98.8%	5.6	3.6	-2.0
Combined shock B (equity val., vol., depreciation)	18	-98.6%	5.6	2.1	-3.5

1/ A rupee depreciation shock increases the market value of foreign currency debt immediately, reducing the market value of equity. If a firm has a small equity cushion, this could bring the market value of equity below 0 immediately, causing default right away.

2/ 100 percent implies a one standard deviation shock.

3/ Excluding the companies that lose all the equity value and go in default immediately as a result of a shock. A negative equity value causes computation problems in calculating asset value and volatility.

D. Corporate Sector Health and Economic Growth

21. **What does the increase in corporate sector stress mean for India's investment and economic growth in the near future?** When companies are in distress, they are likely to cut investment and production, weakening economic growth. In addition, the expected economic downturn heightens corporate sector vulnerability. Even though causality between firm vulnerability and economic indicators likely runs both ways, we can apply a leading economic indicator framework to quantify the impact of higher default risk on near-term investment and growth. We first establish whether default risk measures are useful leading indicators for firm-level investment. We then estimate the link between average corporate sector default measures and macro-level investment. Finally, we show the implication of the deterioration in DtD considered in the previous section on GDP growth.

22. **At the firm level, we estimate a standard panel investment model based on Tobin's Q, controlling for macroeconomic conditions and industry/ownership specific factors.** We extend this baseline investment model by including default risk indicators. The dependent variable is capital expenditure normalized by firm asset size. The following regression model is estimated using annual data from 1993/94 to 2007/08 with indicating individual firms and t indicating time.

$$Capex_{t,i} = \alpha + \beta_1 DefaultRisk_{t-1,i} + \beta_2 Tobin'sQ_{t-1,i} + \beta_3 Control_{t,i} + \beta_4 CompanyFixedEffects + \beta_5 TimeD + \varepsilon_{it}$$

Default risk indicators include either DtD or default probability. Tobin's Q is approximated by the market-to-book ratio. The model includes company level fixed effects to control for the effects from other company specific characteristics and time dummy variable in order to control for macroeconomic and external conditions. For robustness checks, some firm

specific control variables, including the opening cash balances (in order to consider the impact of possible borrowing constraints), leverage, firm size, lagged equity volatility, and lagged asset volatility are included.

23. Default risks indicators have strong predictive power for corporate investment at the micro level (Table A2). Both DtD and default probability explain future capital expenditure (with the correct sign) and the coefficients are statistically significant. The default risk measures remain statistically significant and stable when other firm-specific variables are added to the estimation.

24. At the macro level, we see whether default indicators have any predictive power for an economic activity variable over its own past value. We estimate the following model:

$$Y_t = \alpha + \beta_1 \text{DefaultRisk}_{t-1} + \beta_2 Y_{t-1} + \varepsilon_t$$

Various measures of economic activity, including corporate investment as a share of GDP, corporate investment growth, overall investment as a share of GDP, overall investment growth, and real non-agricultural GDP growth are used as dependent variables. Default risk indicators are cross-company average/median/market capitalization weighted average DtD or default probability for each year t . Only the results with average default risk are presented, as they seem to have more robust and stable relationships with the dependent variables.¹⁸

25. Default indicators have statistically significant predictive power for key macroeconomic variables (Table A3). Also, these results are robust to the inclusion of other macroeconomic variables for India or the world. Therefore, these estimated coefficients could be applied to the estimated deterioration in default risk measures from the previous section to provide an estimate of the deceleration in GDP growth rate implied by the corporate sector indicators. Since the DtD seems to be a stronger predictor of firm behavior than default probability, we focus on average DtD in the following exercise.

26. India's economic growth could be severely dented in the near term (Table 3). The implied impact of a 2.0 decline in DtD (such as estimated in the Combined Shock A scenario) on overall economic growth ranges from -2.8 percentage points to -4.4 percentage points. With GDP in 2007/08 growing at 9 percent, these estimates imply a deceleration to

¹⁸ Ex ante, one would expect the market capitalization weighted average to be better correlated with macro variables as it tends to reflect the trends for larger, more economically important companies. However, in India, the share of the formal sector is very small (employing only 10 percent of the labor force). The simple average might do a better job as it can better represent the trend for a large number of small companies that, nonetheless, represent a large share of total economic activity.

4.6-6.2 percent growth. The latter is indeed in line with the IMF's and consensus forecast for 2009/10 growth as of January 2009. These estimates should obviously be taken with a grain of salt. In addition, financial and economic conditions in India and the world could change the conditions of the corporate sector and/or the economy significantly and in unexpected ways: the degree of uncertainty is indeed very large. However, this model-based approach does indicate a potentially a significant impact of the current global crisis on India's corporate sector, investment, and growth.

Table 3: Impact of corporate sector distress on investment and growth

Estimation model	Impact of combined shock (equity price and volatility, $\Delta D_t D = -2$)	Impact on headline real GDP growth
Corporate investment in percent of GDP	-2.8 ppts	-2.8ppts 1/
Corporate investment growth in percent	-31.3 ppts	-4.4 ppts 2/
Investment in percent of GDP	-2.8 ppts	-2.8 ppts 1/
Investment growth in percent	-12.7 ppts	-4.3 ppts 2/
(non-agricultural) GDP growth	-3.4 ppts	-2.8 ppts

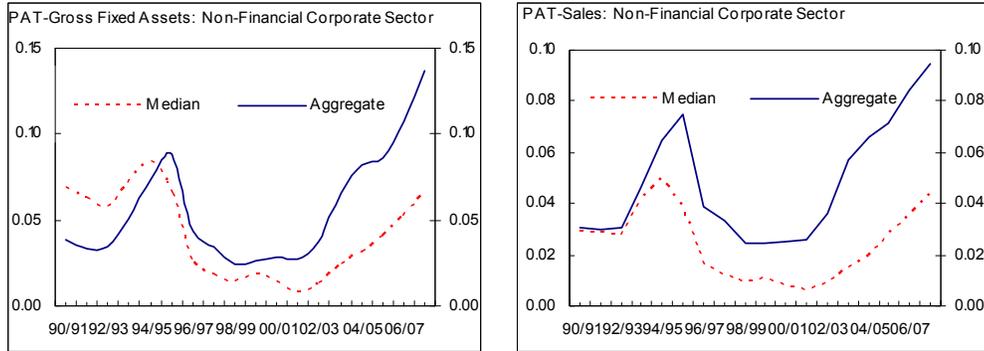
1/ Assuming a multiplier effect of 1.

2/ Contribution to GDP growth, assuming a multiplier effect of 1.

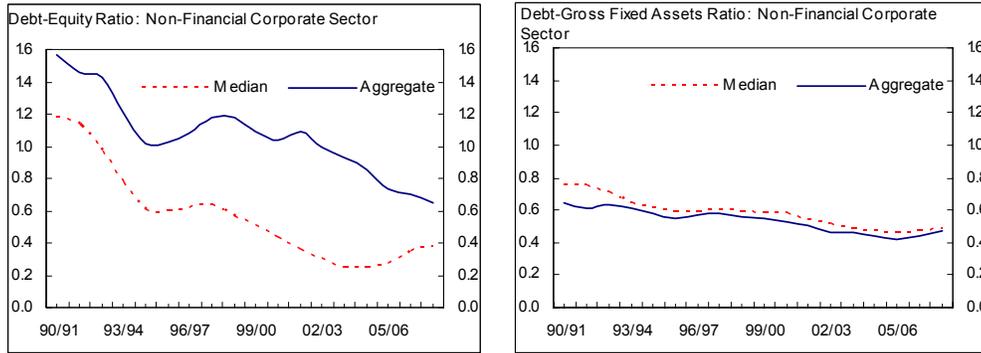
Panel Figure

India's Non-Financial Corporate Sector is facing the crisis from a strong position 1/

Profitability and profit margins have improved substantially ...

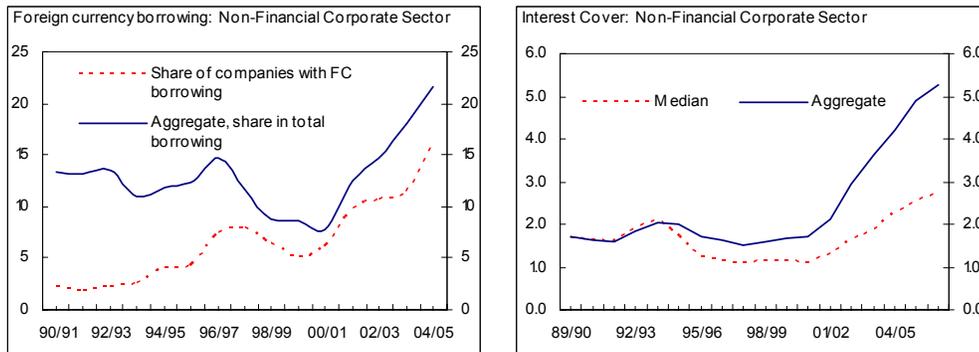


... and over the past decade, companies have deleveraged



Foreign currency borrowing has increased, but remains limited to a small number of companies.

As of March 2008, India's firms were in a comfortable liquidity position.



Sources: CMIE; Prowess database, and authors' estimates.

1/ "Aggregate" series show ratios taken after aggregating across firms for a variable. For instance, the debt-equity ratio is computed by first summing up debt and equity across all the firms, and then by taking the ratio.

Table A1: Distance-to-default and Default Probability

This table presents results from regressions using data excluding companies with less than 24 weeks observation for active equity price data. All models include industry dummies (not shown) and ownership dummies set against private independent companies. Dependent variable are estimated distance to default and Black-Schorles-Merton default probability. Estimated market value of total asset is used to calculate independent variables. Sample includes firm-level panel data from fiscal year 1993/94 to 2007/08. Standard deviation is adjusted for within company serial correlation.

Independent Variables		Dependent variables	
		Distance to default	Default probability
Firm specific characteristics	Size (log asset)	0.490*** [0.028]	-0.024*** [0.003]
	Age	-0.003** [0.002]	0 [0.000]
	Market-to-book	0.012*** [0.004]	-0.001** [0.000]
	Profitability (ROA)	0 [0.070]	-0.066*** [0.015]
	Leverage (total debt/ asset)	-0.013 [0.037]	0.003 [0.006]
	Equity volatility	-1.372*** [0.147]	0.243*** [0.026]
Indian macroeconomic conditions	GDP growth rate, India	0.056* [0.030]	-0.026*** [0.003]
	3M TB yield, India	-0.208*** [0.022]	0.031*** [0.002]
	Inflation, India	0.081*** [0.016]	-0.018*** [0.002]
External conditions	10Y TB yield, US	-0.009 [0.051]	-0.017*** [0.005]
	Vix	-0.044*** [0.008]	0.003*** [0.001]
Ownership dummy	Private group (dummy)	-0.537*** [0.067]	0.034*** [0.005]
	Foreign (dummy)	0.446*** [0.129]	-0.022*** [0.008]
	Government (dummy)	-1.452*** [0.231]	0.095*** [0.016]
Number of observations		25090	25122
R-square		0.228	0.371

***, **, and * denote significance at the 1percent, 5 percent, and 10 percent levels, respectively. T-statistics are given in brackets.

Table A2: Micro-level investment regression

This table presents results from regressions using data excluding companies with less than 24 weeks observation for active equity price data. All models include firm fixed effects (not shown) and time dummies. Samples with extreme capex variables (top 5% and bottom 5%) are excluded.

	Dependent variable: Capex (t) / Book value of total asset (t-1)						
Independent Variables							
Distance to default (t-1)		0.18**		0.13*	0.14**		
		[0.08]		[0.07]	[0.07]		
Default probability (t-1)			-0.03***			-0.03***	-0.03***
			[0.00]			[0.00]	[0.00]
Market-to-book (Tobin's Q, t-1)	0.02***	0.03***	0.03***	0.02***	0.02***	0.02***	0.02***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Opening cash balance	0	0	0	0	0	0	0
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Asset return volatility					0.22*		0.33**
					[0.13]		[0.16]
Equity volatility				-0.01		0.15	
				[0.08]		[0.11]	
Leverage (total debt/ asset)				0.1	0.11	0.17	0.18
				[0.20]	[0.20]	[0.19]	[0.19]
Size (log of asset)				2.21***	2.22***	2.17***	2.17***
				[0.21]	[0.21]	[0.21]	[0.21]
Number of observations	20893	18681	18696	18681	18681	18696	18696
R-square	0.41	0.41	0.42	0.42	0.42	0.43	0.43

***, **, and * denote significance at the 1percent, 5 percent, and 10 percent levels, respectively. T-statistics are given in brackets.

Table A3: Macro level analysis

Independent Variables	Dependent variable (t)					
	Corporate investment %GDP			Real corporate inv. growth %		
Dependent variable (t-1)	0.98 *** (4.55)	0.83 *** (4.86)	0.86 *** (4.72)	0.46 * 1.78	0.19 0.67	0.23 0.79
Average DtD (t-1)		1.40 *** (3.31)			15.66 1.83 *	
Average default prob. (t-1)			-0.09 ** (-2.83)			-0.99 -1.63
Number of observations	14	13	13	14	13	13
R-square	0.63	0.82	0.79	0.21	0.41	0.38

***, **, and * denote significance at the 1percent, 5 percent, and 10 percent levels, respectively. T-statistics are given in brackets.

Independent Variables	Dependent variable (t)					
	Real overall inv. Growth %			Real non-ag.GDP growth %		
Dependent variable (t-1)	0.38 1.45	-0.15 -0.69	-0.04 0.88	0.56 ** (2.64)	0.24 (1.40)	0.26 (1.39)
Average DtD (t-1)		6.37 ** 3.93			1.69 *** (4.51)	
Average default prob. (t-1)			-0.35 ** -2.64			-0.11 *** (-3.78)
Number of observations	14	13	13	15	14	14
R-square	0.14	0.63	0.46	0.35	0.76	0.70

***, **, and * denote significance at the 1percent, 5 percent, and 10 percent levels, respectively. T-statistics are given in brackets.

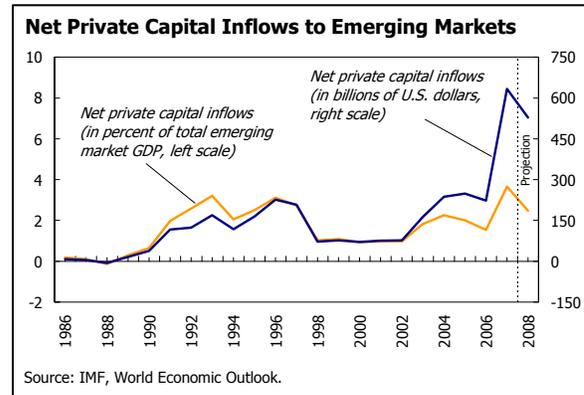
References

- Brooks, Robin, and Kenichi Ueda, 2007, *User Manual for the Corporate Vulnerability Utility*, International Monetary Fund, manuscript.
- Cavallo, Eduardo, and Patricio Valenzuela, 2007, “The Determinants of Corporate Risk in Emerging Markets: An Option-Adjusted Spread Analysis,” IMF Working Paper WP/07/228.
- Chan-Lau, Jorge, 2006, “Fundamentals-Based Estimation of Default Probabilities: A Survey,” IMF Working Paper WP/06/149.
- Chan-Lau, Jorge, and Toni Gravelle, 2005, “The END: A New Indicator of Financial and Nonfinancial Corporate Sector Vulnerability,” IMF Working Paper WP/05/231.
- Chan-Lau, Jorge, and Andre Santos, 2006, “Currency Mismatches and Corporate Default Risk: Modeling, Measurement, and Surveillance Applications,” IMF Working Paper WP/06/269.
- Goldman Sachs, 2000, *Asia Bank NPLs III: How High, How Structural?*, Goldman Sachs Global Equity Research Report (Hong Kong SAR: Goldman Sachs).
- Heytens, Paul, and Cem Karacadag, 2001, “An Attempt to Profile the Finances of China’s Enterprise Sector,” IMF Working Paper WP/01/182.
- Jones, Matthew T., and Meral Karasulu, 2006, “The Korean Crisis: What Did We Know and When Did We Know It? What Stress Test of the Corporate Sector Reveal,” IMF Working Paper WP/06/114.
- Oura, Hiroko, 2008, “Financial Development and Growth in India: A Growing Tiger in a Cage?” IMF Working Paper WP/08/79.
- Topalova, Petia, 2004, “Overview of the Indian Corporate Sector: 1989-2002,” IMF Working Paper WP/04/64.

II. CAUSES AND CONSEQUENCES OF CAPITAL FLOWS TO INDIA¹

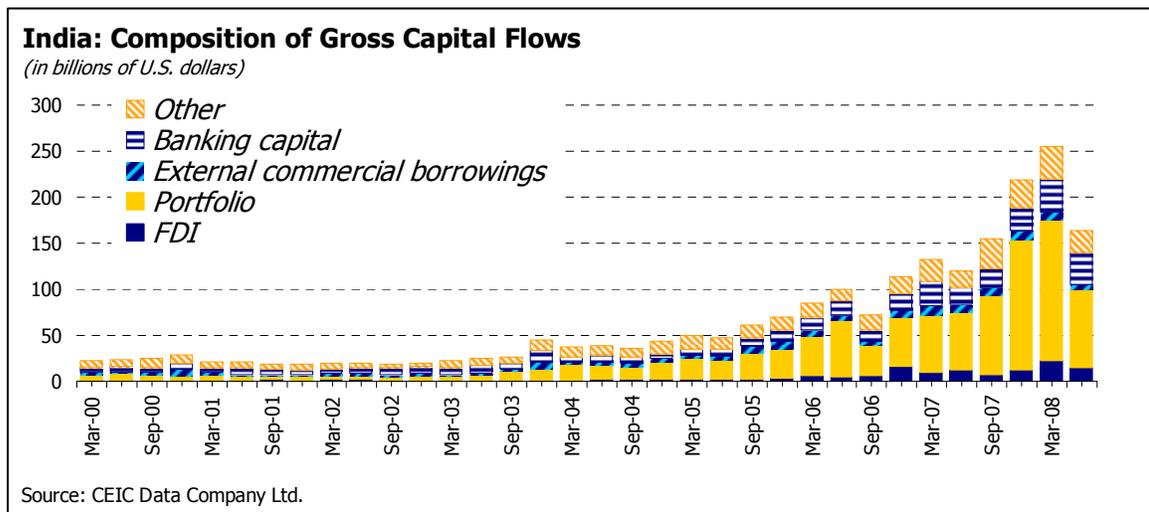
A. Introduction

1. This paper analyzes two cycles of capital flows to emerging markets (EMs), with a particular focus on India. The first began in the late 1980s and ended in the late 1990s following the 1994-95 “Tequila” crisis and the 1997–98 Asian crisis (IMF 2007b). The recent wave, which has been building since 2002, accelerated markedly in 2006, but has since subsided as a result of the current global financial crisis. Capital flows to India have displayed a similar pattern, with foreign institutional investment (FII) flows in particular surging since 2003.



B. The Determinants of Capital Flows

2. We use a panel data framework to identify the determinants of net capital flows to EMs from 1985-2007, and a time series approach to estimate the determinants of net FII flows to India from 2003 onwards. Identification of the causes of capital inflows is not only important for forecasting the likely evolution of capital inflows, but also for determining the appropriate policy response to the current decline in capital flows. It has become conventional to divide the causes of the recent surge of capital inflows into pull and push factors. Pull factors are those that attract capital inflows as a result of improvement in the



¹ This paper is a summary of a forthcoming IMF working paper. Prepared by Shanaka J. Peiris and Magnus Saxegaard.

risk-return characteristics of assets issued by the capital-importing country, while push factors are global financial factors such as the high liquidity, low volatility, and compressed yields of recent years. If capital inflows are caused by push factors, their level and persistence are outside the control of the capital-importing countries and could be subject to reversal. If pull factors dominate, more direct measures to encourage or sustain the flows may be feasible.

3. **The panel data analysis suggests that push and pull factors each explain about half of the variation of capital flows to EMs, with some differences across different types of capital flows.** The fact that push factors (e.g., U.S. interest rates and economic activity) only explain about half of the variation in the aggregate capital account of EMs suggests that there is scope for emerging markets to implement measures to pull capital flows into their economies. In particular, our results suggest that FDI is influenced by financial openness (an indicator computed by Chinn and Ito, 2006 as a proxy for capital account restrictions) and domestic growth expectations, while portfolio investment (both equity and debt) is determined more by domestic asset returns, financial depth (measured by stock market capitalization), and the quality of corporate institutions. Other capital flows to EMs, mostly accounted for by international bank lending, are explained by a similar set of variables to the aggregate capital account, with domestic growth expectations, country credit rating (a proxy for the investment climate), lagged stock returns (a measure of the return on capital), and institutional quality (reflecting the influence of domestic micro-financial development) playing a significant role. Our results are broadly in line with previous studies.²

4. **Our time series analysis also suggests that net FII flows to India are roughly equally influenced by both push and pull factors.** Most existing studies of FII flows to India (Rai and Bhanumurthy, 2004; Chakrabarti, 2001; Gordon and Gupta, 2003; Trivedi and Nair, 2007) emphasize the importance of domestic equity returns as well as global and regional push factors outside the control of the Indian authorities. However, these studies typically do not account for the time-varying volatility typically found in financial time series data.³ The only study to do so (Rai and Bhanumurthy, 2004) found significant episodes of volatility clustering or time varying conditional variance.

5. **To address this econometric issue, we use a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) framework which has become the standard**

² See Calvo, G., Leiderman, L. and Reinhart, C. (1993), Chohan, P., Claessens, S., and Mamingi. (1993), Fernandez-Ariaz, E. (1996), IMF (2007a), and Taylor and Sarno (1997) for empirical analyses on EMs.

³ An exception is Shah and Patnaik (2008) who find that currency expectations is the most important determining factor for portfolio flows into the equity market in India.

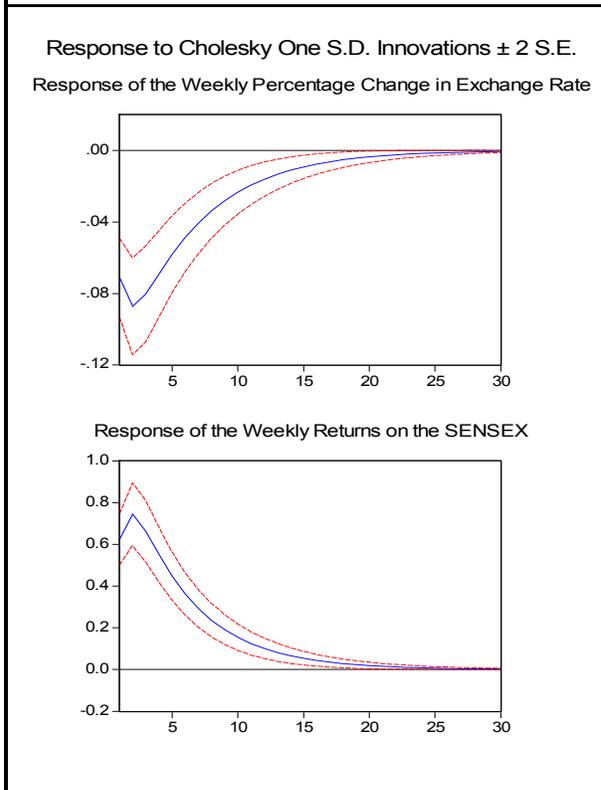
tool for modeling volatility in financial economics.⁴ The results show that pull factors (e.g. stock returns, industrial production, and exchange rate expectations) explain about half of the variation in FII flows into India, while the U.S. interest rate is the most important push factor. Higher global risk aversion (measured by the VIX) increases the volatility of net FII flows.

C. The Impact of Capital Flows on Investment and Asset Price Volatility

6. **Our analysis suggests that net capital flows to India encourages capital formation.** We estimate a vector error correction model (VECM) to assess the long-term impact of net capital flows and capital flow volatility on gross fixed capital formation from 1996 to 2008 using quarterly data. Our results suggest that a 10 percent increase in the level of net capital flows would raise gross fixed capital formation by 2.8 percent, but that a 10 percent increase in capital flow volatility would reduce gross fixed capital formation by 2 percent. However, these results should be interpreted with a degree of caution given the reduced form nature of the model and the limited number of explanatory variables.⁵ In particular, the impact of net capital flows could reflect other factors that are correlated with capital flows (e.g. the investment climate and domestic credit). In the same vein, the negative impact of capital flow volatility on gross fixed capital formation could also reflect the indirect effect of capital flow volatility on asset price volatility which is explored below. Nevertheless, our results do highlight the positive role played by capital flows in encouraging investment in India.

7. **Shocks to FII flows to India result in significant asset price volatility.** We estimate a recursive VAR on daily data (January 2003 to November 2008) in order to assess the impact of unexpected shocks to FII flows on the exchange rate and the

Figure 1: Impact of Shock to FII Flows on the Exchange Rate and the SENSEX



⁴ Contrary to previous studies, we focus exclusively on the post-2003 surge in capital flows.

⁵ The variables in the VECM include real gross fixed capital formation, real GDP, the prime lending rate, net capital flows, and net capital flow volatility.

stock market.⁶ Our results (see Figure 1) suggest that a one standard deviation shock to daily net FII flows (equivalent to US\$145 million) leads to a 0.08 percent appreciation of the rupee against the U.S. dollar and a 0.7 percent rise in the return of the SENSEX. Thus, the positive effect of capital flows on investment is likely to be at the expense of somewhat higher asset price volatility.

D. Conclusion

8. Our paper finds that domestic factors are important determinants of capital flows to India and that capital flows have a positive long-run impact on investment. India could therefore prepare for the return of capital flows to EMs by continuing with capital account liberalization, pro-growth reforms, and fostering other pull factors. However, global push factors are also important. Capital flows to EMs are therefore unlikely to return to previous high levels until the global financial turmoil subsides. In the interim, domestic sources of financing will have to be relied upon to offset the impact of lower capital flows on investment.

⁶ The VAR includes daily data on net FII flows, the week on week depreciation of the rupee/US\$ exchange rate, and the week on week returns on the SENSEX. The results were robust to the inclusion of a wide range of other variables.

References

- Rai, K., and K. Bhanumurthy, 2004, "Determinants of Foreign Institutional Investment in India: The Role of Return, Risk, and Inflation" *The Developing Economies*, Vol. 42, No. 4.
- Calvo, G., L. Leiderman, and C. Reinhart, 1993, "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors". IMF Staff Papers, Vol. 40.
- Chakrabarti, R., 2001, "FII Flows to India: Nature and Causes" *Money and Finance*, Vol. 2, No. 7.
- Chinn, M., and H. Ito, 2006, "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics*, Vol. 81 (October), pp. 163–92.
- Chuhan, P., S. Claessens, and N. Mamingi, 1993, "Equity and Bond Flows to Asia and Latin America." World Bank Working Paper No. 1160.
- Fernandez-Ariaz, E., 1996, "The New Wave of Private Capital Inflows: Push or Pull?" *Journal of Development Economics*, Vol. 48.
- Gordon, J., and P. Gupta., 2003, "Portfolio Flows into India: Do Domestic Fundamentals Matter?" IMF Working Paper No. 03/02.
- International Monetary Fund (IMF), 2007a, "*Global Financial Stability Report*, World Economic and Financial Surveys (Washington, October).
- , 2007b, "Managing Large Capital Inflows," in *World Economic Outlook*, World Economic and Financial Surveys (Washington, October).
- Shah A, Patnaik I, 2008, "Managing Capital Flows: The Case of India" ADB Institute Discussion Paper No. 98.
- Taylor, M.P. and L. Sarno, 1997, "Capital Flows to Developing Countries: Long- and Short Term Determinants." *World Bank Economic Review*, Vol. 11.
- Trivedi, P. and A. Nair, 2007, "Determinants of FII Investment Inflow to India", *The ICFAI Journal of Applied Finance*, April 2006.

III. EXCHANGE RATE PASS-THROUGH IN INDIA: A NON-LINEAR STUDY¹

1. Pass-through from exchange rate movements to inflation is an important component of the inflationary process in open economies. A depreciation of the exchange rate: (i) raises the price of imported consumer and intermediate goods; (ii) raises the cost of producing domestically produced goods; and (iii) shifts consumption toward domestically produced goods, thus raising their price. As a result, understanding the degree and timing of exchange rate pass-through is critical for forecasting inflation, and hence for deciding on the appropriate targets for monetary policy. Numerous studies, including Choudri and Hakura (2001), Mihaljek and Klau (2001), Devereux and Yetman (2003), Khundrakpam (2007), and Battacharya, Patnaik, and Shah (2008) have evaluated the pass-through of exchange rate changes to inflation in India. This paper adds to this body of research by analyzing pass-through from the exchange rate to inflation in India using non-linear estimation techniques.²

A. Non-linearities in Exchange Rate Pass-through

2. The literature on non-linearities in exchange rate pass-through identifies various reasons why exchange rate pass-through could be non-linear. Pass-through could be lower in an economic downturn, when firms prefer to compress their margins rather than pass on the impact of depreciation on their input costs to the buyer of their products. Pass-through could also be lower in an environment where exchange rate volatility is high, as firms may believe that any change to the exchange rate is transitory. Consistent with the gradual decline in exchange rate pass-through in advanced countries over time, some (including Taylor, 2000) argue that pass-through will be lower in a low-inflation environment because of the credibility of the monetary policy authorities' commitment to price stability. Other studies identify non-linearities relating to the direction of the exchange rate movement, the size of the change in the exchange rate, and the degree of trade distortions.

B. Econometric Framework

3. This paper examines non-linearities in pass-through in India relating to the state of the economy, the volatility of the exchange rate, and the level of inflation, by estimating a non-linear threshold VAR (TVAR) where the economy switches between regimes depending on the value of a switching variable. The threshold value of the switching variable is determined endogenously to maximize the conditional log-likelihood of the model. A modified log-

¹ Summary of a forthcoming Working Paper. Prepared by Andrea Richter Hume and Magnus Saxegaard.

² Khundrakpam (2007) also conducts a non-linear study of exchange rate pass-through in India although the source of non-linearities examined in that paper differ from those in this paper.

likelihood test can be used to test the hypothesis that the data process is described by a benchmark linear VAR against the alternative of a non-linear TVAR.

4. The TVAR includes quarterly data on four variables from 1996Q2-2008Q2: the output gap (derived using a Hodrick-Prescott filter), the nominal effective exchange rate (NEER), the wholesale price index (WPI) and the consumer price index (CPI). The NEER is chosen instead of the bilateral US\$/rupee exchange rate as it better reflects the overall exchange rate facing the economy. With the exception of the output gap, all variables are transformed into log first differences.

C. Results

5. For comparison purposes, the paper first estimates a benchmark linear VAR. The results suggest that a one percent appreciation of the NEER reduces quarterly WPI and CPI inflation by 0.25 and 0.17 percent, respectively, on impact. In other words, the pass-through elasticities are 25 and 17 percent, respectively. After 10 quarters, the pass-through elasticities rise to 25 and 24 percent. These results are towards the upper range of other studies of exchange rate pass-through in India. Our results also confirm the findings of other studies that pass-through is lower for the CPI than for the WPI. This could reflect the higher import content in the WPI or a more competitive retail than wholesale sector.

6. The results from our non-linear TVAR suggest that pass-through to wholesale price inflation is significantly lower in an economic downturn (proxied by a relatively low level of the output gap) as firms seek to preserve their market share (Figure 1). In particular, the pass-through elasticity of exchange rate changes to WPI inflation is 40 percent when the output gap is relatively high, and close to zero when it is low. For CPI inflation, the difference between the two regimes is less important, both economically and statistically.

7. Our results also provide some evidence in support of the hypothesis that agents interpret a volatile exchange rate as a signal that the exchange rate change is unlikely to be permanent. (Figure 2) Thus, pass-through to the WPI is higher when exchange rate volatility is low, both in the long and the short run. In fact, pass-through is close to complete in the long run when exchange rate volatility is low. As before, there is no difference across the regimes in terms of the pass-through to CPI inflation.

8. Finally, we test for the existence of asymmetries in pass-through depending on whether inflation is low or high. If low inflation is the outcome of a credible commitment to price stability by the monetary authority, then firms will recognize the temporary nature of nominal price increases and have less reason to pass through a cost increase. Conversely, economies with higher inflation could be those with a poorer record of inflation control, making private agents more likely to pass through cost increases. Our results suggest that the level of inflation does not significantly affect the degree of pass-through to WPI and CPI inflation. The analysis, however, does not enable us to differentiate between various

explanations for why this is the case. It could reflect the RBI's relatively favorable record of inflation control such that, even during times of high inflation, firms expect the RBI to act swiftly to bring inflation down. Another possible explanation is that because of the relatively low inflation persistence in India (due to relatively low structural rigidities in most product and labor markets), firms do not expect periods of high inflation to persist, and thus do not pass through exchange rate movements more aggressively in a high inflation environment.³

D. Conclusion and Policy Implications

9. This paper has reexamined exchange pass-through to inflation in India using non-linear estimation techniques. The results suggest that the state of the economy as well as the degree of exchange rate volatility matter for the degree of pass-through. In particular, an exchange rate depreciation is likely to be less inflationary when output is slowing, while pass-through is likely to be relatively low when exchange rate volatility is high. Both of the latter conditions obtain in early 2009, suggesting that the sharp exchange rate depreciation of late 2008 is likely to have only a minor impact on inflation.

³ Baum et al. (1996) examine the persistence of inflation in several countries. Their results suggest that inflation (both WPI and CPI) in India has been lower than in most G7 countries and comparable to that in other emerging markets in Asia. See also Rabanal and Rubio-Ramirez (2003) for a discussion of factors that explain inflation persistence.

Figure 1: Non-linearities in pass-through relating to the state of the economy (Top panel: Impulse responses; bottom panel: Cumulative Impulse Responses)

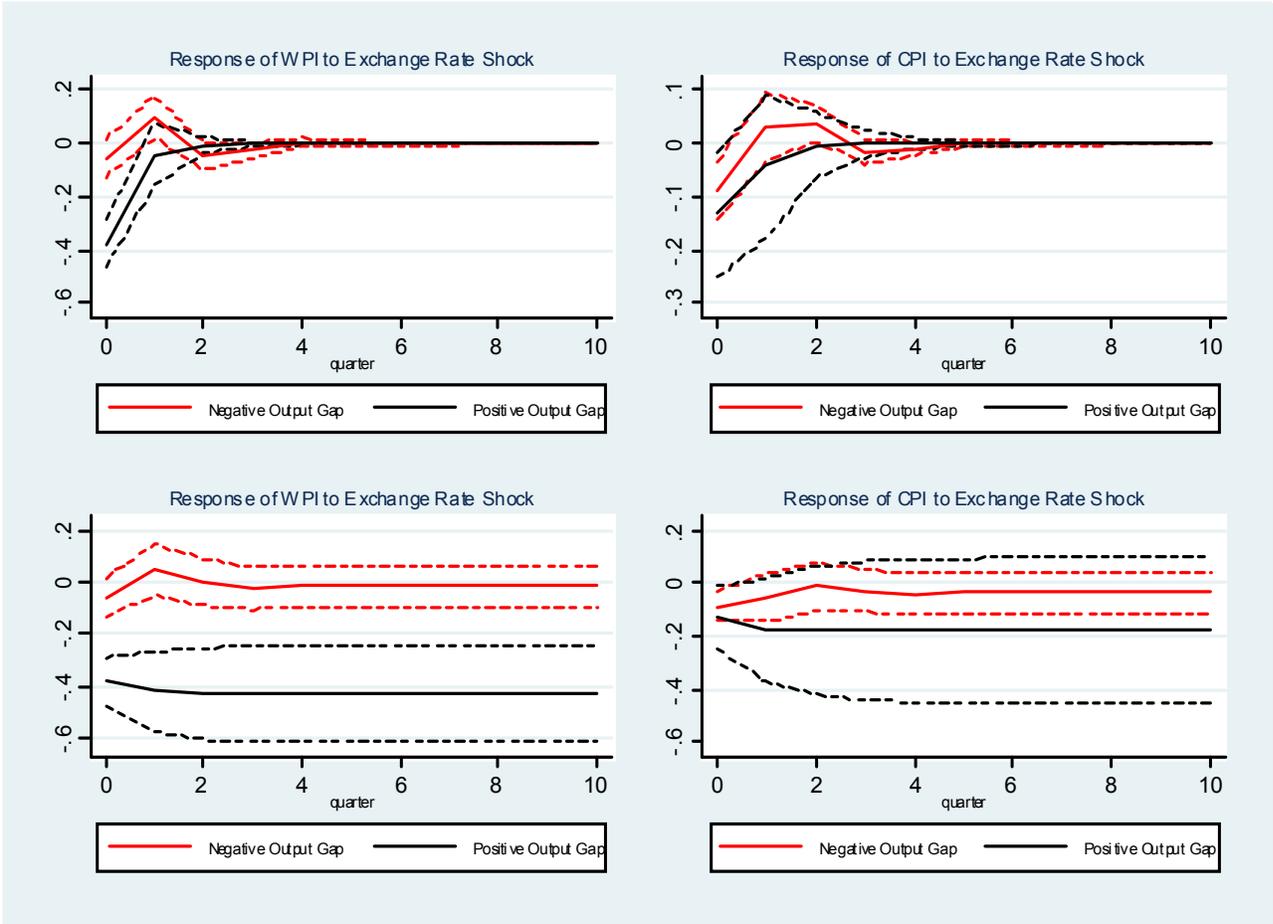


Figure 2: Non-linearities in pass-through relating to exchange rate volatility
 (Top panel: Impulse responses; bottom panel: Cumulative Impulse Responses)

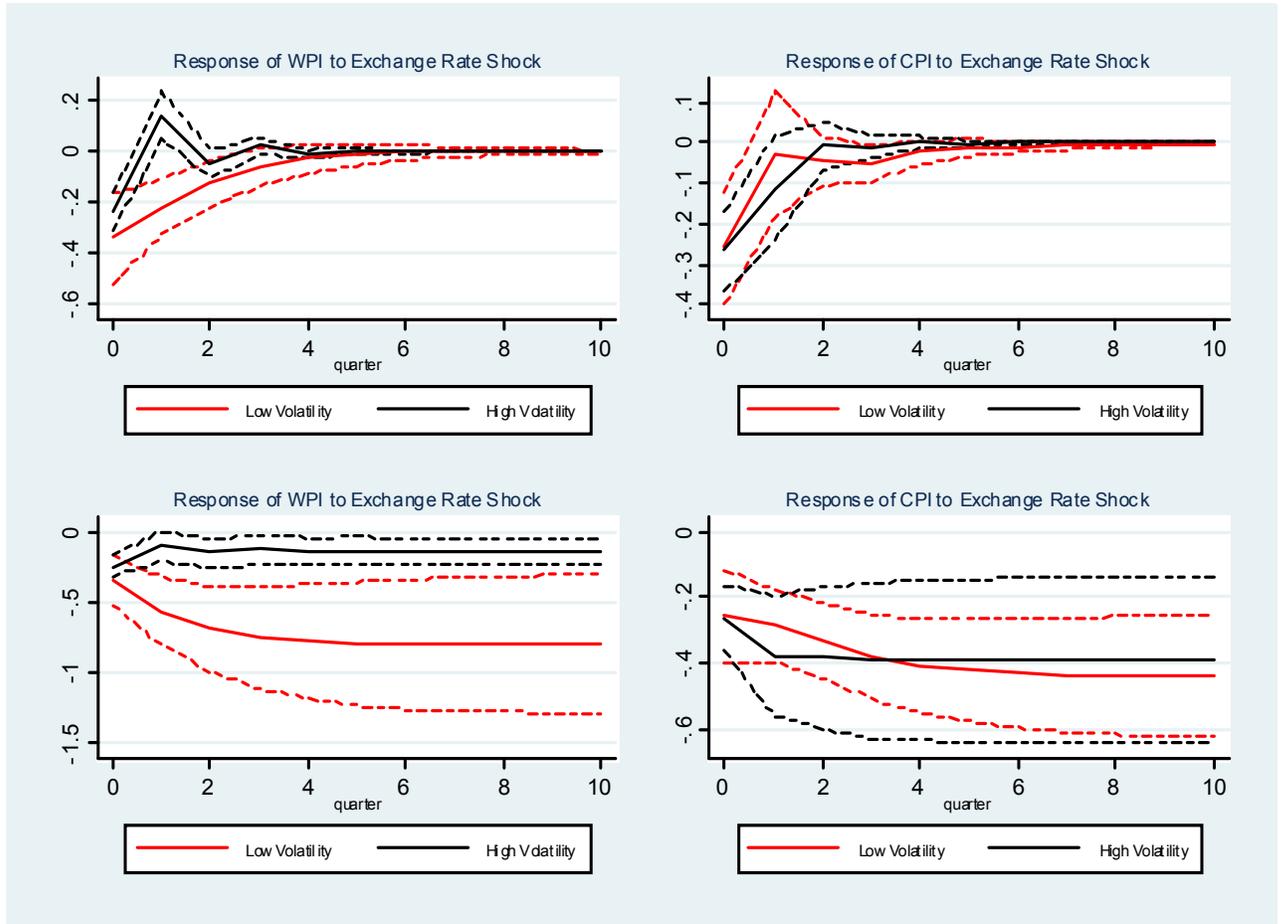
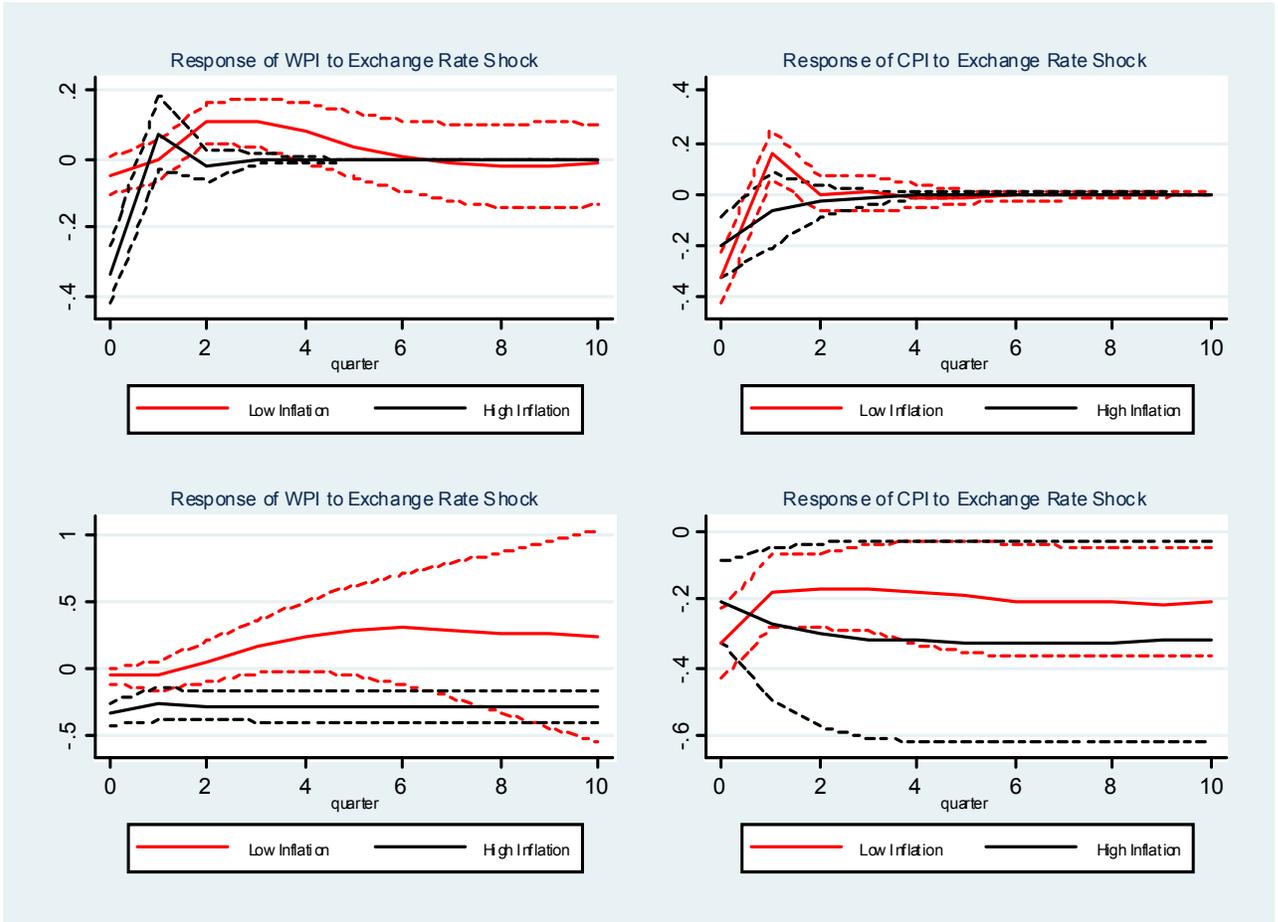


Figure 3: Non-linearities relating to the inflationary process
 (Top panel: Impulse responses; bottom panel: Cumulative Impulse Responses)



References

- Bhattacharya, R., I. Patnaik, and A. Shah, 2008, "Exchange Rate Pass-through in India", *mimeo*, National Institute of Public Finance and Policy, New Delhi.
- Baum, C., John Barkoulas, and M. Caglayan, 2006, "Persistence in International Inflation Rates", Boston College Department of Economics, Boston College Working Papers in Economics: 333.
- Choudhri, E. U., and D. Hakura, 2001, "Exchange Rate Pass-through to Domestic Prices: Does the Inflationary Environment Matter?", IMF Working Paper No. 01/194.
- Devereux, M. B., and J. Yetman, 2003; "Predetermined Prices and the Persistent Effects of Money on Output", *Journal of Money, Credit, and Banking*, Vol. 35 (5).
- Khundrakpam, J. K., 2007, "Economic Reforms and Exchange Rate Pass-through to Domestic Prices in India", BIS Working Papers No 225.
- Mihaljek, D., and M. Klau, 2001, "A note on the pass-through from exchange rate and foreign price changes to inflation in selected emerging market economies", *BIS Papers*, no 8.
- Rabanal, P., and J.F. Rubio-Ramirez, 2003, "Inflation Persistence: How Much Can We Explain?", Federal Reserve Bank of Atlanta, Economic Review, Second Quarter 2003.

IV. INDIA'S EXPERIENCE WITH FISCAL RULES: AN EVALUATION AND THE WAY FORWARD¹

1. **India is currently reviewing its fiscal rules framework with a view to inform the design of a successor arrangement.** After a decade of large and intractable fiscal deficits, India adopted a rules-based fiscal framework, the Fiscal Responsibility and Budget Management Act (FRBMA), in 2003. The FRBMA's stated objective is to ensure inter-generational equity in fiscal management and the fiscal sustainability necessary for long-term macro-economic stability. India's states were given incentives by the Twelfth Finance Commission (TFC) to implement their own fiscal responsibility laws (FRLs) in the form of conditional debt restructuring and interest rate relief.² With the FRBMA and FRLs only setting out targets until March 2009, policy makers are currently evaluating the strengths and weaknesses of the existing framework to learn lessons that could help inform a possible successor fiscal rule framework. This paper aims to contribute to the current debate by discussing India's experience with fiscal rules, assessing strengths and weaknesses of the current fiscal rules framework, and proposing options for strengthening fiscal discipline in India, which encompass both design options for a successor FRBMA and other complementary reforms.

A. India's Experience with Fiscal Rules

2. **The FRBMA and supporting regulations establish procedural rules and set out fiscal targets in a multiyear context.** The FRBMA requires the government to commit upfront to a monitorable fiscal policy strategy over a multiyear period, and to report and publish fiscal outcomes and strategy changes on a routine basis. FRBMA numerical rules include a single medium-term target of current balance of the central government to be achieved by March 2008. The associated regulations, meant to guide the execution of the provisions of the Act, set out the following numerical rules: (i) reduction of the current deficit by at least 0.5 per cent of GDP in each financial year beginning with 2004/05; (ii) reduction of the overall deficit by at least 0.3 percent of GDP in each financial year; (iii) limit of 0.5 percent of GDP on the incremental amount of guarantees given by the central government; (iv) initial annual limit on debt accumulation of 9 percent of GDP, to be progressively reduced by at least one percentage point of GDP each year.

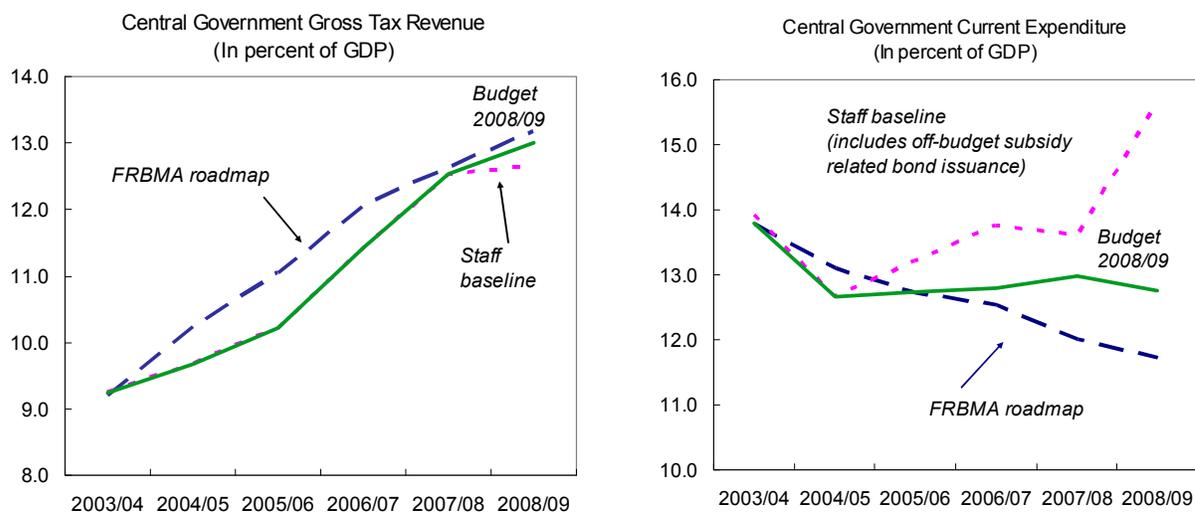
¹ Prepared by Alejandro Sergio Simone and Petia Topalova. This paper summarizes the main findings and reform options discussed in a forthcoming working paper.

² The Finance Commission is a constitutional body established under article 280 of the Indian Constitution every five years with the primary purpose of determining the sharing of centrally collected tax proceeds between the central and state governments and the distribution of grants-in-aid of revenues across states. The terms of reference of the Finance Commissions can be expanded by order of parliament.

3. **At the subnational level, nearly all of India's 28 states have enacted FRLs.**³ The TFC suggested that the FRL of each state should provide for the elimination of the current deficit by 2008/09, the reduction of the overall fiscal deficit to 3 percent of gross state domestic product (GSDP), along with annual targets for revenue and reduction of fiscal deficits, measures to enhance transparency in budgetary operations, and a medium-term fiscal policy framework. While there is some variation in design of the FRLs across states, an important number of features of the FRBMA have been adopted in the states' FRLs.

4. **So far, India's experience with fiscal rules has been mixed.** At the central level, the FRBMA contributed by strengthening the procedural rules underpinning the fiscal framework. However, it is less clear whether the FRBMA led to better fiscal performance. While a substantial fiscal consolidation occurred following the adoption of the FRBMA (and until 2007/08), it is difficult to establish causality since robust economic growth and tax administration reforms led to significant revenue gains. Moreover, despite the apparent consolidation, off-budget activities increased, deadlines to comply with fiscal targets were extended, and the fiscal adjustment was not underpinned by expenditure reform. Significant slippages with respect to the 2008/09 deficit targets were expected even before the evolving global crisis precipitated calls for fiscal stimulus, raising questions about the effectiveness of the FRBMA (Figure 1).

Figure 1: Central Government Fiscal Performance under FRBMA



5. **The experience with FRLs at the subnational level also shows mixed results.** While significant improvements were observed in the states' overall balances, a more detailed look at the nature of the fiscal consolidation reveals the large role that increased

³ West Bengal and Sikkim are the only two states that have not yet enacted a fiscal responsibility law.

central government transfers (linked to buoyant central government tax revenues) and lower interest payments have played in this consolidation. This raises questions about the vulnerability of states' fiscal positions to a slowdown in economic growth. Econometric analysis also does not reveal a statistically significant association between the adoption of fiscal rules and the degree of fiscal consolidation when revenue sharing transfers and interest payments are excluded from the current deficit measure.

Table 1. Adjustment in State Government Finances, 2002/03–2008/09

	2003/04	2007/08 R.E.	Cumulative Change 2003/04-2007/08
Total revenue and grants	11.3	13.0	1.7
Tax revenue	8.2	9.4	1.3
Share of Central Government tax revenue 1/	2.4	3.2	0.8
State taxes	5.8	6.2	0.4
Non-tax revenue	1.4	1.3	-0.1
Grants from Central Government 1/	1.7	2.2	0.5
Total expenditure, <i>Of which</i>	15.8	15.5	-0.3
Capital expenditure and loans & advances	2.8	3.1	0.2
Revenue expenditure	13.4	12.9	-0.6
<i>Of which</i> : Interest payments	2.9	2.2	-0.7
Overall balance	-4.5	-2.5	2.0
Revenue balance 2/	-2.2	0.5	2.7
Overall balance (excl. Net resources transferred and Interest Payments)	-6.1	-5.8	0.3
Net resources transferred from central government	4.6	5.6	1.0

1/ According to central government accounts.

2/ According to the RBI Study of State Budgets which uses state accounts' estimates of central government transfers.

6. **However, states that had either debt targets and/or expenditure rules showed more fiscal adjustment than the ones that did not.** The variation in the design of fiscal laws across India's states permits an examination of whether certain design features of the fiscal rules are correlated with better fiscal performance. In a

Table 2: State Fiscal Adjustment and Fiscal Rule Design

Dependent Variable:	Revenue Deficit Excl. Central Transfers and Interest Payments		
	(1)	(2)	(3)
Post * FRL	0.0018 [0.0046]	-0.0024 [0.0033]	-0.0047 [0.0050]
Post * FRL * Debt Target	-0.0076* [0.0042]		
Post * FRL * Expenditure Target		-0.0059** [0.0024]	
N	188	188	188

dynamic panel data framework, a regression of the current deficit excluding central government transfers and interest payments as a share of GSDP⁴ on interaction variables of an FRL indicator and the dummy for a debt target or expenditure target and relevant controls⁵ yield negative and statistically significant coefficients for the former, suggesting that fiscal consolidation was larger after the enactment of the FRL in states whose laws also included these design features.

B. Strengths and Weaknesses of the Current Fiscal Rules Framework

7. **India's current FRBMA is in line with FRLs in other countries in highlighting the importance of sound procedural rules.** The strengths of the FRBMA lie predominantly in the adoption of several important procedural rules including, medium-term targets and enhanced transparency for budget processes. These rules have similarities with the frameworks of advanced countries, such as New Zealand, the EU and Canada, and have contributed to improving fiscal management in India.

8. **However, on several dimensions, the FRBMA could be strengthened.** The main weaknesses are:

(1) *Absence of clear accounting definitions for target fiscal indicators.* This has allowed creative accounting as reflected by the issuance of off-budget bonds to finance subsidies, which have thus been excluded from the definition of the FRBMA-relevant deficit variable.

(2) *Insufficient transparency in budget preparation.* Numerical targets have not been supported by comprehensive expenditure reform plans. In addition, the assumptions underpinning the budget do not always include annual forecasts for key macroeconomic variables, and the discussion of fiscal risks⁶ is limited.

⁴ The current balance is used as an indicator of fiscal performance because all the states' FRLs include a target for the current deficit.

⁵ Controls include fixed-effects to control for economy-wide changes (such as economic growth, higher revenue at the central level, implementation of the TFC recommendations), state fixed-effects to control for time-invariant heterogeneity in the fiscal stance across India's states, the (log of) GSDP, the lag of the debt to GSDP ratio, and an indicator for the adoption of VAT at the state level.

⁶ Fiscal risks, defined as the possibility of deviations in fiscal variables from what is expected, are generated from different sources such as unexpected fluctuations in traditional macroeconomic variables including real growth, exchange rates, interest rates, commodity prices as well as unexpected contingent liabilities stemming from banking crises, natural disasters, state owned enterprises, subnational government bailouts, legal claims, government guarantees and public-private partnerships (see IMF (2008) for an in-depth discussion).

(3) *Focus on a current balance target.* This allows weaknesses in budget classification to be exploited, by misclassifying current expenditures as capital expenditures. Targeting the current balance may also bias spending against education and health, which have a large current expenditure component.⁷ In addition, international experience illustrates that deficit type targets such as the current balance are more likely to reduce incentives for fiscal savings in good times, and to force adjustment in bad times (i.e. procyclicality).⁸

(4) *Lack of explicit debt and expenditure targets.* Despite rapid economic growth and buoyant revenues, India's inability to contain expenditure growth (Figure 1) led to modest declines in the general government debt. Since the enactment of the FRBMA, general government debt fell by only 7-8 percentage points of GDP and, at 80 percent of GDP, is high by emerging markets standards.

(5) *Absence of well-defined sanctions for noncompliance.* There are no explicit automatic penalties for missing fiscal targets and/or not following budget procedures. International experience shows that institutional sanctions (e.g., withholding of transfers, borrowing restrictions, and fines) and/or personal sanctions (e.g., fines, dismissal, and penal prosecution) are likely to be needed especially in countries with a history of weak fiscal discipline.

(6) *No independent assessment of compliance with the FRBMA.* Historically, budget projections have been subject to systematic forecast errors. Expenditures have consistently being underestimated in recent years even more particularly so if off-budget bonds are included.

9. **Subnational FRLs are likely to share the strengths and weakness of the FRBMA.** While there is some variation in the characteristics of subnational FRLs and some states have debt and/or expenditure targets, most of the FRLs have been inspired by the FRBMA and the recommendations of the Twelfth Finance Commission. An additional weakness at the subnational level is the inability to obtain reliable information on state finances on a timely basis. While the lags have been reduced in recent years, they remain sizeable.

10. **The approach for setting numerical targets for subnational governments may need to be revisited given the significant disparity across India's states.** Most states target a current balance of 0 percent of GSDP and an overall deficit of 3 percent of GSDP. However, as illustrated by Flanagan and Purfield (2006) and Rajaraman (2007), states face

⁷ See IMF (2004) for additional discussion.

⁸ See Anderson (2006) for a discussion of the European experience, and Buitert and Patel (2006) for a discussion of this feature of India's FRBMA.

widely different initial fiscal conditions and growth prospects. Thus, some states require more fiscal adjustment than others to achieve a sustainable debt position.

C. The Way Forward

11. **Based on international experience as well as the experience with fiscal rules in India, the following options may be considered when designing a successor to the FRBMA:**

- **In terms of target variables:** (i) include an explicit national medium-term debt target and define a path to achieve it; (ii) discuss with states the setting of state debt targets consistent with such path, for example, based on net revenue as in Brazil; (iii) on the basis of the desired debt path and a revenue projection based on a prudent trend growth assumption, derive annual nominal primary expenditure growth rules on the basis of the government's flow budget constraint; and (iv) consider including specific rules to protect capital spending if there is a concern that it may be cut excessively during adjustment. These changes will put the medium-term focus of fiscal policy squarely on debt sustainability, tackle the deficit bias at its very core (expenditure overruns), and reduce the tendency to procyclical responses of fiscal balance targets by allowing automatic stabilizers to operate.
- **In terms of coverage:** (i) bring all subsidy-related expenditures on budget; (ii) gradually expand the coverage of the fiscal accounts to include public enterprises that pose fiscal risks; and (iii) the accounts of special purpose vehicles created for funding government spending such as PPPs both at central and subnational levels. This coverage expansion will address existing loopholes and reduce possibilities of circumvention.
- **In terms of procedure and transparency:** (i) explicitly provide a plan of measures and reforms that support the achievement of targets (e.g., subsidy reform); (ii) systematically discuss the macroeconomic assumptions underlying the targets (including GDP growth, inflation, imports, exports and the exchange rate); (iii) provide exact definitions of the concepts underpinning the target variables; and (iv) include a statement of fiscal risks, including from PPPs. Additional disclosure along these lines will allow improved market monitoring and pricing of risk. In addition, (v) strengthen public financial management by reforming the budget classification and the accounting framework, and (vi) ensure timely and reliable reporting of subnational fiscal operations since these are important preconditions for the successful implementation of a fiscal rule.

- **In terms of escape clauses:** tighten the definition of escape clauses so that they only apply to exceptional circumstances and require objective analysis and scrutiny in their application by an independent fiscal council to strengthen credibility.
- **In terms of correction of deviations and enforcement:** (i) reduce the size of deviations that trigger corrective actions; (ii) introduce automatic and time bound mechanisms to correct deviations from targets that prioritize areas of spending that would be cut if there were a need; (iii) introduce explicit penalties that are applied automatically when fiscal targets are missed and/or budget procedures are not followed; and (iv) institute independent fiscal councils to assess compliance with statistical and accounting standards and fiscal rules *ex ante* (i.e., budget forecasts, assessment of the impact of measures and targets) and *ex post* (execution, invocation of escape clauses, assessment of compliance with medium-term fiscal strategy). Consideration should be given as to whether existing bodies (such as the Controller Accountant General, Controller Auditor General, and Estimates Committee of the parliament) could carry out some or all of these functions before creating new institutions. Timely corrective actions and sanctions for non compliance coupled with independent oversight will reduce the likelihood of deviations and increase the cost of deviations to key players, thus strengthening the credibility of the rules.

12. **A range of additional reforms could help strengthen fiscal discipline.** In particular, continuing to strengthen financial market control mechanisms as well as cooperative arrangements across government levels and pursuing reforms to the intergovernmental fiscal relations system. Strengthening financial market control mechanisms involves gradually eliminating the availability of significant non market based and captive sources of financing (such as the statutory liquidity requirement for banks to hold state issued paper, compulsory investment by the National Small Savings fund in state debt and borrowings from public accounts). Cooperative arrangements could be reinforced by transforming existing cooperation frameworks (such as the bi-annual conference of State Finance Secretaries) into forums where both the center and the states could discuss subnational FRL reforms and borrowing ceilings consistent with national objectives. Finally, persevering with intergovernmental fiscal reforms in particular to reduce states' dependence on central transfers, simplify the transfer system, and review the design of the transfer system on the basis of needs and fiscal capacity of the different states.

References

- Anderson, B. and J. Minarik, 2006. "Design Choices for Fiscal Policy Rules," *OECD Journal of Budgeting*, 5(4).
- Buiter, Willem and Urjit Patel, 2006. "Excessive Budget Deficits, a Government-Abused Financial System, and Fiscal Rules," *India Policy Forum*.
- International Monetary Fund, 2004. "Public Investment and Fiscal Policy" (Washington). Available via the Internet: <http://www.imf.org/external/np/fad/2004/pifp/eng/>
- International Monetary Fund, 2005. "Fiscal Responsibility Laws" (unpublished, Washington).
- International Monetary Fund, 2005. "Promoting Fiscal Discipline Over the Business Cycle" (unpublished, Washington).
- International Monetary Fund, 2005. "Promoting Fiscal Discipline: Is There a Role for Independent Fiscal Agencies" (unpublished, Washington).
- International Monetary Fund, 2008. "Fiscal Risks—Sources, Disclosure, and Management." (Washington). Available via the Internet: <http://www.imf.org/external/pubs/ft/dp/2009/dp0901.pdf>
- Purfield, Catriona and Mark Flanagan, 2006. "Reining in State Deficits," in *India Goes Global: Its Expanding Role in the World Economy*, eds Catriona Purfield and Jerald Schiff (Washington: International Monetary Fund).
- Rajaraman, Indira, 2007. "The Political Economy of the Indian Fiscal Federation." *India Policy Forum*.