# Multinationals and the erosion of effectiveness of capital controls against foreign borrowing

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**Abstract**

Indian capital controls impede foreign borrowing by corporations, and particularly short-term debt. In recent years, many Indian companies have become multinationals, which makes it possible for them to obtain short-term debt finance into offshore entities. This paper tests the extent to which Indian MNCs have greater exposure to global credit market conditions.

The exposure of each firm to the Moody's Baa spread is directly measured from stock prices. We find that this exposure is bigger for multinationals. The stock market performance of a portfolio which is long multinationals, and has short positions in matched non-multinational firms, is examined. The returns of this portfolio strongly responds to the Moody's Baa spread.

This evidence suggests that capital controls against short-dated foreign currency debt become less effective in the presence of multinationals.

Keywords: capital controls against short-term debt, Indian multinationals, effectiveness of capital controls. JEL codes: G18, F23.

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# Contents

# 1 Introduction

In India, there is an elaborate set of restrictions which impede foreign borrowing by corporations. The minimum maturity of borrowing is three years, which prevents overseas money market financing. There are restrictions on the size of borrowing and on the uses to which borrowed money is applied.

In recent years, an important new phenomenon which has come about is the rise of Indian multinationals. Many Indian firms have embarked on a process of investing abroad and becoming multinationals. For a firm, once this change is in place, borrowing abroad can be done in a subsidiary or an affiliate company. This may be expected to reduce the effectiveness of capital controls that prevent foreign borrowing.

The Moody's Baa Spread portrays the cost of borrowing as seen by the best Indian firms. In the global financial crisis, the Baa spread experienced sharp fluctuations. These fluctuations are an opportunity to obtain enhanced statistical precision in learning about how the Baa spread matters to Indian firms. If multinationals are able to bypass Indian capital controls by borrowing through their subsidiaries or affiliates, then the exposure of multinationals to the Baa spread should be bigger.

We approach this question in two ways. First, we construct a large dataset of 2,126 firms and measure the exposure of all these firms to the Baa spread. We examine the cross-sectional variation of these exposures. We find that multinationals have bigger exposures, i.e. that the stock prices of multinationals drop more when the Baa spread goes up.

We then start from the set of multinationals, and engage in a matching exercise, attaching each multinational to a partner firm with similar characteristics. This is used to form a portfolio which invests in multinationals and is financed by short selling the matched non-multinational firm. We find that this portfolio is quite sensitive to fluctuations of the Baa spread.

Hence, we can conclude that the phenomenon of large Indian companies becoming multinationals has led to a reduction in the effectiveness of capital controls that impede foreign borrowing by these firms. This forms a component of the larger literature on the difficulties of obtaining effective capital controls as the economy becomes more sophisticated, and of the Indian capital controls debate [Prasad, 2009].

# 2 The setting

In this section, we describe the setting of this paper. We start by describing the system of capital controls in India which impedes foreign borrowing by firms. We then touch upon the recent phenomenon of Indian firms becoming multinationals with investments outside the country. We then describe the dataset that is employed in the empirical work.

## 2.1 Capital controls against foreign borrowing by firms

The system of capital controls that is in place in India has the following elements aimed at inhibiting foreign borrowing by firms:

- Borrowing of upto $0.5 billion per firm is on 'automatic route'. Despite the use of the term 'automatic', firms have to apply to RBI to do the borrowing. The latency of response of RBI is variable, and constitutes a tool for controlling capital flows. There are no public announcements about the latency that is prevalent at a given point in time.
- Borrowing of above $0.5 billion by a firm requires approval.
- All borrowing is subject to 'end-use restrictions' which specify that the borrowed funds can only be applied for certain purposes (e.g. purchase of capital goods). These end-use restrictions include rules about expenditures by the borrower in foreign exchange as opposed to expenditures in rupees.
- The minimum maturity is three years.
- There is a ceiling on the spread above LIBOR that can be paid by the borrower.

## 2.2 The rise of Indian MNCs

In recent years, there has been an upsurge of outward FDI from India [Pradhan, 2004, Demirbas et al., 2009]. Hundreds of large Indian firms are now MNCs, and the most outwardly oriented of these increasingly have over 50 per cent of their assets outside the country.

The literature on capital account openess or cross-border flows has focussed on portfolio, debt or FDI flows rather than on the internal flows and treasury

**Table 1** Exporters and MNCs in the CMIE Cospi firms

Our dataset is 2,162 firms who are members of the CMIE Cospi market index, and have annual report data for 2007-08. The table shows the joint distribution of these firms viewed in two dimensions: are firms exporters and have firms done outbound FDI.

| | Not MNC | MNC | Sum |
|---|---|---|---|
| Not Exporter | 827 | 44 | 871 |
| Exporter | 1003 | 288 | 1291 |
| Sum | 1830 | 332 | 2162 |

operations of MNCs. However, there is a literature on how MNCs organise themselves, which suggests that MNCs make decisions about utilising financial markets in different countries based on costs of financing. As an example, Desai et al. [2004] examine the ways in which firms use internal capital markets opportunistically to complement external financing opportunities when external finance is costly and when there are tax arbitrage opportunities.

In a world where MNCs run global treasuries, maximise the tax efficiency of their operations, and source capital at the cheapest price across multiple locations, it is reasonable to think that MNCs would also optimally exploit opportunities for engaging in cross-border finance, based on a sophisticated understanding of a given set of capital controls.

Another dimension is the explicit evasion of capital controls. MNCs engage in substantial intra-firm trade. These transactions can be used for transfer pricing, so as to recognise profits at low-tax locations, and to move capital across the world in ways that are not permitted by capital controls. There is thus a link between the rise of MNCs and the long-understood issues of misinvoicing as a mechanism for obtaining *de facto* capital account openness [Patnaik and Vasudevan, 2000, Patnaik et al., 2009].

## 2.3 Data description

We draw firm level data from the CMIE Prowess data base, using data for firms in the CMIE COSPI index, which is a set of 2500 companies with high stock market liquidity and good disclosure. This includes both financial and non-financial firms. Of these, the companies which had full data availability for 2007-08, 2162 firms were included in the data set for our analysis.

A firm is defined as a multinational if it holds more than 1 per cent of total assets outside India. This emphasises the abrupt transition which takes place when a firm becomes an MNC. When a firm is not an MNC, it is fully subject

**Table 2** Descriptive statistics about the firms observed

This table shows summary statistics about the firms, focusing on three sets: all firms, the multinationals, and the exporters who are not multinationals. A residual set – of non-exporting firms – is not shown here. In all cases, the median value is reported in the table.

| Characteristic | Unit | MNCs | Exporters | All |
|---|---|---|---|---|
| Age | Years | 21 | 23 | 22 |
| Total assets | Bln. Rs. | 6.15 | 2.27 | 2.14 |
| Sales | Bln. Rs. | 3.44 | 2.03 | 1.75 |
| Employees | Number | 845 | 383 | 296 |
| Market capitalisation | Bln. Rs. | 5.78 | 0.99 | 1.12 |
| Turnover ratio | Percent | 93.23 | 77.27 | 80.51 |
| Exports to sales | Percent | 28.34 | 15.18 | 3.53 |
| OFDI to assets | Percent | 7.55 | 0.00 | 0.00 |
| Size | | 6.21 | 5.41 | 5.34 |
| Leverage | Times | 1.96 | 2.48 | 2.26 |

to RBI's capital controls. Once a firm establishes overseas operations, a new set of techniques for doing corporate finance become available. This transition is about becoming an MNC, and not about the magnitude of foreign assets.

Symmetrically, we also define a firm as an exporting firm if it derives more than 1 per cent of sales from exports. Table 1 shows the breakdown of firms based on their exporting status and their MNC status. Of the 2,162 firms in the database, there are 332 MNCs, of which 288 are exporters and 44 are not.

Table 2 shows summary statistics about the dataset. Here, we define 'size' as $\log((\text{sales} + \text{assets})/2)$.

The period that we focus on in the empirical analysis is from the start of the crisis in June 2007, when credit conditions started deteriorating, till Jan 2009 when a substantial return to normalcy had come about. This is a period of 19 months. In this period, there was considerable variation in the Moody's Baa Spread, which reflects the cost of borrowing of the best Indian companies. This variation improves our statistical precision in understanding the impact of changes in global credit market conditions upon Indian firms.

# 3 Are firms that are more exposed to the global credit market multinational?

Our first line of attack consists of measuring the exposure to the global credit market of all the firms in our dataset, and then asking whether multinationals have a bigger exposure. This involves two steps: Measuring the exposure to the global credit market for each firm, and examining whether the more exposed firms are multinationals.

## 3.1 Measuring the exposure of firms to the global credit market

Estimation of the exposure of a firm to the global credit market is done through a regression

$$r_j = \alpha + \beta_1 r_{M1} + \beta_2 r_{M2} + \beta_3 (1-L)S + \epsilon \quad (1)$$

which relates the stock market returns on the firm, $r_j$, to market index movements $r_{M1}$, currency fluctuations $r_{M2}$ and the first differences of the Moody's Baa spread $S$. The coefficient $\beta_3$ measures the sensitivity of the firm valuation to changes in global credit market conditions.[1]

In an efficient market, this has the advantage of reflecting the efforts of speculative markets at putting together all aspects of the credit exposure of the firm. This approach works identically for financial firms as it does for non-financial firms. Stock market speculators have an incentive to unearth information about the currency derivatives position of the firm and the invoicing currency of international trade of the firm. In particular, if borrowing has been done through offshore affiliates or subsidiaries, and is managed out of a global treasury, this approach is likely to show the full exposure while accounting data for the Indian operations might not.

Fluctuations of $r_{M2}$ or $S$ might not influence stock prices immediately. Hence, it is important to have lagged values in the model as well. The total impact of an unexpected change in the exchange rate on a stock price is the sum of the coefficients across all lags. To address the problem of heteroscedasticity

[1] Our work builds on the measurement of currency exposure in a similar dataset done in Patnaik and Shah [2008], where a more detailed description is found.

in the explanatory variables, we use a HAC estimator of the covariance matrix [Zeileis, 2006].

The market index $r_{M1}$ might be affected by $(1-L)S$ and $r_{M2}$. Hence, we orthogonalise the market index time-series by first estimating a regression model explaining $r_{M1}$ as a function of past and present values of $r_{M2}$ and $(1-L)S$, and extracting the residual from this regression [Griffin and Stulz, 2001]. These residuals represent pure domestic equity index returns, uncontaminated by the impact of exchange rate and credit spread fluctuations (if any). These residuals are then used in the estimation of credit exposure at the firm level.

## 3.2 Analysing the exposure of firms to the global credit market

Using the procedure of the previous subsection, we have an estimate $\hat{\beta}_{3,j}$ of the exposure of firm $j$ to the Moody's Baa spread, along with the standard error of this estimate, $\sigma_{\beta,j}$. Figure 1 shows the cumulative distribution of the two sets of firms after removing the most extreme 1% of values from both ends of the distribution. It shows a clear pattern where firms with outbound FDI have more negative values of $\hat{\beta}_{3,j}$; i.e. they experience a bigger decline in stock prices when the Moody's Baa spread rises.

In the literature on capital controls, it has often been observed that large firms are more effective at finding ways around capital controls [Forbes, 2003]. It may be argued that more leveraged firms have a greater incentive to find ways to engage in offshore borrowing. Hence, we might expect bigger and more leveraged firms to have bigger exposures to global credit market conditions. On the other hand, the quantitative restrictions used in India's capital controls about offshore borrowing, where there is a dollar limit for borrowing that is permitted on the 'automatic route', could yield smaller exposures for big companies as compared with small companies.

Another dimension lies in firms which have internationalised through exporting. Exporting firms have a greater exposure to the world economy, and may have better knowledge about operating in the international financial system. Hence, we may expect exporting firms to have a bigger exposure to global credit market conditions.

A natural strategy for exploring this data involves regressions of the form:

**Figure 1** Distribution of $\hat{\beta}_{3,j}$ for the two groups of firms

Estimation of the augmented market model yields an estimate for the exposure of each firm, $\hat{\beta}_{3,j}$, to the Moody's Baa spread. The cumulative distribution of the estimates for two groups of firms – exporters without FDI and the FDI firms – are shown in this figure, after removing the most extreme 1% of the values from both ends of the distribution. It shows a clear pattern where FDI firms have bigger (i.e. more negative) values of the measured exposure.

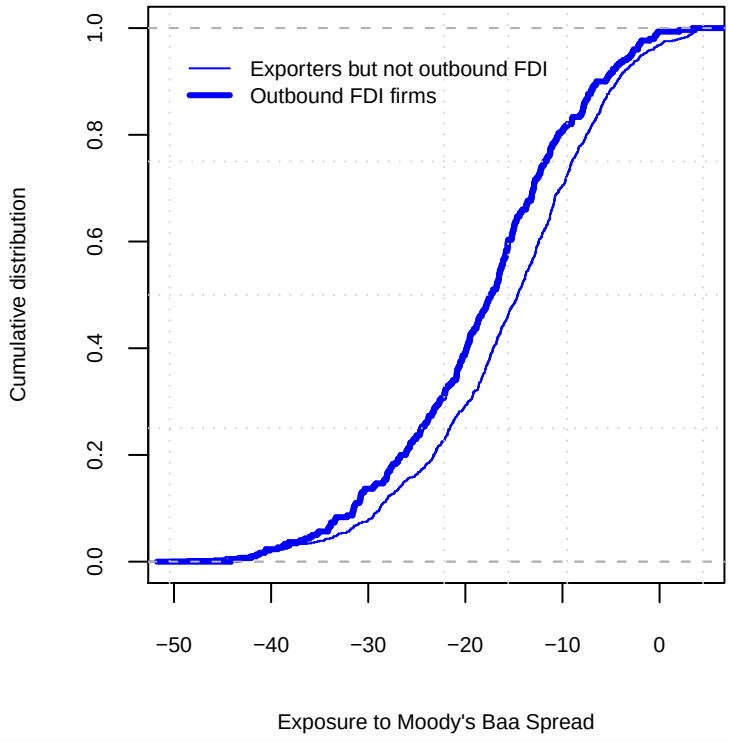


**Table 3** Modelling the measured exposure to the Moody's Baa spread

We seek to explain the observed exposure of each firm, $\hat{\beta}_{3,j}$, based on firm characteristics. This is done through two methods: a simple OLS, and a maximum likelihood estimator that exploits the fact that the measurement error of each value for $\hat{\beta}_{3,j}$ is observed. The FDI dummy is statistically and economically significant in this. The other explanatory variables prove to be uninteresting.

| | MLE | OLS |
|---|---|---|
| Intercept | -14.4410 | -16.4122 |
| | (-17.26) | (-17.81) |
| FDI dummy | -2.2798 | -2.1646 |
| | (-3.66) | (-2.91) |
| Export dummy | -0.1917 | -0.3177 |
| | (-0.39) | (-0.56) |
| Leverage | 0.0167 | -0.0046 |
| | (0.71) | (-0.27) |
| Size | -0.0047 | 0.1161 |
| | (-0.1) | (0.77) |
| $\sigma_e$ | 4.6389 | 11.4 |

$$\hat{\beta}_{3,j} = a\text{DFDI}_j + bX_j + e_j$$

where $\text{DFDI}_j$ is 1 for firms with outbound FDI, $X_j$ is a vector of characteristics about firm $j$ and $e_j$ is a residual.

The OLS estimator of the model above fails to utilise the fact that we have an estimate of the imprecision of each exposure. Since the $\sigma_{\beta,j}$ of $\hat{\beta}_{3,j}$ is observed, this is a measurement error model with known measurement error.

Financial data is known to have important deviations from normality. However, estimates from the augmented market model are likely to be normally distributed owing to the central limit theorem. This suggests a parametric model of measurement error, which would give greater efficiency:

$$\beta_{3,j} \sim N\left(a\text{DFDI}_j + bX_j, \sigma^2_{\beta,j} + \sigma^2_e\right)$$

where the observed $\beta_{3,j}$ for each company is viewed as a linear model with a two-part error: a generic $\sigma^2_e$ which reflects deviations from the linear model and a firm–specific $\sigma^2_{\beta,j}$ which reflects the measurement error specific to firm $j$. The model is estimated by maximum likelihood.

Table 3 shows estimates of this model through both strategies: OLS and the parametric MLE. The $\sigma_e$ of the OLS model reflects a combination of the

measurement error of $\beta_{3,j}$ and the residual of this model. The MLE yields an estimate of $\sigma_e$ which is much smaller, which reflects the separation of measurement noise.

Both models find that the FDI dummy is strongly significant. FDI firms have a bigger exposure to the Moody's Baa spread to the extent of a 2.5% decline in the stock price for a 100 bps rise in the Moody's Baa credit spread. The other explanatory variables in the model are not significant; the result holds after controlling for exporting, size and leverage.

# 4 Are multinationals more exposed to the global credit market?

In the previous section, we identified firms with a high exposure to the global credit market, and asked whether they were multinationals. In this section, we approach this backwards: we start with firms which were multinationals and ask whether they have a bigger exposure to the global credit market.

In order to examine whether multinationals are more exposed to the global credit market, the simplest empirical strategy would involve examining how the stock prices of MNCs fluctuated in relation to the changing values of the Moody's Baa spread. There are three difficulties with this approach:

1. Individual stock prices contain substantial idiosyncratic risk. The signal (of the extent to which Indian MNCs are influenced by the Moody's Baa spread) would be weak when compared with the noise (of idiosyncratic stock price fluctuations).[2]

2. It could be argued that MNCs are firms with significant international exposure. When business cycle conditions in the world economy worsen, stock prices of Indian MNCs would do badly. Since the Moody's Baa spread is correlated with global business cycle conditions, there would be a bias in favour of finding that the Moody's Baa spread is linked to the stock price fluctuations of Indian MNCs.

[2]There is a small literature which argues that in many emerging markets, a substantial proportion of stock price volatility is explained by the overall market index. However, in the Indian case, the market model $R^2$ of the CMIE Cospi companies ranges from a median value of 0.273 in the top decile by size to 0.023 in the bottom decile (Table 4.14 of Shah et al. [2008]). The extent of idiosyncratic risk in India is hence broadly comparable with that seen in OECD countries.

3. It could be argued that MNCs tend to be large firms with more leverage. As a consequence, they are more exposed to credit market conditions. Indian firms do borrow abroad, though constrained by quantitative restrictions. All large leveraged Indian firms are likely to have some borrowing abroad, and would be adversely affected when the Moody's Baa spread rises. Interpreting this as a consequence of outbound FDI would be incorrect.

## 4.1 Matching procedure

To address these problems, we resort to analysis of a portfolio constructed through a matching procedure. We make two lists of firms: one of Indian MNCs, and another of exporting firms who are not MNCs. Each MNC is matched to a partner firm with similar size and leverage.

In this matching procedure, variables are standardised, but in the interest of robustness, the sample median is used instead of the sample mean and the inter-quartile range is used instead of the sample standard deviation.

Each firm $i$ is a point $z_i = (z_{1i}, z_{2i})$ where $z_{1i}$ is the standardised size and $z_{2i}$ is the standardised leverage. Let $E$ be the set of exporting, non-MNC firms. For each MNC $i$, the matching procedure involves finding the firm $i^*$ such that:

$$i^* = \arg\min_{j \in E} ||z_i - z_j||$$

We define $Q_i = ||z_i - z_{i^*}||$. In order to improve the quality of matching, the worst 5 per cent of firms in terms of the values of $Q_i$ were deleted from the dataset. This corresponds to deleting the 17 firms with poor matching, leaving a dataset of 315 MNCs and their matched partners. This corresponded to deletion of firms where $Q_i > 0.16$. Figure 2 shows the kernel density plot of the best match seen across all the firms. The 25th and 75th percentile of $Q_i$ prove to be 0.02 and 0.06, which suggests that for most firms, excellent matches were obtained. After deletion of the 5 per cent of firms with poor matching, the 25th and 75th percentile of $Q_i$ works out to 0.021 and 0.056.

Some examples of matching are shown in Table 4. The firms in the left column are MNCs; they are matched against non-MNC exporting firms in the right column. As an example, Infosys is matched against Sterlite. Infosys has a standardised size of 9.71, while Sterlite is at 9.68. Infosys has a standardised

**Figure 2** Distribution of quality of match

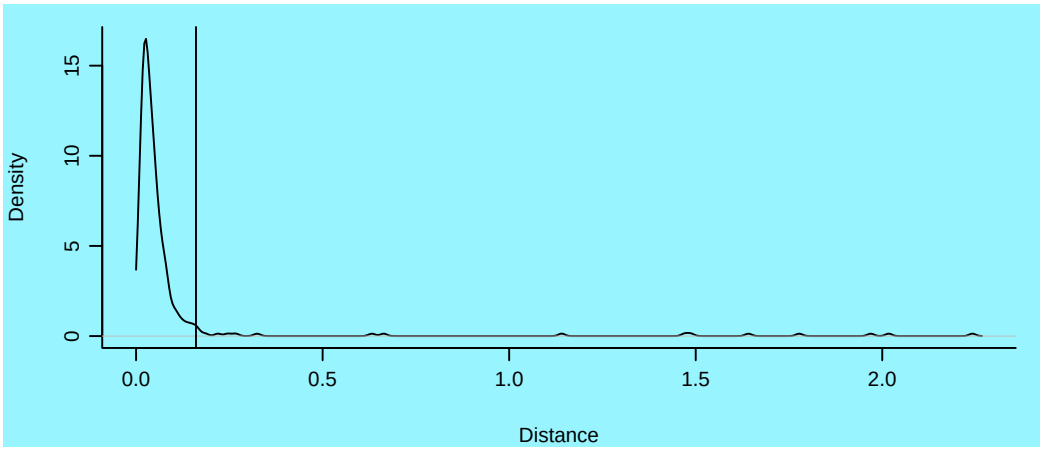



**Table 4** Examples of matching procedure

The table shows some examples of the matching procedure in action. As an example, the firm 'Infosys', an MNC which has standardised (size, leverage) of $(9.71, 1.28)$, gets matched with a firm 'Sterlite', an exporting non-MNC which has standardised (size,leverage) of $(9.68, 1.41)$. This match implies a distance $||z_i - z_{i^*}|| = 0.0752$.

| | Standardised | | | Standardised | | |
|---|---|---|---|---|---|---|
| Firm | Size | Lev. | Best match | Size | Lev. | Distance |
| Info-drive Software | 3.24 | 1.16 | Intellvisions Software | 3.21 | 1.16 | 0.0122 |
| Infosys | 9.71 | 1.28 | Sterlite | 9.68 | 1.41 | 0.0752 |
| Infotech Ent. | 6.38 | 1.19 | Mahindra L. Devp. | 6.37 | 1.16 | 0.0171 |
| IPCA Labs | 7.10 | 2.10 | Kalyani Steels | 7.06 | 2.20 | 0.0541 |
| J B Chemicals | 6.49 | 1.61 | Jagatjit Inds | 6.56 | 1.56 | 0.0402 |

leverage of 1.28 and Sterlite is at 1.41. Thus, Sterlite is a company with size and leverage much like Infosys. In this case, $Q_i$ works out to 0.0752. In the table, the numerical values seen for distance are small, which is consistent with the distribution of $Q_i$ seen in Figure 2.

## 4.2 Portfolio which is long MNCs + short matched non-MNC

Using the results of this matching procedure, we form a portfolio which holds long positions in the MNCs along with holding short positions in their exporting partners. The performance of the portfolio shows the ways in which MNCs are different from companies in India which have not embarked on outbound FDI. This empirical strategy addresses the three problems described above:

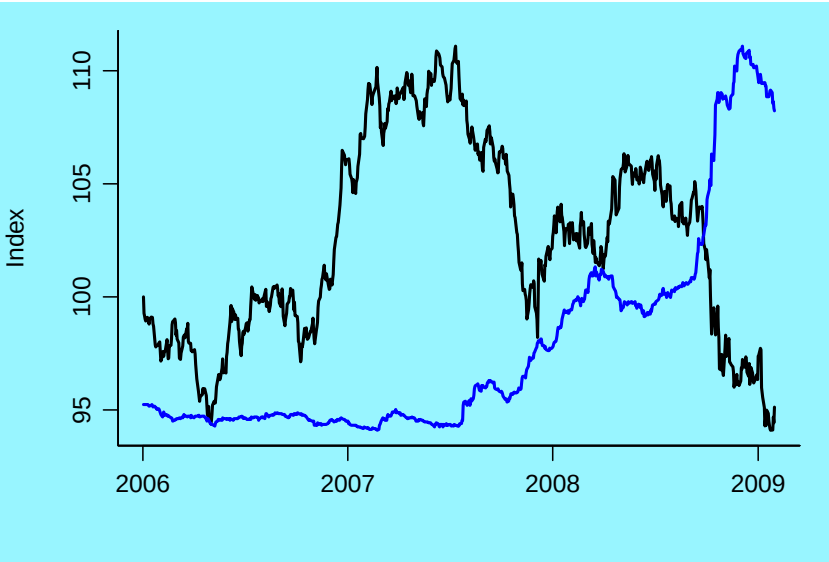
1. *Idiosyncratic risk*: Idiosyncratic risk would be diversified away since the analysis only involves the returns on portfolios.
2. *Exposure to the world economy*: MNCs and exporting firms would both be exposed to the world economy. Hence, mere business cycle considerations would affect both the exporters portfolio and the MNC portfolio.
3. *MNCs tend to be large leveraged firms*: The matching procedure identifies exporting non-MNC firms which have similar size and leverage when compared with the MNCs. Credit market conditions onshore and offshore would influence both portfolios equally, since both kinds of firms operate under the identical capital controls onshore.

In this fashion, we compute the returns on this portfolio, which is long MNCs and short a matched portfolio of exporters who are not MNCs. Figure 3 shows the time-series of the value of this portfolio, which is indexed to start from 100. The time-series of the Moody's Baa spread, $S_t$ is also shown on this graph. Both these series are in levels in the graph. The notation $H_t^{I/DX}$ denotes the daily *returns* of the hedged portfolio which is long MNCs and short non-MNC exporters.

An alternative explanation that limits the interpretation of these results concerns exposure to global business cycle conditions. While the portfolio that has been formed is long MNCs and short non-MNC exporters, both of which should have a trade exposure to the world economy, there is a possibility that

**Figure 3** Long MNC + short exporter portfolio, against the Moody's Baa spread

The black line shows the time-series of the portfolio value of a portfolio, initialised to Rs.100, which is long MNCs and simultaneously short a matched set of non-MNC exporters. The blue line (right scale) is the time-series of the Moody's Baa spread. Visually, it appears that the two periods where the hedged portfolio did badly were periods where the Moody's Baa spread rose.



MNCs are more exposed to international trade.[3] The impact of the Moody's Baa spread upon the hedged portfolio could merely reflect the bigger trade exposure of MNCs.

In order to address this concern, we construct a daily time-series which represents the Indian stock market implications of international trade exposure. We break the non-MNC exporting firms into two groups: the firms with an above-median exports/sales ratio and the firms with a below-median export/sales ratio. The same matching procedure is used to match all above-median exporting firms with a below-median exporting firm while mimicking the size and leverage. This gives us the returns series on another hedged portfolio: long high exports + short low exports. We interpret the returns series on this portfolio as reflecting pure trade exposure to the world economy, mapped into the Indian stock market returns. We use the notation $H_t^{Xhi/Xlo}$ for the daily returns of the hedged portfolio which is long high-export non-MNCs and short low-export non-MNCs.

## 4.3 Do MNCs have bigger exposure to the Moody's Baa credit spread?

The natural estimation strategy is a regression explaining *returns* on these long/short portfolios using *changes* in the Moody's Baa spread. To recapitulate notation, $H_t^{I/DX}$ is the daily returns of the hedged portfolio which is long MNCs and short non-MNC exporters; $H_t^{Xhi/Xlo}$ is the daily returns of the hedged portfolio which is long high-export non-MNCs and short low-export non-MNCs; $S_t$ is the level of the Moody's Baa spread on date $t$. The simplest model[4] is:

[3]The exports/sales ratio is observed for all firms, so in principle, matching could be done to find firms with similar size, leverage and the exports/sales ratio. The difficulty with this path is that for MNCs, sales outside India are tantamount to serving foreign customers by other means and induce trade exposure to global economic conditions. A fuller definition of sales to foreign customers (whether through exports or through outbound FDI) is not measured in the CMIE database.

[4]When estimating models explaining stock market returns on a portfolio, the overall stock market index is often useful as an explanatory variable, to reflect overall market fluctuations. That is inappropriate here for two reasons. First, the hedged portfolio is long MNCs and short non-MNC exporters. Both groups of firms have similar leverage and are spread across all kinds of industries. Hence, the overall exposure of $H_t^{Xhi/Xlo}$ to the stock market index should be zero.

Further, the typical market-capitalisation weighted stock market index attaches considerable importance to MNCs, who tend to be big companies with a bigger weightage in the index. E.g. a disproportionate number of the big components of the Nifty index

$$H_t^{I/DX} = a_0 + a_2(1-L)S_t + e_{1t} \tag{2}$$

This model suffers from the problem that MNCs might have a greater trade exposure to the world economy than non-MNC exporters, and that $(1-L)S_t$ is likely to be correlated with global business cycle conditions. As a consequence, part of what is seen in $a_2$ is just the greater trade exposure of MNCs; $\hat{a}_2$ cannot be interpreted as being only about offshore borrowing by MNCs. This motivates:

$$H_t^{I/DX} = a_0 + a_1 H_t^{Xhi/Xlo} + a_2(1-L)S_t + e_{2t} \tag{3}$$

The coefficient $a_1$ would pickup the extent to which $H_t^{I/DX}$ does well when global trade conditions improve. If it is the case that MNCs have greater trade exposure to the world economy when compared with non-MNC exporters with similar size and leverage, then we will observe $\hat{a}_1 > 0$.

A concern about these models lies in the extent to which shocks to $(1-L)S_t$ influence Indian stock prices immediately. If there are weaknesses in information processing by the stock market, this information processing could take many days. To address this, we estimate models of the form:

$$H_t^{I/DX} = a_0 + a_1 H_t^{Xhi/Xlo} + \sum_{j=0}^{10} b_j(1-L)S_{t-j} + e_{3t} \tag{4}$$

where lagged values of $(1-L)S_t$ are allowed to influence $H^{I/DX}$ at time $t$.

## 4.4 Results

These results are shown in Table 5. Model 1, corresponding to equation 2, explains returns on the hedged portfolio (long MNC + short non-MNC exporters) using first differences of the Moody's Baa spread. This proves to

are likely to be multinationals. Hence, the typical market-capitalisation weighted stock market index is likely to be contaminated with exposure to the very MNCness that we are trying to identify.

**Table 5** Does the Moody's Baa spread matter in explaining stock market returns of Indian MNCs?

The table shows four alternative regression models, all of them aiming to explain $H_t^{I/DX}$, the daily returns on the hedged portfolio which is long MNCs and short a matched portfolio of non-MNC exporters.
Model M1 uses only the contemporaneous value of the change in the Moody's Baa spread. Model M2 additionally uses $H_t^{Xhi/Xlo}$, the returns on a portfolio which is long high-export companies and short low-export companies (all of which are not MNCs). This translates trade exposure to the world economy into Indian stock market returns.
The last two columns have models which augment M1 and M2 with lagged values of changes in the Moody's Baa spread.
In all cases, we find that the coefficient of the change in the Moody's Baa spread is statistically and economically significant. This suggests that Indian MNCs had a credit exposure to the Moody's Baa spread over and beyond what non-MNC exporters with a similar size and leverage had.

| | M1 | M2 | M1 with lags | M2 with lags |
|---|---|---|---|---|
| (Intercept) | −0.02 | −0.02 | −0.01 | −0.01 |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| $H_t^{Xhi/Xlo}$ | | 0.15* | | 0.15* |
| | | (0.06) | | (0.06) |
| dBaa.spread | −1.50* | −1.47* | −1.32* | −1.31* |
| | (0.43) | (0.43) | (0.46) | (0.46) |
| dBaa.spread lag 1 | | | 0.22 | 0.29 |
| | | | (0.45) | (0.45) |
| dBaa.spread lag 2 | | | 0.62 | 0.65 |
| | | | (0.45) | (0.45) |
| dBaa.spread lag 3 | | | −0.11 | −0.13 |
| | | | (0.46) | (0.45) |
| dBaa.spread lag 4 | | | −0.15 | −0.11 |
| | | | (0.45) | (0.45) |
| dBaa.spread lag 5 | | | −0.60 | −0.63 |
| | | | (0.47) | (0.47) |
| dBaa.spread lag 6 | | | 0.18 | 0.11 |
| | | | (0.46) | (0.46) |
| dBaa.spread lag 7 | | | −0.32 | −0.22 |
| | | | (0.46) | (0.45) |
| dBaa.spread lag 8 | | | −0.38 | −0.48 |
| | | | (0.45) | (0.45) |
| dBaa.spread lag 9 | | | −0.17 | −0.14 |
| | | | (0.48) | (0.48) |
| dBaa.spread lag 10 | | | −0.62 | −0.52 |
| | | | (0.46) | (0.46) |
| $N$ | 413 | 413 | 403 | 403 |
| $R^2$ | 0.03 | 0.04 | 0.05 | 0.06 |
| adj. $R^2$ | 0.03 | 0.04 | 0.02 | 0.03 |

Standard errors in parentheses
* indicates significance at $p < 0.05$

be statistically significant at a 95% level, and economically significant with a coefficient of -1.5. In other words, a 100 bps rise in the Moody's Baa spread induces a negative stock market return for Indian MNCs of -1.5 per cent. The time profile of information disclosure here involves data emanating from the US about the Baa spread in the Indian night, which is impounded into Indian stock prices in the day.

Model M2 reflects equation 3, augments Model M1 with an additional explanatory variable, $H_t^{Xhi/Xlo}$. This measures the Indian stock market impact of trade exposure to the world economy. This coefficient is statistically significant and has a value of 0.15. On average, when $H_t^{Xhi/Xlo}$ is +1 per cent, the portfolio $H_t^{I/DX}$ gains 0.15 per cent. This suggests that in the hedged portfolio $H_t^{I/DX}$, the MNCs have more trade exposure to the world economy than their matched partners with similar size and leverage. At the same time, after controlling for this, the Moody's Baa spread coefficient is essentially unchanged at -1.47. This shows that our main result is robust to the problem of MNCs having greater trade exposure than non-MNCs.

Two additional specifications are shown, which utilise lagged values of the Moody's Baa spread. These investigate the idea that the Indian stock market is not fast enough in understanding these things, that the process of domestic price discovery is not able to understand the implications of last night's value of the Moody's Baa spread for the valuation of hundreds of Indian MNCs. This conjecture is not substantiated. Ten days of lagged values are not significant, the adjusted $R^2$ actually declines, and the basic results stand. This suggests that stock market speculators are quite aware of the implications of fluctuations of credit conditions in the US for valuation of Indian MNCs.

The interpretation of these results is as follows. All firms – MNCs or otherwise – face the same capital controls that inhibit foreign borrowing and prohibit short-dated foreign borrowing. It is reasonable to think that MNCs and non-MNCs of similar size and leverage would have the identical incentives to engage in foreign borrowing (within the constraints of the capital controls). In both cases, capital controls that blocked short-dated borrowing should have implied that turmoil on the money market in London was not so important to Indian firms who were supposed to not have money market operations. Yet, we find that Indian MNCs had a credit exposure to the Moody's Baa spread over and beyond what non-MNC exporters with a similar size and leverage had. This suggests that there is something about MNCness which induces a bigger exposure to the Moody's Baa spread.

# 5 Conclusion

India has long had strong restrictions which inhibit foreign borrowing, and particularly short-dated foreign borrowing, by Indian firms. In recent years, the biggest Indian firms have become multinationals. This raises questions about the effectiveness of these capital controls, since a multinational firm would be able to borrow abroad in a subsidiary or affiliate, and thus evade capital controls.

In the period of the global financial crisis, the Moody's Baa Spread experienced sharp fluctuations. This helps obtain statistical precision in understanding the consequences of the fluctuations of the Baa spread.

We first measure the exposure of all Indian firms to the Baa spread. When we examine the cross-sectional variation of these exposures, we find that multinational firms have bigger exposures. We then turn to the multinational firms, and setup a portfolio which is long multinationals and financed by short-selling a matched portfolio of firms with similar characteristics which are not multinationals. We find that this portfolio is highly sensitive to fluctuations of the Baa spread.

These two empirical strategies suggest that when a firm becomes a multinational, it obtains an increased exposure to the Baa spread; i.e. that such firms undertake more foreign borrowing when compared with non-multinationals.

This evidence thus suggests that in countries where important firms are multinationals, capital controls that seek to inhibit foreign borrowing have reduced effectiveness.

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