Foreign Currency Borrowing of Corporations as Carry Trades: Evidence from India *

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Abstract

We study the causes and consequences of the rise in foreign currency borrowing by non-financial corporates in an emerging market over the last decade. Using detailed firm-level issuance data from India, we show that issuance propensity for the same firm is higher when the difference in short-term interest rates between India and the US are higher i.e. when the dollar 'carry trade' is more profitable; a phenomenon that is driven by the period after the global financial crisis. In contrast, most standard firm-level variables, on their own, are not predictive of issuance. Consistent with the carry trade motive, we find that firms with low leverage are most likely to take advantage of these favorable funding conditions; firm cash holdings rise more after a foreign currency debt issue than after an equivalent amount raised through other sources; and firm exposure to foreign exchange risk rises after an issuance implying that the currency risk is not fully hedged. Using the 'taper tantrum' episode of Summer 2013 as an unexpected shock to foreign exchange volatility, we find that a market-based measure of FX exposure does a better job in capturing firm exposures than accounting measures. Firms with high FX exposure and a propensity to issue in more favorable funding environments are the hardest hit during the taper tantrum episode. Finally, we also present suggestive evidence that risks spill over to local banks from foreign currency borrowers with whom they have relationships.

Keywords: emerging markets; foreign currency debt; foreign exchange risk; taper tantrum

JEL Codes: F31; F34; G15; G30

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1 Introduction

Over the last decade, non-financial corporations in emerging market economies (EMEs) have increasingly been issuing foreign currency debt in global markets. According to the IMF's Global Financial Stability Report of October 2015, the stock of EME non-financial corporate debt quadrupled between 2004 and 2014. Recently, concern has risen that the magnitude of this foreign debt not only leaves the borrowing firms vulnerable to adverse exchange rate movements but given their size, it might have implications for the stability of the local financial sector as well as domestic growth (Acharya et al 2015, Shin 2013, Chui, Fender and Sushko 2013, Du and Schreger 2015).

What has caused this surge in foreign currency borrowing by EME corporates? How do firms use the funds obtained through this increasingly important source? What risks does this phenomenon pose? Much of the extant academic research has focused on hypothesizing channels of transmission as well as documenting aggregate trends[1]. The contribution of this paper is that we use detailed borrowing, accounting and market data on Indian firms to answer these questions.

We find that the same firm is more likely to issue abroad when the difference in short-term interest rates between India and the US are higher i.e. when the dollar 'carry trade' is more profitable; a phenomenon that is driven by the period after the global financial crisis. In contrast, most standard firm-level variables, on their own, are not predictive of issuance. Consistent with a 'carry trade' motive, firm cash holdings following foreign currency borrowing rise more than after funds are sourced through other channels. During times of market stress, it is those firms that borrow when external funding conditions are most favorable and leave their foreign exchange exposure unhedged that perform most poorly.

Multiple reasons could lead firms to increase their borrowing in foreign markets: first, if their revenues are increasingly earned in foreign currency owing to globalized supply chains, the sales provide a natural hedge for the foreign borrowing and allow firms to access deeper international funding markets[2]; second, firms with international ambitions wanting to invest in long-lived foreign assets would like to finance those assets in the same currency as the cash flows generated. Oil

[1] Important exceptions are Bruno and Shin (2016), Caballero, Panizza and Powell (2016) and Frank and Shen (2016)

[2] Trade financing is another source of increased foreign currency borrowing. However, since our focus is on debt with a maturity above three years, we ignore this interesting topic in this paper since trade financing is generally of a short maturity

and gas firms have been shown to increase their dollar issuance for this reason (Cuarana, 2016); third, firms borrow abroad to finance positive NPV local projects, and ensure they are adequately hedge through financial markets; and fourth, owing to favorable funding conditions in international markets, non-financial corporates may indulge in a *'carry trade'* whereby they borrow cheaply abroad and park those funds as short-term wholesale deposits in domestic banks (Shin and Zhao, 2013).

Disentangling these competing hypotheses requires firm-level analysis which is what we do using a sample of Indian firms that borrow abroad. We first show that macro factors drive issuance more than firm-specific factors. In particular, the difference in short-term rates between India and the US, a proxy for the profitability of the *'Carry Trade'* is positively associated with a given firm issuing foreign currency debt even after controlling for firm fixed effects and the year of issue. This phenomenon is much stronger post the financial crisis. Figure 1 shows the aggregate time series relationship between the number of issuances in a quarter and the CT index, which we define as the difference between Indian and US 3 month interest rates scaled by the implied volatility of 3 month FX options. The correlation is negative before the Lehman collapse but strongly positive after, not just for the number of issues but also the total amount raised. Additionally, when we try to identify which firms are issuing when the *carry trade* is more favorable, we find strong evidence that low leverage firms (i.e. presumably those with high debt capacity), more liquid firms and more profitable firms are the ones most likely to issue. On the other hand, most standard balance sheet determinants of leverage do not on their own seem to predict issuance propensity once we control for firm fixed effects. For instance, though a higher ratio of exports to total sales does predict foreign currency borrowing in the cross-section of firms, the same firm does not tend to issue more abroad as its exports rise.

Next, we investigate how borrowing firms use the proceeds from these issuances. First, we document that foreign currency borrowing is a substitute for other sources of funds i.e. when money raised domestically is lower, the amount raised in foreign currency is higher. The magnitude of the substitutability is lower following the global financial crisis. When it comes to the use of funds itself, using the empirical framework of Kim and Weisbach (2008), we are able to document how foreign currency borrowing is utilized as compared to other sources of funds. We confirm that gross investment, the stated rationale for most foreign currency borrowing, is higher post issuance (vis-

a-vis an equivalent amount of funding through other sources) but so are cash holdings, a finding consistent with the 'carry trade' motive (Bruno and Shin, 2016). These results hold both in the period leading up to the global financial crisis, and after. All in all, our results are more consistent with the hypothesis that Indian corporates have been taking advantage of the carry trade in the period post financial crisis.

It is unclear apriori if this foreign currency exposure is adequately hedged, either naturally or through financial contracts. Recently, concern has risen that the magnitude of this foreign debt not only leaves the borrowing firms vulnerable to adverse exchange rate movements but given their size, it might have implications for the stability of the local financial sector as well as domestic growth (Acharya et al 2015, Shin 2013, Chui, Fender and Sushko 2013, Du and Schreger 2015). If the foreign exchange exposure is not adequately hedged, either naturally or through financial markets, firm balance sheets might be impaired by significant exchange rate depreciations. This might not only hamper firm investment but any losses that non-financial firms suffer on their foreign liabilities would reduce their creditworthiness, and push the more highly levered firms towards defaulting on their domestic obligations. An additional risk to the local financial system is hypothesized by Shin and Zhao (2013): owing to favorable funding conditions in international markets, non-financial corporates have been indulging in a *'carry trade'* whereby they borrow cheaply abroad and park those funds as short-term wholesale deposit in domestic banks. If banks have come to rely on these wholesale deposits for their funding needs, a sudden shock to firm balance sheets might force banks to cut back on their lending. As such, policymakers have a strong interest in the issue of measuring the risks of foreign currency borrowing by non-financial corporates in EMEs.

The next step of our analysis is to measure these risks. A market-based measure of foreign exchange rate exposure (an FX β) rises right after issuance, suggesting firms do not totally hedge their exposure. Using the *'taper tantrum'* episode of Summer 2013 as an unexpected negative shock to the exchange rate, we show that firms more likely to borrow when CT is higher are hit most during the stress period. Market-based measures of foreign exchange rate exposure such as FX β do a better job at capturing the risk than balance-sheet measures such as ratio of foreign to total debt. We also find that within the set of the most-exposed firms i.e. high FX β firms, it is precisely those firms with a propensity to issue at times when the 'carry trade' is most profitable that suffer the most when the foreign exchange market is stressed. These results support the idea that 'carry

trade' incentives have been at least partly responsible for the rise in foreign exchange borrowings in EMEs, the currency risk is not completely hedged and it is exactly those firms that obtain funding when it is cheap that are most vulnerable at times of stress.

Finally, we use data on the firm's banking relationships to study the effect on the local banking sector. The domestic banking system might be susceptible through both asset and liability side exposures to risks emanating from foreign currency borrowing by corporations. Banks face credit risk emanating from stressed borrowers who also borrow abroad, and there might be a funding risk if firms have been raising funds abroad and parking the proceeds as deposits in the local banking system. Our tests show that there is a positive relationship between a bank's foreign exchange exposure i.e. FX β and the weighted average FX β of related firms. We find suggestive evidence of risk spillover from foreign currency borrowers to the local financial system.

Related Literature: Our results fit into a burgeoning literature on the risks to local growth and financial stability from worsening external debt position of the corporate sector. Du and Schreger (2015) show, in a cross-country setting, that higher reliance on foreign currency borrowing on the part of corporates is associated with a higher default risk on sovereign debt. Shin and Zhao (2013) provide evidence that the balance sheet dynamics of non-financial corporations in India and China suggest that they are behaving like surrogate financial intermediaries. Financial assets and liabilities for these firms covary positively as is the case for regular intermediaries. One hypothesis is that non-financial firms in EMEs are better able to circumvent capital controls (Caballero, Panizza and Powell (2016)) i.e. regulatory arbitrage is driving this behavior. Chui, Fender and Sushko (2014) hypothesize that these changes have led to local banks facing risks on both sides of their balance sheet. Stressed corporates might default on domestic loan obligations while wholesale funding might get squeezed if banks have come to rely on corporate deposits for funding. Acharya et al (2015) summarizes the risks policymakers face and provides case studies from India, Turkey and Latin America.

The set of papers closest to ours are Bruno and Shin (2016), Caballero, Panizza and Powell (2016) and Frank and Shen (2016). Like us, these papers do a firm-level analysis to distinguish between the different hypotheses regarding foreign currency borrowing by EME firms. Bruno and Shin (2016) find that emerging market firms with high cash holdings tend to issue dollar-

denominated bonds and add to their cash pile. This behavior is more pronounced during times when the carry trade is more profitable. Caballero, Panizza and Powell (2016) confirm these findings and show that this motive is concentrated in countries with higher capital controls on inflows. On the other hand, Frank and Shen (2016) look at Chinese firms, and find evidence that new dollar issuances are being used to finance productive investments. All these papers focus on dollar bond issuance since they use the SDC database. We collect issuance data from India's central bank which allows us to study both bank debt and bond issuance. In fact, the vast majority of foreign currency debt issuance by Indian corporates is through bank loans. Since the firms that have access to bond markets tend to be larger, our study covers a more representative sample of foreign borrowing firms. Importantly, our bank-driven results provide a counterpoint to the hypothesis that the Second Phase of Global Liquidity (Shin, 2013) is driven primarily by global asset managers 'reaching for yield' in international debt markets. Our results show that much of the liquidity transmission is still through the bank channel. Another feature of our empirical analysis is that our detailed database allows us to incorporate *firm fixed effects* in all our tests. Controlling for unobserved time-invariant firm-specific heterogeneity, our results specify how the same firm behaves under different macroeconomic and financial conditions. Additionally, we also study how the risks arising from foreign currency borrowing manifest during times of market stress.

This area is part of a wider literature on the centrality of dollar funding and US monetary policy in driving cross-border flows (Bruno and Shin, 2013; Rey(2013); Miranda-Agrippino and Rey (2015); McCauley et al (2015)). Papers such as Eichengreen and Gupta (2014), Feroli et al (2014) and Sahay et al (2014) study the 'taper tantrum' episode and its impact on asset markets, particularly in emerging markets. Sahay et al (2014) find that the US Federal Reserve's monetary policy announcements is strongly correlated with asset prices and capital flows in emerging markets, and this phenomenon has strengthened during the post-crisis phase of unconventional monetary policy

Patnaik, Shah and Singh (2015a) is a separate study of foreign currency borrowing by Indian firms. Their measure of external borrowing includes trade credit. They employ a matching approach to find comparable firms that do and do not utilize foreign currency borrowings. They find that firms borrowing from abroad are generally large, internationally active and have low financing constraints. We, on the other hand, look only within the universe of firms that *do* employ foreign

currency debt. Our definition of external borrowing only covers bank debt and bonds.

Outline of Paper: The rest of the paper proceeds as follows: Section 2 provides context on foreign currency borrowing by Indian corporates; Section 3 describes the data and summary statistics; Section 4 analyzes the determinants of external borrowing; Section 5 analyzes the use of funds raised; Section 6 uses the taper tantrum episode to identify the firms that are most exposed to foreign exchange risk; Section 7 looks at how domestic banks might be affected, and Section 8 concludes.

2 Institutional Background

India's total external debt at the end of 2014 was $461.9 billion[3] of which 37% was made up of foreign currency commercial borrowings. These borrowings are the largest component of the external debt followed by deposits of Non-Resident Indians (23.8%), loans from multilateral or bilateral agencies (17.4%) and short-term trade credit (17.1%). Almost 60% of the amount is in the form of commercial bank loans while the rest is categorized as securitized borrowings which include Foreign Currency Convertible Bonds (FCCB).

The share of foreign currency commercial debt in the external debt has climbed rapidly in the last decade. In 1995, this ratio was only 13.1%. It had risen to 19.7% by 2005 before rapidly climbing to the current level of 37% at the end of 2014. Multiple factors have been suggested for the increasing dominance of foreign currency commercial borrowing in India's external debt. These include strong investment demand at home, increase in investor risk appetite for emerging market credit, rising domestic interest rates relative to foreign rates, improved sovereign credit ratings and continued underdevelopment of India's local corporate bond market.

Issuance is regulated by India's central bank, the Reserve Bank of India (RBI), through 'automatic' or 'approval' route. All issue sizes above $750 million need RBI approval. The central bank also determines the lenders who are eligible. There are also restrictions on maturity, cost and use of funds. Debt maturities have a floor of three years and for loans with a maturity over five years the all-in cost is capped at 500 basis points above 6-month LIBOR. One of the features of the Indian market is the relative scarcity of convertible bond issuance compared to bank debt.

[3] http://finmin.nic.in/the_ministry/dept_eco_affairs/economic_div/ExternalDebt_Dec14_E.pdf

Figure 2 compares the number of External Commercial Borrowings (ECBs) to Foreign Currency Convertible Bonds (FCCBs) taken out by Indian firms in every year from 2005 to 2015. ECBs include bank debt and secured borrowings. Though FCCBs were somewhat popular from 2005 to 2007, their number has become very small post the crisis. As far as volumes are concerned, over 90% of issuance is through the ECB route since 2010. Given the scarcity of FCCB issuance, we do not distinguish between the two types of debt in our analysis. Though we include FCCB issues in all our tests, from here on we refer to all foreign currency commercial borrowing as ECB.

The major purposes for which ECBs are undertaken include the import of capital goods, modernization, rupee expenditures on local capital goods, overseas acquisitions, new projects and refinancing of existing ECBs. The refinancing of rupee loans is also permitted but requires approval from the RBI. On-lending or investment of proceeds in capital markets in India is generally not permitted. Guarantees from local banks are discouraged. The policy framework under which ECBs are issued is continuously evolving. Patnaik, Shah and Singh (2015b) summarize the existing framework and how it has evolved over the years.

3 Data and Summary Statistics

The Reserve Bank of India (RBI) maintains a public database on the foreign currency borrowing of Indian firms[4]. The data, available from January 2004 onwards, has the following information on all instances of external commercial borrowing (ECB) and foreign currency convertible bonds (FCCB): the identity of the borrower, issue size in US dollars, maturity and calendar month and year of issue. Our sample covers issues between January 2004 and December 2015. Over this period, the data show that there were 9274 instances of foreign currency borrowing by 4236 distinct firms.

Accounting and stock price data comes from the Prowess database of the Centre for Monitoring Indian Economy (CMIE).The database has annual balance sheet and income statement data as well as daily data on stock prices. Another unique feature of Prowess is that, for each firm in a particular year, it lists the banks that have a relationship with the firm in that firm. There is no common identifier linking firms in Prowess to the companies in the RBI data on foreign currency borrowing. In order to link the databases, we match names using a string matching algorithm and supplement this approach with a manual match for verification and completeness. This process

[4]Available at https://rbi.org.in/Scripts/ECBView.aspx

results in a match of 1403 firms between the two databases. Though these 1403 firms form only 33.1% of the firms in the RBI database, they account for 44.5% of the issues and 81.2% of the total amount issued. The firms we are unable to match from the RBI data to Prowess are mainly smaller private firms and non-profits for which financial data is unavailable in Prowess. This matched Prowess-RBI sample is the basis of all the analysis from here on. We also collect data on exchange rates and interest rates from Datastream.

Figure 3 graphically represents some of the characteristics of the foreign currency debt issued by firms in the matched sample. Figure 3a shows that the average (inflation-adjusted) issue amount rose from less than $30 million to over $50 million in a four-year span just before the crisis. Issue sizes decreased during the crisis and right after but have started rising since 2012 and now are at their highest level in the sample period. A similar pattern is seen with average issue maturity. Figure 3a plots a histogram of issue maturities. Issues of a maturity less than 3 years are very rare. This is unsurprising since regulatory approval is required to issue foreign currency debt with those maturities. Even though many of the assets being funded through these borrowings are long-lived and take a while to generate cash flows, long maturity issues remain relatively rare. This is partly due to most of the debt being bank loans and partly due to a hesitation on the part of creditors to extend long maturity credit given the somewhat uncertain strength of creditor rights in the Indian legal context. Term loans of five year duration are, by far, the most popular kind of claim issued.

Panel A of Table 1 tabulates summary statistics on the issuance characteristics of the firms in the matched Prowess-RBI sample. From 2004 to 2015, these 1403 firms issued a total of 4124 foreign currency debt claims. The median firm borrowed twice in the period but the firm at the 95th percentile borrowed 9 times. There is a significant positive skew in issue size as the median size is $15 million but the average size is $57.765 million. The second panel in the same table presents summary statistics on some key balance sheet measures and ratios for the sample firms. On the asset side, at the end of the median firm-year, a modest 2% of the firm's assets are held as cash. Current and fixed assets are held in similar proportions (0.370 vs. 0.303). When we turn to the liabilities side, we find that the median firm-year shows a debt-to-asset ratio of 0.361. Most of the debt is long-term in nature i.e. not due within the next year. The median long-term to total debt ratio is 0.766. Prowess also has some data on a firm's outstanding foreign currency debt. Their definition also includes trade credit which is not a part of the RBI data. Including debt taken

from suppliers, the ratio of foreign currency to total debt is 0.261 for the median firm-year. There is a wide variance in this ratio with the standard deviation being 0.284, almost the same as the median. At the 95th percentile, almost 95% of the debt is in foreign currency. Interestingly, foreign currency borrowing is not dominated by export-dominated firms. In fact, the median firm-year has an exports-to-sales ratio of less than 5%. A majority of the firms that borrow abroad do not have a natural hedge through the channel of foreign currency revenues. For the 20 largest firms in our sample, we report summary statistics in the Appendix (Table A1). We see that even among large firms there is wide variation in their appetite for foreign currency debt.

4 Carry Trade and ECB Issuance

In this section, we test the determinants of the issuance decision. We look at both macroeconomic and balance sheet factors. Motivated by the results in Bruno and Shin (2016) and Caballero, Panizza and Powell (2016), we test whether foreign currency borrowing (both bank and bond debt), within our sample of Indian corporates, is affected by a 'carry trade' motive. Our first hypothesis spells this out:

H1: Indian firms issue more ECB when the carry trade is more profitable

To test this hypothesis we estimate the following logit model at the firm-month level to predict issuance:

$$Issue_{it} = \alpha_i + \beta_{CT} CT_{t-1} + \beta_i r_{i,t-1} + \beta_M r_{M,t-1} + \beta_{FX} r_{FX,t-1} + \gamma X_{i,y-1} + \delta_y + \varepsilon_{it} \qquad (1)$$

The left-hand side variable takes the value 1 if firm i issues ECB in month t, and 0 otherwise. The main variable of interest is CT which is a measure of the profitability of the carry trade that, following Bruno and Shin (2015), we define as $CT = \frac{\text{3M rate(IND)} - \text{3M rate(US)}}{\text{IV of 3M FX options}}$ i.e. the difference in short-term interest rates between India and the US standardized by the implied volatility of 3 month USDINR options. It can be thought of as the Sharpe ratio of the Carry Trade. We control for the monthly NIFTY index return, the USDINR return as well as the firm's equity return in some specifications. To control for firm-level determinants, we control for a battery of accounting measures recorded at the previous fiscal year-end. These include total assets, leverage, cash-to-assets ratio, exports-to-sales ratio, ROA, current to total assets and dividend to total assets. To

control for the macroeconomic environment, we employ year fixed effects. Importantly, to control for unobserved time invariant firm-level characteristics, we also employ firm fixed effects in certain specifications. In those specifications, the results we get reflect within-firm estimates of *Carry Trade* profitability on the issuance decision.

Results

Figure 1 plots how aggregate issuance and our carry trade move over time. The figure is quite stark - before the crisis (demarcated by the vertical red line), there seems to be a negative relation between the number of issues in a quarter against the CT measure in the quarter. However, post-crisis this pattern almost completely reverses. Aggregate ECB issuance and the profitability of the carry trade seem to be almost perfectly positively correlated.

We confirm this pattern at the firm-month level by estimating equation 1. The results are in the odd-numbered columns of Table 2. In columns (1) and (3), we exclude the firm-level market return allowing us to include private firms in those tests. Columns (3) and (7) include firm fixed effects. The results across all specifications are qualitatively consistent. A higher value of the CT index predicts higher foreign currency borrowing in the next month, and the effect is statistically significant at the 1% level. In the specifications with firm and year fixed effects, it means that the same firm is more likely to issue ECBs in months immediately following those in which the carry trade is more profitable. Quantitatively, the effect is large. Using the estimated coefficient of 0.448 in column (3), a one standard deviation increase in the CT index (The CT index has a standard deviation of 0.281 during the sample period) would increase a firm's probability of issuing ECBs by 12.6%. These results confirm our first hypothesis that firms in India borrow in foreign currency when the carry trade is more profitable. Has this behavior become more pronounced following the financial crisis? The aggregate evidence in Figure 1 seems to suggest so but is this true at the firm level? To test this, we re-estimate equation 1 but with an additional variable that is the interaction of the CT index with a dummy variable that takes the value 1 for September 2008 and after. The coefficient on this interaction term is the differential probability of issuing in the post-crisis period. The even-numbered columns of Table 2 present the results. In all specifications, we see that the interaction is positive and significant. In fact, the coefficient on the CT variable itself, though positive, is insignificant and much smaller in magnitude. This suggests that the explanatory power

of the carry trade in explaining firm-level issuance mainly arises in the post-crisis period.

Which firms are more likely to issue ECB when the carry trade is more profitable? Bruno and Shin (2015) find that firms with existing high levels of cash holding are more likely to issue when the carry trade is more appealing. In the same spirit, we successively interact our *CT* and *CT*Post-crisis* terms with a number of firm-level variables like size, leverage, cash holding and export/sales. We use both dummy variables indicating whether a firm has above or below median value for a particular metric, as well as the value of the metric itself. In Tables 3 we present the results using the ratio of debt to assets. The negative and significant coefficients on the triple interaction terms *CT*Post-crisis*HighDebt* and *CT*Post-crisis*Debt/Assets* show that firms with low leverage are the most likely to issue ECB when the value of *CT* is high in the post-crisis period. These firms would be exactly the ones with the debt capacity to take advantage of favorable funding conditions. Rather than reporting complete tables for each of the other financial ratios, we present a single specification for each ratio in Table 4. In column (1), we present results using Debt/Assets. This is the same result as in column (4) of Table 3. Turning to other metrics, characteristics like firm size, cash holdings, dividend policy and even export/sales do not seem to predict issuance, either on their own or when the carry trade is more profitable. In column (4), when we use export/sales as the interacting variable, we find no significant coefficient on the triple interaction terms. This suggests that high and low export firms do not differ in their propensity to tap foreign debt markets when conditions were favorable post-crisis. This suggests that the boom in issuance post 2008 was not driven by export firms looking to issue in the currencies in which they derived a substantial portion of their revenues. We do find that high liquidity firms (i.e those with high current assets) and more profitable firms (i.e those with high ROA) are the ones that are more likely to issue when the carry trade is more favorable in the post-crisis period.

In unreported results, we also check how foreign currency borrowing is related to these firm-level metrics on their own. Results from firm-year regressions suggest that these balance sheet measures on their own do not have much explanatory power for the timing of issue. Unlike Bruno and Shin (2015), at least for Indian firms we do not find that those with high cash holdings are the ones more likely to borrow abroad. In the specification with both firm and year fixed effects, only the coefficient on the return on assets is significant. Taken together with the preceding results, the implication seems to be that macro factors (in this case, the carry trade post 2008) rather than

firm-level factors are responsible for the rise in foreign currency borrowing.

5 Use of Funds

What happens to the money raised by Indian businesses abroad? The stated purpose of most foreign currency borrowing is capital expenditure – in our data, over 80% of the issuances give this as the rationale for the issue. The next most popular purpose is refinancing of loans. But do firms abide by their stated rationale? If the carry trade really is responsible for the rise in foreign currency borrowing, we would expect firms to hold the proceeds as cash or bank deposits rather than invest it in risky capital projects. Perhaps, firms are substituting equity with debt and paying out higher dividends. To figure out how exactly ECB proceeds are being used in practice, we follow the methodology as in Kim and Weisbach (2008) which allows to benchmark the use of ECB proceeds with funds raised by the firm through other sources. We define two new variables: firstly, $Log(1 + \frac{ECBAmount_{it}}{TotalAssets_{i,t-1}})$ where $ECBAmount_{it}$ is the total amount (in INR) that the firm i raised through the ECB route in year t[5]; and secondly, $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$. We measure other sources of funds as the difference between total sources and the amount raised through ECB in year t. Total sources is the sum of funds from operations, sale of fixed assets, long-term debt issuances, and sale of common and preferred stock. We scale both the ECB amount and the other sources by beginning-of-year assets, and take logs to minimize the impact of outliers. Before we test how ECB funds are used, we analyze the substitutability between foreign currency debt and other sources of funds. We estimate the following equation by OLS:

$$Log\left(1 + \frac{ECBAmount_{it}}{TotalAssets_{i,t-1}}\right) = \alpha_i + \beta Log\left(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}}\right) + \gamma Log(Assets)_{i,t-1} + \delta_t + \varepsilon_{it} \tag{2}$$

Controlling for beginning-of-year assets as well as firm and year fixed effects, this model asks how sensitive ECB borrowing is to the quantum of other funds. We expect $\beta < 0$ i.e. the higher other sources of funds, the lower the amount raised through the ECB route. Since the other sources of funds are primarily comprised of internally generated funds and domestic debt, by the pecking order theory (Myers and Majluf, 1984) we expect them to be prioritized as a source of funds compared

[5]The RBI data has ECB amounts in USD. We convert to INR using the INRUSD exchange rate at the end of the calendar month in which the issuance was undertaken

to foreign currency debt.

Next, we test how the ECB proceeds are used, benchmarked to the use of other sources of funds. In the spirit of Kim and Weisbach (2008), we estimate the following regression equation at the firm-fiscal year level:

$$Y_{it} = \alpha_i + \beta_1 Log\left(1 + \frac{ECBAmount_{it}}{TotalAssets_{i,t-1}}\right) + \beta_2 Log\left(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}}\right) + \beta_3 Log\left(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}}\right) * IssueYr_{it} + \gamma Log(Assets)_{i,t-1} + \delta_t + \varepsilon_{it} \quad (3)$$

The dependent variable, Y_{it}, is defined as $Log(1 + \frac{Use_{it}}{TotalAssets_{i,t-1}})$ where Use_{it} can be (i) change in cash holdings from year t-1 to t, (ii) gross investment (Change in gross fixed assets from year t-1 to t) in year t, (iii) dividends paid in year t, and (iv) long-term debt reduction in year t.

The independent variable of interest is $Log(1 + \frac{ECBAmount_{it}}{TotalAssets_{i,t-1}})$. The coefficient β_1 measures how cash, investments or payouts change as firms increase the amount of ECB they issue. To benchmark the use of ECB funds with other sources of funds, we also include, as in Kim and Weisbach (2008), a separate regressor for other sources, $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$. We also include the interaction of $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$ with $IssueYr$, a dummy variable that takes the value 1 if firm i undertook an ECB issue in year t. Comparing β_1 with β_2 allows us to measure the difference between use of ECB funds and other funds in years when no ECB was issued. β_3 tells us the differential impact on the use of other sources in years when foreign currency debt is employed. We can think about these coefficients as measuring how much of an additional rupee raised through either of the two channels would be used. The logarithm of total assets at the beginning of the issuance year controls for firm size. Year fixed effects are included to control for nationwide macroeconomic shocks that might affect both issuance behavior and use of funds while firm fixed effects control for unobserved time invariant firm characteristics. We cluster standard errors at the firm level.

Results

The results from the OLS estimation of equation 2 are in Table 5. In column (1) we see that the coefficient on $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$ i.e. β is -0.082 and is significantly different from zero at the 1% level. When funds raised through other sources are higher, proceeds from ECB issuances are lower, confirming that the two sources are substitutes. We've seen earlier that carry

trade incentives post the financial crisis seem to explain issuance behavior better than firm-level variables. If firms are raising money abroad primarily because of favorable funding conditions, we expect to see the substitutability between ECB funds and other sources to be lower in the post-crisis period. This is exactly what the result in column(2) shows. When we include an interaction between $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$ and *Postcrisis*, a dummy that takes the value 1 post September 2008, we find that the coefficient on this interaction term is positive and significant, and the magnitude of the coefficient is about half that of β in the same regression (0.049 vs. -0.105). The substitutability between the two types of funds is significantly lower (though still present) post the financial crisis.

A concern with the above set of results is that our dependent variable takes the value 0 in most firm-years (about 80%) since most firms undertake foreign currency borrowing only sporadically. It is possible that the decision to issue abroad is linked to funds available from other sources, but not the amount i.e. this substitutability only holds at the extensive margin. To clearly analyze whether the amount of money raised is also linked to other sources of funding, we re-run the tests of the first two columns but restrict the sample to only those firm-years in which the firm issued abroad. These results are in column (3) and (4). We see that the coefficient β is still negative and significant, and is larger in magnitude than in the previous columns (-0.159 in column(3) vs. -0.082 in column (1)). Given the decision to issue abroad, the substitutability between the funds raised in foreign currency and those in domestic currency is larger than the unconditional. Results in column (4) are also consistent with this – in the post-crisis period, the association between other funds and the ECB amount is less negative (significant at the 10% level) than in the pre-crisis period. How do we interpret the magnitudes in these tables, such as the -0.159 coefficient in column (3). The median firm-year has a ratio of other sources to beginning-of-year assets of 0.144 (Panel B of Table 1). If there is a 20 % positive shock (0.0288) to this value, keeping all else equal, the reduction in ECB amount would be from median value 0.099 of total assets to 0.094, a decrease of about 5%. Perhaps surprisingly, the magnitude of the substitution is not as large as one might have expected.

Next, we turn to the use of funds. The results from the OLS estimation of equation 3 are in Table 6. In the odd-numbered columns, the sample covers the entire time period from 2004-2015 while in the even-numbered columns, it is restricted to post-crisis i.e. post September 2008 observations. The results in column (1) show that ECB issuance leads to a significant increase in the firm's cash holdings. The coefficient of 0.327 suggests the impact is much larger than the effect

on cash holdings of other sources of funds (coefficient of 0.200) in years when ECB not issued. This is true both statistically and economically. We can measure the economic impact by comparing how do cash holdings changed for the same absolute value of additional funds raised through different sources. For a median firm-year, an increase in ECB amount of 0.02 units (of beginning-of-year total assets) leads to a a cash rise of about 0.005 units [6] The same 0.02 units of increase via other sources (in years without ECB issuance) raises cash holdings by 0.0035 units. A larger fraction of an additional rupee raised through the ECB route is held as cash compared to a rupee raised through other sources. A negative coefficient on β_3 suggests that in years when firms access foreign currency debt markets, they hold less of the funds raised through other sources as cash. This again points to the substitutability between different sources of funds. In the post-crisis period (column 2), the impact of capital raising on cash holdings overall is slightly smaller. Again, the strong positive association between ECB issuance and cash holdings (even compared to other funding sources) lends further credence to the idea that Indian corporates are engaging in a 'carry trade' through their foreign currency borrowing. This result on cash holdings is consistent with what Bruno and Shin (2016) find for a sample of emerging economy firms. Interestingly, the coefficient on β_3 is insignificant in the post-crisis period which means that, irrespective of whether a firm issues ECB, it sets aside a similar fraction of other sources as cash. The substitutability between the use of ECB funds and other funds as cash breaks down. Firms seem to be using all means to boost their cash holdings, pointing perhaps to an attempt to build financial slack while funding conditions are favorable.

On turning to investment (column 3), the results again suggest that a rupee of ECB borrowing leads to a more significant impact than a rupee through other sources. Since the stated purpose of most ECB loans is capital expenditure, this finding is perhaps unsurprising. Firms are at least using some of the proceeds to invest in real assets. As in the case of cash holdings, the magnitudes in the post-crisis period (column 4) are smaller and we cannot statistically rule out that there is no difference between an ECB rupee and a rupee through other means. The coefficient on β_3 is near zero and insignificant. At least when it comes to investment, there is no substitutability between the two sources

In the case of dividend payouts (column 5 and 6), the effect of ECB issuance is again positive but

[6] The median change in cash held as a fraction of beginning-of-year assets is about 0.005

is not different from the effect of other sources of capital either in the full sample or the post-crisis period. Long-term debt (LTD) reduction is one area where the effect of ECB funds is lower than other funds (column 7). Though firms do use new capital infusion to retire existing debt, they are likely to extinguish a significantly larger proportion when the funds are domestically raised rather than raised abroad.

To summarize, the results of this section suggest that firms regard ECB issuance as a substitute for other sources, but this relationship is smaller in the post-crisis period. An additional raised through the ECB route is more likely to be held as cash or to go into investment compared to other sources.

6 Firm Exposure to FX Risk

Having studied the determinants and uses of foreign currency borrowings, in this section of the paper, we study how these borrowings affect the risks to which the firms are exposed, particularly foreign exchange risk. A primary concern that regulators have expressed about the recent rise in ECB issuance is that borrowers are leaving the resulting foreign currency exposure unhedged (Ministry of Finance, 2015). The same report, also known as the Sahoo Committee report, identifies two primary reasons why companies might not hedge their exposure post issuance: first, the local derivatives market is illiquid and firms lack access to offshore markets; and second, they imagine an implicit guarantee from the RBI that it won't let the currency depreciate outside a narrow band [7]. To measure the extent of exposure that is left unhedged at the time of issuance, we look at market-based measures obtained from stock returns.

To obtain a market-based measure of foreign exchange risk, we estimate the following market model separately for each firm:

$$r_{it} = \alpha + \beta_M r_{Mt} + \beta_{FX} r_{FX,t} + \varepsilon_{it} \tag{4}$$

r_{it} is the return for firm i on day t. r_{Mt} represents the return on the broader Indian stock market and is proxied by the NIFTY index return. $r_{FX,t}$ is the USDINR daily return and is defined as $\frac{P_t - P_{t-1}}{P_{t-1}}$ where P_t is the number of INR required to buy 1 USD at the end of period t. The model

[7] The danger with the perpuation of the low volatility exchange rate regime is that when the eventual adjustment does take place it will be sharp

is estimated using OLS with an estimation window of 75 trading days, allowing us to obtain rolling estimates of β_{FX} for each firm. Table 7 has summary statistics on the rolling market and FX βs so obtained. As we would expect, the rolling market β for the median firm is close to 1 and is positive at the 5th and 95th percentile. When it comes to the FX β, the median is close to 0 with the 5th percentile being around -2 and the 95th percentile being around 2. This suggests a wide variation in firms' market-implied exposure to FX risk. Low FX β firms, presumably exporters, are the ones that do well when the Indian Rupee depreciates against the US Dollar while high FX β firms are the ones that do badly.

Motivated by concerns expressed by policymakers, we hypothesize that firms that borrow abroad do not fully hedge their foreign exchange exposure. This leads to our next hypothesis:

H2: Firm FX $\beta's$ increase following ECB issuance

To test this hypothesis, we estimate the following equation:

$$beta_{it} = \alpha + \beta_1 Issue_{i,t-1} + \nu_t + \eta_i + \varepsilon_{it} \tag{5}$$

The dependent variable is the β estimated for firm i from the market model in a 75-day trading window starting at the beginning of month t . The independent variable is a dummy that takes value 1 if firm i made an ECB issuance in month $t-1$. We include time and firm fixed effects. The results from this estimation are presented in Table 8. In the specification without firm fixed effects (column 1), we see that the FX β increases significantly post an ECB issuance. Since the median FX β is only 0.138, an increase of 0.058 post issuance is huge in magnitude, and speaks to the unhedged risks that the firms are exposed to. On adding firm fixed effects, the effect becomes insignificant though the magnitude is positive and substantial at 0.033. NIFTY $\beta's$ are unaffected.

Taper Tantrum as Natural Experiment

A tightening of international funding conditions, and dollar appreciation pose rollover risks to corporations that borrow abroad (Acharya et al, 2015). Apriori it is unclear which firms are exposed to these risks and which ones have hedged their exposure through financial markets or their external revenue streams. We analyze market movements during the 'taper tantrum' episode of Summer 2013 across the cross-section of foreign currency borrowers to identify which metrics capture true

risk exposure of Indian firms that borrow abroad. During May-September 2013, the US Federal Reserve made a series of statements about the probability of the tapering of their quantitative easing (QE) program. We use these statements as proxies for shocks to foreign exchange volatility, and as a preview of tighter future funding conditions. Sahay et al (2014) show that the 'taper tantrum' led to a surge of foreign capital outflows from emerging markets, creating turmoil and a sharp decline in asset prices including in equities. The Indian market was not spared during this period – from the start of May to the end of September, the Indian Rupee declined almost 14% against the US Dollar while the NIFTY market index fell about 2.35%. In fact, in August 2013 the RBI responded by imposing capital controls on outflows by residents[8].

Through an event study framework, we analyze which foreign currency borrowers experienced the largest abnormal stock returns, and how this was related to their measurable characteristics. To clearly identify the effects of the taper tantrum episode, we focus on three distinct events that market participants identify as having significantly altered the probability of tapering:

- *May 22, 2013*: In a testimony to the Joint Economic Committee of the US Congress, Federal Reserve Chairman Ben Bernanke suggested that tapering could begin after the next couple of meetings of the Federal Open Market Committee[9].

- *June 19, 2013*: In a press conference following the FOMC meeting, Chairman Bernanke again suggested that asset purchases would be reduced later in 2013[10].

- *September 18, 2013*: After the FOMC meeting, Chairman Bernanke unexpectedly announced that the Fed was going to delay tapering till economic conditions improved[11].

We consider the first two dates as having increased the probability of tapering while the third decreased the probability. Consistent with this interpretation, we find that the INR depreciated on the day after the first two events (by 0.14% and 1.69% respectively) and appreciated by 2.15% the day after the third event[12]. With respect to each of the event dates, we estimate the market model (Equation 4) over a 180 calendar day window ending at $t = -6$ where $t = 0$ captures the event

[8] see https://rbi.org.in/scripts/BS_PressReleaseDisplay.aspx?prid=29309

[9] http://www.marketwatch.com/story/bernanke-premature-tightening-could-end-growth-2013-05-22

[10] https://research.stlouisfed.org/publications/es/article/10036

[11] http://www.bloomberg.com/news/articles/2013-09-18/fed-refrains-from-qe-taper-keeps-bond-buying-at-85-bln

[12] The NIFTY stock index actually rose by 0.28% after the first event date. On the other two dates, the impact was much starker – the index fell 2.86% following the second event date and rose 3.66% after the third

date. The estimated market and FX $\beta's$ are used to predict returns around the event date. The abnormal return on a particular date is the difference between the actual and predicted return. We focus on the Cumulative Abnormal Return (CAR) on the first 5 trading days following the event (CAR[1,5]). The actual event date is not included since the Indian market was closed by the time the relevant statements were made on those days.

Next, we sort the sample of firms into terciles based on different metrics. The CAR is then regressed on indicator variables for each tercile. The first metric we use is based on our analysis in Section 4, and measures the propensity of firms to issue when the CT value is high. For each firm that has at least 4 issuances in the sample, we calculate a firm-specific CT measure which is the amount-weighted average of the CT index values in the immediate month preceding issuance. Firms in the top tercile of the CT are those with a higher propensity to issue when the carry trade is more profitable. Our second sorting metric comes from the market model and is simply the estimated FX β in the pre-taper period. These two metrics rely on market-based information to be constructed. We also sort based on a series of balance sheet metrics such as the ratio of foreign to total debt, debt to asset ratio and total assets.

Since we have already seen that market conditions are more informative about the issuance decision than firm-specific factors, we hypothesize that:

H3: Effective exposure to foreign exchange risk is better captured by market-based metrics than by balance sheet ratios

Taper Tantrum Results

Table 9 has the results from the event study analysis around significant events concerning the tapering of quantitative easing. In the first panel, the firms are sorted based on the firm-specific CT measure while in Panel B, the sorting is done on the basis of the pre-period estimated FX β.

The results from Panel A indicate that it is exactly those firms that issue more when the carry trade is more profitable (high CT issuers) that see the sharpest abnormal reaction. Following the second event date, their CAR is smaller than -4% while following the third event, it is bigger than 2%[13]. Figure 4 plots the difference in CAR for high and low CT issuers as it develops over the 5 days before and after the event date. The difference in CAR between high and low CT issuers is

[13]We do not find much difference following the first event date which might be unsurprising given that INR and NIFTY did not move significantly immediately following that date.

large in magnitude though statistically insignificant. This might be due to the smaller sample of firms used since we need firms that have issued at least 4 times over the sample period. Another interesting finding is that the entire sample of repeat foreign currency borrowers experiences large negative declines following increase in taper risk (post 19 June 2013). Since we are controlling for the overall market reaction in the market model, this implies that foreign currency borrowers perform worse compared to non-borrowers (which can be thought of as the omitted group).

The second panel suggests that the abnormal reaction post event is sharpest for the firms with low FX β. On all three dates, the difference in reaction between high and low FX β is statistically significant. For instance, over the 5 days following June 19, 2013, the cumulative abnormal return for low FX β firms was 2.5 % points more negative than that for high FX β firms. This difference is statistically significant at the 1% level. It is perhaps surprising that low FX β firms see the sharpest negative reaction on news of taper since the rupee depreciated right after the taper news but it must be remembered that the movement in stock price due to exchange rate change is already accounted for in the predicted return. What this result suggests is that this measure does a good job of quantifying the risk for high FX β firms.

When we double sort based on the CT measure as well as their FX β we find interesting results. As Panel C in Table 9 shows, within high FX β firms those who are prone to issue when the carry trade is more profitable suffer higher negative abnormal returns when taper probability goes up and lower when it goes down. The magnitude of the difference is large though it is statistically insignificant. This may owe to the small number of firms that are repeat issuers. The market-based measure FX β does a good job of identifying firms exposed to FX risk but it works even better when complemented with an identification of which firms tend to issue when funding conditions are favorable. Our results suggest that high FX β firms that tend to issue when the carry trade is the most favorable are the ones policymakers need to track most closely.

In contrast, the three panels in Table 10 suggest that balance sheet measures do not explain differences in abnormal reaction. For instance, in panel A we see that following an increase in probability of tapering, there is a significant negative abnormal reaction but the difference between borrowers with a high fraction of foreign debt and those with a low fraction is not statistically significant. We see a similar pattern when the sorting variable is leverage. In panel C for the second event date, the top tercile of firms in terms of assets see a significantly larger decline than

the bottom tercile. However, this effect is not there for the other two event dates. Together, these results provide support for our second hypothesis i.e market-based measures of foreign exchange risk better capture firm vulnerability than balance sheet measures.

7 Bank Risks

The domestic banking system might be susceptible through both asset and liability side exposures to risks emanating from foreign currency borrowing by non-financial corporates. Firms are indulging in a carry trade might be parking their proceeds in domestic banks as deposits. We have shown evidence that cash holdings do rise post issuance. If banks have come to rely on such corporate deposits for funding, heightened forex volatility or narrowing interest rate differentials could lead to a funding squeeze. The more conventional risk to domestic banks is from asset-side exposures to non-financial corporations with currency mismatches. Any losses that non-financial firms suffer on their foreign liabilities would reduce their creditworthiness, and push the more highly levered firms towards defaulting on their domestic obligations. Given the already elevated levels of Non-Performing Assets (NPAs) in the banking system, further deterioration in borrower credit quality might be something domestic banks are not prepared to weather. To quantify these risks, a bank FX β can be calculated for publicly traded banks in the same vein as for non-financials. Appendix Table A2 lists the top 15 banks in terms of average FX β in descending order. There is a mix of private and state-owned banks in the list as well as both small and large banks. Of course, the foreign exchange exposure of banks might be due to their own foreign operations rather than through links from non-financial corporations. To actually document the risks emanating from the corporate sector, we use a unique feature of Prowess: the identity of banks with which a company has a relationship. Based on this annual data, for each bank we can calculate a weighted firm FX βs which is essentially a weighted average of the FX βs for the firms to which the bank is connected. We regress the bank's own FX β against this related firm FX β as well as the related firm NIFTY β i.e. we estimate the following equation:

$$BankFXbeta_{jt} = \alpha_j + \gamma_1 WtdFirmFXbeta_{jt} + \gamma_2 WtdFirmNIFTYbeta_{jt} + \nu_t + \varepsilon_{jt} \quad (6)$$

Results from this regression are presented in Table 11. In the first two columns, the dependent

variable is the bank FX β and in the last two, it is the bank NIFTY β. The coefficients on the related firm FX β in the first two columns confirm that a rise in the FX β of related firms is associated with a rise in the FX β of the bank. This suggests that at least some foreign exchange exposure that banks face is due to their relationships with unhedged corporates who borrow abroad.

8 Conclusion

Our results have several implications for the literature on emerging market corporate debt as well as for policymakers tasked with preventing the spread of any stress that emerges due to firms' foreign borrowings. Given that we find favourable funding conditions to be much a stronger determinant of issuance than any firm-level factors, it is reasonable to conclude that firms will not issue to the same extent when interest rates rise in developed economies. Will they be able to weather a storm if it arrives and be able to rollover their obligations or pay them off without trouble? Our results suggest that many firms are not adequately hedged against FX risk, and it is exactly those ones with the highest propensity to issue in favorable funding conditions that might face the most risk. The danger of stress spreading to the local financial system cannot be dismissed, and policymakers need to pay special attention to those banks linked to the most vulnerable firms.

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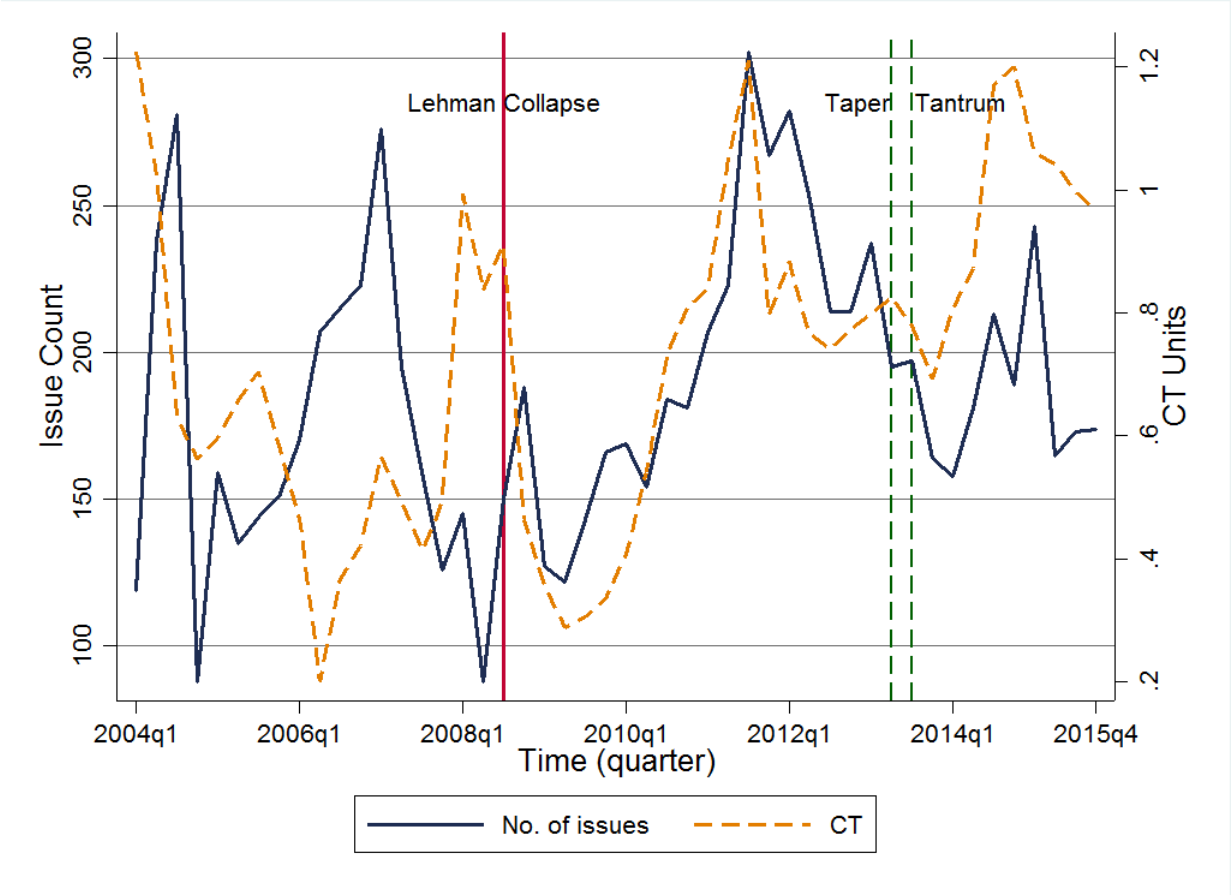


Figure 1: **Carry Trade and Aggregate ECB Issuance**
The figure plots the total number of ECB issues each quarter against CT, a proxy for the difference in short-term rates between India and the US. CT is defined as the difference in 3-month interest rates between India and the US scaled by the implied volatility of 3-month FX options. The sample period is from 2004 to 2015.

The table below lists the correlation between the monthly CT index and the monthly ECB issuance count and total amount issued.

Correlation (monthly)	Jan 2004-Dec 2015	Jan 2004-Aug 2008	Sep 2008-Dec 2015
ρ(No. of Issues, CT index)	0.1773	-0.1880	0.4069
ρ(Total Amount, CT index)	0.1521	-0.2935	0.3167

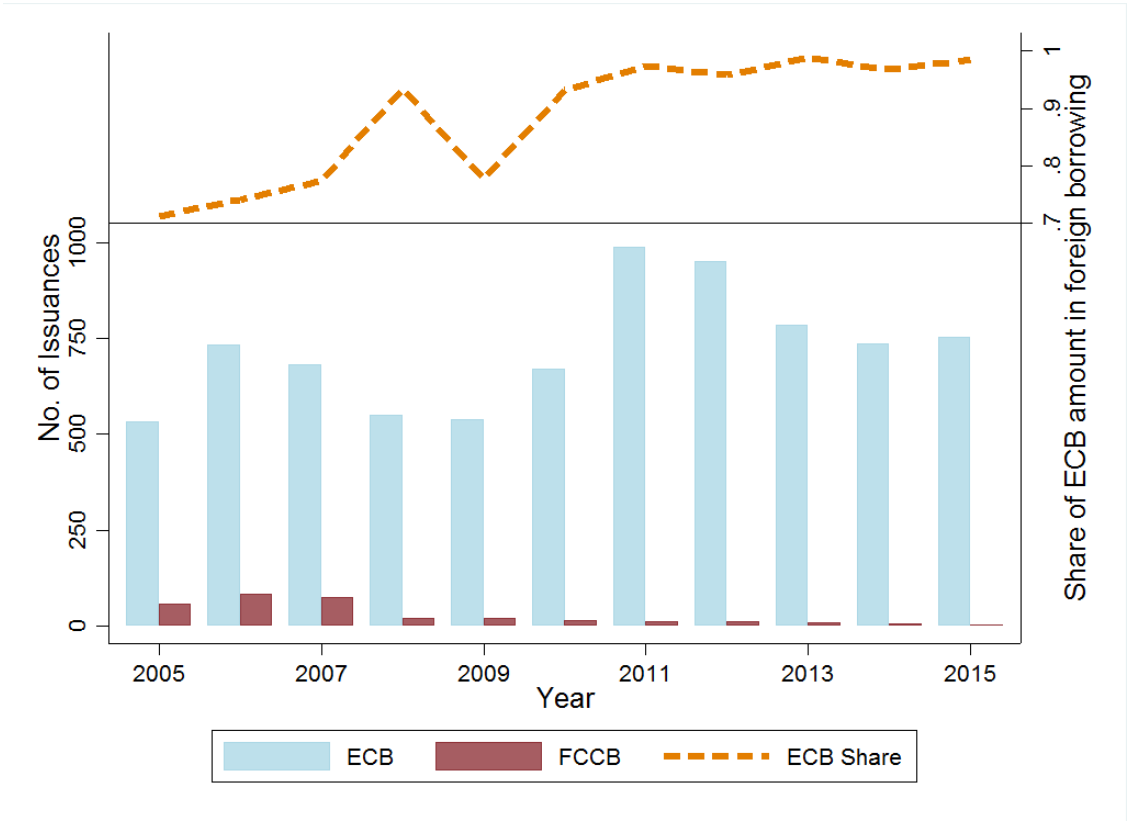
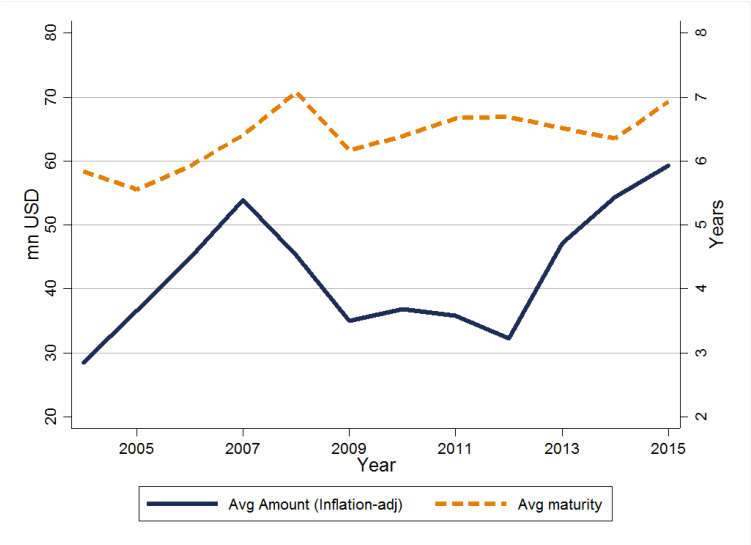


Figure 2: **Bonds vs. Bank debt**

The figure shows the relative importance of bond financing compared to bank debt in the foreign currency borrowing of Indian firms over the period 2005 to 2015. The bars are the number of issues of External Commercial Borrowing (ECB) and Foreign Currency Convertible Bonds (FCCB) in each year while the dashed line captures the percentage of total amount borrowed that is in the form of ECB.

(a) Average amount and maturity of ECB issuance (2004-2015)



(b) Distribution of maturity of ECB Issuances

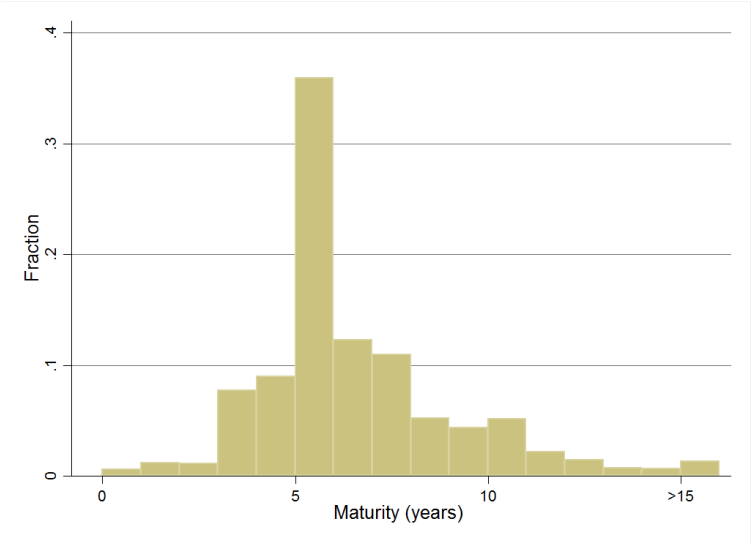


Figure 3: **Characteristics of ECB Issuances**

The figure graphically depicts the salient characteristics of External Commercial Borrowings (ECB) of firms that can be matched to the Prowess database. The sample period is 2004 to 2015. Figure (a) shows how the inflation-adjusted average issuance amount and maturity vary over time. Figure (b) is a histogram showing the distribution of maturities of the borrowings.

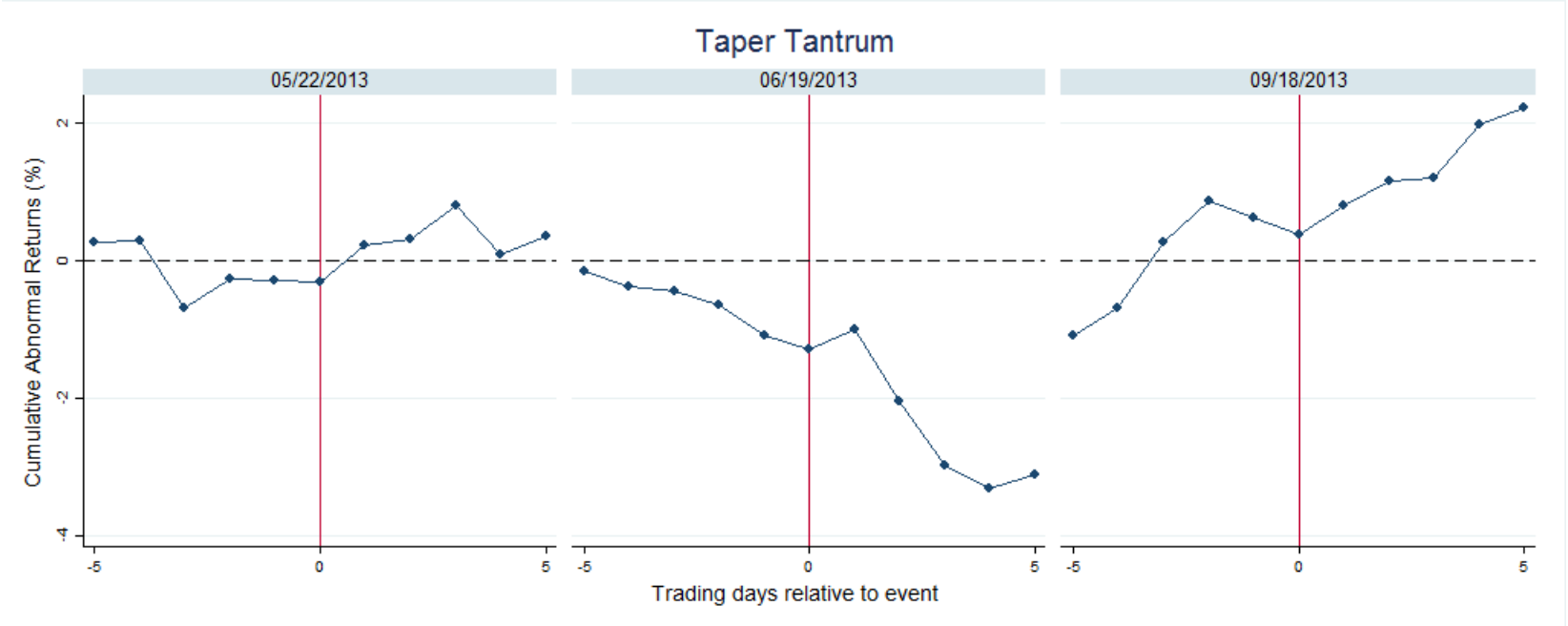


Figure 4: **Taper Tantrum: CAR of high CT issuer (top tercile) relative to low FX CT issuer (bottom tercile)** The figure shows the cumulative abnormal return (CAR) for high CT issuer stocks relative to low CT issuer stocks, for three event dates, from 5 days prior to the event date to 5 days after. The three event dates are May 22, 2013, June 19, 2013 and September 18, 2003. As detailed in the text, the first two are dates on which likelihood of tapering went up while the third is one on which the likelihood went down. A multivariate market model is used for estimation with the NIFTY return proxying for the market return while USDINR return proxies for FX return. The estimation window is 180 calendar days and ends 5 trading days before the announcement date.

Table 1: **Summary Statistics: ECB and firm characteristics**

Panel A has statistics on the issuance of External Commercial Borrowings (ECB) by Indian corporates as per data from the Reserve Bank of India (RBI). The sample has the 1403 firms that can be matched to the Prowess database and is from Jan. 2004 to Dec. 2015. Panel B has summary statistics on the balance sheet of firms that appear both in Prowess and in the RBI data on ECB. The foreign currency borrowing is as per Prowess. The sample period covers fiscal year-ends between Jan. 2004 and Dec. 2015. The sample period is Jan. 2004 to Dec. 2015

Panel A: ECB Facilities

	N	Mean	Median	St. Dev.	P5	P95
Amount (mn USD)	4,124	60.408	15.000	140.948	1.100	280.000
Maturity (Years)	4,124	6.410	5.500	2.969	3.000	11.583
No. of facilities (per firm)	1,403	2.939	2	3.987	1	9

Panel B: Firm Balance Sheets

	N	Mean	Median	St. Dev.	P5	P95
Assets						
Total Assets (bn INR)	23,362	13.96	1.82	42.32	0.01	64.75
Cash/Assets	22,814	0.074	0.02	0.15	0.00	0.32
Fixed/Total Assets	21,694	0.329	0.303	0.234	0.006	0.776
Current/Total Assets	23,052	0.390	0.370	0.257	0.014	0.862
Liabilities						
Total Debt (bn INR)	20,754	5.79	0.690	17.744	0.002	27.159
Foreign Currency Debt (bn INR)	6,233	3.88	0.622	10.496	0.000	18.063
Long-Term/Total Debt	20,371	0.683	0.766	0.318	0.019	1.000
Foreign Currency/Total Debt	6,207	0.341	0.270	0.282	0.001	0.947
Debt/Assets	20,713	0.466	0.361	0.668	0.010	0.997
Other Ratios						
Dividends/Total Assets	8,545	0.015	0.008	0.022	0.000	0.051
Return on Assets	20,144	0.128	0.118	0.158	-0.049	0.375
Exports/Sales (%)	10,706	17.892	4.692	26.209	0.000	81.837
Source of Funds						
Total Sources$_t$/Total Assets$_{t-1}$	13,353	0.227	0.139	0.435	-0.048	0.720
ECB Amt$_t$/Total Assets$_{t-1}$ (Issue Yrs)	2,062	0.454	0.099	1.810	0.017	1.165
Other Sources$_t$/Total Assets$_{t-1}$	10,411	0.209	0.144	0.389	-0.094	0.676

Table 2: **Determinants of ECB Issuance: Carry Trade and the post-crisis period**

This table shows results from a logistic regression used to predict the issuance of ECB. All observations are at the firm-month level. The dependent variable takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the US scaled by the implied volatility of 3-month FX options. *CT*post-crisis* is the value of *CT* interacted with a dummy that takes the value 1 if the month is September 2008 or after, and 0 otherwise. The USDINR and NIFTY market returns are included in all specifications while the firm's monthly return is included in the last two columns. These independent variables are one-month lagged values. Firm-level controls include total assets, debt to asset ratio, ratio of dividends to assets, ratio of exports to sales, cash to asset ratio and current assets to total assets. These are measured at the end of the previous fiscal year. Firm clustered standard errors are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CT	0.439***	0.172	0.448***	0.168	0.608***	0.310	0.610***	0.297
	(0.155)	(0.192)	(0.160)	(0.198)	(0.185)	(0.223)	(0.191)	(0.232)
CT*post-crisis		0.432**		0.454**		0.499**		0.524**
		(0.185)		(0.191)		(0.223)		(0.233)
FX Return	0.004	0.009	0.003	0.009	0.014	0.021	0.013	0.021
	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)	(0.014)	(0.014)	(0.014)
NIFTY return	-0.007	-0.007	-0.007	-0.007	-0.015***	-0.015***	-0.014**	-0.014**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Firm return					0.006***	0.006***	0.006**	0.006**
					(0.002)	(0.002)	(0.002)	(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	92705	92705	85701	85701	53422	53422	48729	48729
PseudoR^2	0.037	0.037	0.097	0.097	0.046	0.047	0.107	0.107

Table 3: **Determinants of ECB Issuance: Carry Trade and Leverage**

This table shows results from a logistic regression used to predict the issuance of ECB. All observations are at the firm-month level. The dependent variable takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the US scaled by the implied volatility of 3-month FX options. *High Debt* takes the value 1 if the firm has an above-median debt-to-asset ratio at the end of the previous fiscal year, and 0 otherwise. *Post-crisis* is a dummy that takes the value 1 if the month is September 2008 or after, and 0 otherwise. The USDINR and NIFTY market returns are included in all specifications while the firm's monthly return is included in the last four columns. These independent variables are one-month lagged values. Firm-level controls include total assets, debt to asset ratio, ratio of dividends to assets, ratio of exports to sales, cash to asset ratio and current assets to total assets. These are measured at the end of the previous fiscal year. Firm clustered standard errors are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CT	0.569***	0.082	0.922***	-0.006	0.725***	0.104	1.337***	0.002
	(0.172)	(0.222)	(0.290)	(0.331)	(0.206)	(0.264)	(0.313)	(0.432)
CT*High Debt	-0.268**	0.135			-0.238	0.336		
	(0.111)	(0.210)			(0.146)	(0.256)		
CT*Debt/Assets			-1.397*	0.474			-2.175***	0.789
			(0.728)	(0.827)			(0.706)	(1.095)
CT*Post-crisis		0.678***		1.013***		0.866***		1.426***
		(0.214)		(0.305)		(0.261)		(0.370)
CT*Post-crisis*High Debt		-0.460**				-0.661***		
		(0.210)				(0.239)		
CT*Post-crisis*Debt/Assets				-1.624**				-2.646***
				(0.747)				(0.872)
FX Return	0.003	0.009	0.002	0.009	0.014	0.021	0.014	0.021
	(0.011)	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)	(0.014)
NIFTY return	-0.007	-0.007	-0.007	-0.007	-0.014**	-0.015**	-0.014**	-0.014**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Firm return					0.006**	0.006**	0.005**	0.005**
					(0.002)	(0.002)	(0.002)	(0.002)
YearFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85701	85701	85701	85701	48729	48729	48729	48729
PseudoR^2	0.097	0.098	0.097	0.098	0.107	0.109	0.108	0.110

Table 4: **Determinants of ECB Issuance: Carry Trade and Firm Characteristics**

This table shows results from a logistic regression used to predict the issuance of ECB. All observations are at the firm-month level. The dependent variable takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the US scaled by the implied volatility of 3-month FX options. *Post-crisis* is a dummy that takes the value 1 if the month is September 2008 or after, and 0 otherwise. *Financial ratio* refers to a distinct characteristic in each specification, as listed at the top of the column. These are measured at the end of the previous fiscal year. The USDINR and NIFTY market returns are included in all specifications. These independent variables are one-month lagged values. Firm-level controls include total assets, debt to asset ratio, ratio of dividends to assets, ratio of exports to sales, cash to asset ratio and current assets to total assets. These are measured at the end of the previous fiscal year. The only reported value among controls is of the characteristic under focus in the specification. Firm clustered standard errors are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)							
	Debt/ TA	Log (TA)	Cash/ TA	Exp/ Sales	ROA	Liq Ratio	Div/ TA	Fixed/ TA
CT	-0.006	-0.775	0.245	0.110	0.179	0.208	0.199	-0.494
	(0.331)	(0.934)	(0.218)	(0.234)	(0.283)	(0.216)	(0.229)	(0.338)
CT*Post-crisis	1.013***	1.268*	0.414**	0.556**	0.172	0.589***	0.413*	0.998***
	(0.305)	(0.722)	(0.209)	(0.216)	(0.255)	(0.211)	(0.218)	(0.296)
Financial ratio	-0.410	0.060	0.645	0.004	0.511	0.035**	2.570	-0.625
	(0.539)	(0.115)	(0.947)	(0.004)	(0.627)	(0.017)	(4.847)	(0.575)
CT*Financial ratio	0.474	0.104	-1.329	0.003	0.172	-0.036	-1.911	1.801**
	(0.827)	(0.098)	(1.530)	(0.005)	(0.851)	(0.031)	(6.985)	(0.768)
CT*Post-crisis*Financial ratio	-1.624**	-0.089	0.603	-0.005	1.306**	-0.063**	2.774	-1.487**
	(0.747)	(0.078)	(1.275)	(0.004)	(0.626)	(0.029)	(5.335)	(0.618)
FX Return	0.009	0.009	0.009	0.008	0.008	0.009	0.009	0.008
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
NIFTY return	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85701	85701	85701	85701	85701	85701	85701	85701
PseudoR^2	0.098	0.097	0.097	0.097	0.097	0.097	0.097	0.097

Table 5: **ECB Issuance and other sources of funds**

This table shows results from a OLS regression relating the amount of funds raised through the ECB route to other sources of funds. All observations are at the firm-year level. The dependent variable is $Log(1 + \frac{ECBAmount}{TotalAssets})$ where $ECBAmount$ is the total amount (in INR) that the firm i raised through the ECB route in year t. The independent variable of interest is $Log(1+\frac{OtherSources}{TotalAssets})$ where we measure other sources of funds as the difference between total sources and the amount raised through ECB in year t. Total sources is the sum of funds from operations, sale of fixed assets, long-term debt issuances, and sale of common and preferred stock. The interaction of $Log(1 + \frac{OthAmount}{TotalAssets})$ with Postcrisis, a dummy taking the value 1 in the period from September 2008 onwards is included in even-numbered columns. The log of total assets at the beginning of the issuance year controls for firm size. Year and firm fixed effects are included in all specifications. The sample in the last two columns is restricted to those firm-years in which ECB issuances were made. Standard errors clustered at the firm level are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Log(1+ECB Amt/Total Sources)			
	All firm-years		Issue firm-years only	
	(1)	(2)	(3)	(4)
Log(1+Other Amt/Total Sources)	-0.082***	-0.105***	-0.159***	-0.201***
	(0.011)	(0.013)	(0.033)	(0.042)
Log(1+Other Amt/Total Sources)*Postcrisis		0.049***		0.093*
		(0.019)		(0.051)
Lag Log(Assets)	-0.009***	-0.010***	-0.129***	-0.127***
	(0.002)	(0.002)	(0.013)	(0.012)
Constant	0.107***	0.109***	1.346***	1.321***
	(0.022)	(0.022)	(0.122)	(0.119)
YearFE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	10339	10339	1949	1949
R^2	0.062	0.066	0.329	0.334

Table 6: **Use of Funds**

This table shows how the firm's cash balance, investment, dividend policy and long-term debt change following ECB issuance. All observations are at the firm-fiscal year level. We estimate the following equation by OLS:

$$Y_{it} = \alpha_i + \beta_1 Log\left(1+\frac{ECBAmount_{it}}{TotalAssets_{i,t-1}}\right) + \beta_2 Log\left(1+\frac{OtherSources_{it}}{TotalAssets_{i,t-1}}\right) + \beta_3 Log\left(1+\frac{OtherSources_{it}}{TotalAssets_{i,t-1}}\right) * IssueYr_{it} + \gamma Log(Assets)_{i,t-1} + \delta_t + \varepsilon_{it}$$

The dependent variable, Y_{it}, is defined as $Log(1 + \frac{Use_{it}}{TotalAssets_{i,t-1}})$ where Use_{it} can be (i) change in cash holdings from year t-1 to t , (ii) gross investment (Change in gross fixed assets from year t-1 to t) in year t, (iii) dividends paid in year t, and (iv) long-term debt reduction in year t. The independent variable of interest is $Log(1 + \frac{ECBAmount_{it}}{TotalAssets_{i,t-1}})$ where $ECBAmount_{it}$ is the total amount (in INR) that the firm i raised through the ECB route in year t. We also include a separate regressor for other sources, $Log(1+\frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$. We measure other sources of funds as the difference between total sources and the amount raised through ECB in year t. Total sources is the sum of funds from operations, sale of fixed assets, long-term debt issuances, and sale of common and preferred stock. Also included is the interaction of $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$ with $IssueYr$, an indicator variable that takes the value 1 if the firm issued ECB in year t, and 0 otherwise. The logarithm of total assets at the beginning of the issuance year controls for firm size. Year and firm fixed effects are included in all specifications. In odd-numbered columns, the sample covers the entire time period while in even numbered it is only post September 2008. Standard errors clustered at the firm level are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Cash		Investment		Dividends		LTD Reduction	
	All	Post Crisis	All	Post Crisis	All	Post Crisis	All	Post Crisis
Log(1+ECB Amt/Total Assets)[β_1]	0.327***	0.257***	0.200***	0.124**	0.017***	0.022***	0.082***	0.068*
	(0.032)	(0.045)	(0.034)	(0.058)	(0.004)	(0.007)	(0.027)	(0.039)
Log(1+Other Amt/Total Assets)[β_2]	0.200***	0.153***	0.100***	0.049*	0.019***	0.018***	0.153***	0.163***
	(0.016)	(0.026)	(0.017)	(0.026)	(0.003)	(0.006)	(0.021)	(0.029)
Log(1+Other Amt/Total Assets)*IssueYr	-0.062**	-0.011	-0.013	-0.015	-0.005	-0.008	-0.010	-0.039
	(0.024)	(0.034)	(0.029)	(0.043)	(0.003)	(0.005)	(0.026)	(0.031)
Lag Log(Assets)	-0.028***	-0.027***	-0.021***	-0.019**	-0.005***	-0.006***	-0.010	-0.006
	(0.004)	(0.007)	(0.004)	(0.009)	(0.002)	(0.002)	(0.007)	(0.018)
$Pr(\beta_1 = \beta_2)$	0	.0156	.0018	.1586	.7265	.4837	.0033	.0082
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10296	6288	10209	6216	6274	3789	4825	3176
R^2	0.374	0.380	0.315	0.366	0.631	0.688	0.483	0.568

Table 7: **Summary Statistics: Returns data**

This table shows summary statistics for the market data used to measure a company's foreign exchange risk exposure. The USDINR return for period t is defined as $\frac{P_t - P_{t-1}}{P_{t-1}}$ where P_t is the number of USD required to buy 1 INR at the end of period t. The $\beta's$ are estimated in a multivariate market model with NIFTY returns and USDINR returns on the right hand side, and stock returns on the left as in equation 4. The estimation window is 75 trading days. The sample is restricted to firms which are present in the RBI ECB data and have stock returns in Prowess. The sample period is Jan. 2004 to Dec. 2015.

	N	Mean	Median	St. Dev.	P5	P95
Stock return (%)	1331728	0.090	-0.077	3.242	-4.608	5.143
NIFTY Return (%)	3,219	0.079	0.103	1.539	-2.283	2.274
USDINR Return (%)	3,219	-0.009	0.000	0.442	-0.729	0.661
NIFTY β	1292215	0.790	0.745	0.538	0.066	1.683
FX β	1292215	0.146	0.138	1.906	-1.761	2.042
CT	144	0.722	0.764	0.281	0.295	1.197

Table 8: **Forward looking β and ECB issuance**

The table has results from the OLS estimation of Equation 5 .The dependent variable is the β estimated for firm i from the market model in a 75-day trading window starting at the beginning of month t . The independent variable is a dummy that takes value 1 if firm i made an ECB issuance in month $t-1$. Fixed effects are as indicated. Sample period is from Jan 2004 to Dec 2015. Standard errors clustered at both firm and time level are reported in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	β (forward looking)			
	FX		NIFTY	
Issue	0.058**	0.033	0.021	-0.015
	(0.027)	(0.026)	(0.018)	(0.011)
Time FE	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes
R^2	0.137	0.173	0.164	0.384
Obs.	60,685	60,685	60,685	60,685

Table 9: **Event Study around taper talk: CT measure and FX β**

The sample consists of companies which are present in the ECB issuance data and for which stock return data is available to estimate the model. A multivariate market model is used for estimation with the NIFTY return proxying for the market return while USDINR return proxies for FX return. The estimation window is 180 calendar days and ends 5 calendar days before the announcement date. In the event study, cumulative abnormal return (CAR) is calculated over 5 trading days post the event date. As detailed in the text, May 22, 2013 and June 19, 2013 are dates on which likelihood of tapering went up while September 18, 2013 is one on which the likelihood went down. The returns are in percentage points. In Panel A, firms are sorted into terciles based on the weighted average value of the CT measure at the time of issuance. The sample in this panel only includes firms with at least 4 issuances over the sample period. In Panel B, firms are sorted into terciles based on their estimated FX β while in Panel C, each firm is assigned to one of nine portfolios based on a double sort. The two dimensions along which the sorting is done is the FX β and the weighted average CT value. Robust standard errors are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

Panel A: CT measure

	CAR[1,5]		
	05/22/13	06/19/13	09/18/13
Low CT Issuer	-0.376	-2.173*	0.448
	(0.669)	(1.300)	(0.853)
Mid CT Issuer	-1.031*	-1.682***	-0.321
	(0.620)	(0.604)	(0.634)
High CT Issuer	0.305	-4.004***	2.268***
	(0.594)	(0.937)	(0.842)
Pr(H-L==0)	.4479	.2443	.136
Observations	170	170	167
R^2	0.019	0.137	0.056

Panel B: FX β

	CAR[1,5]		
	05/22/13	06/19/13	09/18/13
Low FX β	-1.346***	-3.355***	1.769***
	(0.471)	(0.469)	(0.465)
Mid FX β	-0.737*	-1.958***	0.248
	(0.422)	(0.539)	(0.479)
High FX β	-0.282	-1.362**	-0.147
	(0.427)	(0.530)	(0.522)
Pr(H-L==0)	.0952	.0051	.0065
Observations	486	483	479
R^2	0.025	0.118	0.027

Panel C: Double sorting on FX β and CT measure

	CAR[1,5]		
	05/22/13	06/19/13	09/18/13
L FXβ-L *CT Issuer*	-1.483	-2.614**	2.974*
	(0.959)	(1.122)	(1.713)
L FXβ-M *CT Issuer*	0.366	-4.252***	1.127
	(0.956)	(0.871)	(1.318)
L FXβ-H *CT Issuer*	-0.338	-4.445***	3.366**
	(2.221)	(0.585)	(1.664)
M FXβ-L *CT Issuer*	-0.804	-4.129***	-0.312
	(0.807)	(1.193)	(0.779)
M FXβ-M *CT Issuer*	-1.837**	-1.458	2.224
	(0.717)	(0.942)	(1.389)
M FXβ-H *CT Issuer*	0.518	-5.120*	-0.281
	(1.031)	(3.063)	(1.062)
H FXβ-L *CT Issuer*	-0.457	0.040	-2.152
	(1.070)	(2.763)	(1.346)
H FXβ-M *CT Issuer*	1.598	-1.136	0.138
	(1.607)	(1.773)	(1.064)
H FXβ-H *CT Issuer*	-0.034	-2.439**	1.195
	(0.675)	(1.066)	(1.651)
Pr(HH-HL==0)	.7374	.3903	.1283
Observations	170	170	167
R^2	0.050	0.164	0.098

Table 10: **Event Study around taper talk: Balance Sheet characteristics**

The sample consists of companies which are present in the ECB issuance data and for which stock return data is available to estimate the model. A multivariate market model is used for estimation with the NIFTY return proxying for the market return while USDINR return proxies for FX return. The estimation window is 180 calendar days and ends 5 calendar days before the announcement date. In the event study, cumulative abnormal return (CAR) is calculated over 5 trading days post the event date. As detailed in the text, May 22, 2013 and June 19, 2013 are dates on which likelihood of tapering went up while September 18, 2013 is one on which the likelihood went down. The returns are in percentage points. In Panel A, firms are sorted into terciles based on the ratio of their foreign currency borrowing to their total debt at the end of the previous fiscal year. In Panel B, firms are sorted into terciles based on their leverage, proxied by the ratio of debt to assets, at the end of the previous financial year while in Panel C, they are sorted based on their total assets, a proxy for size, at the end of the previous fiscal year. Robust standard errors are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

Panel A: Foreign Currency Borrowing

	CAR[1,5]		
	05/22/13	06/19/13	09/18/13
Low Foreign Currency/Total Debt	-0.870	-3.115***	-0.479
	(0.568)	(0.645)	(0.565)
Mid Foreign Currency/Total Debt	-0.995**	-2.598***	0.816
	(0.495)	(0.726)	(0.610)
High Foreign Currency/Total Debt	-0.376	-2.127***	0.303
	(0.443)	(0.470)	(0.531)
Pr(H-L==0)	.4938	.2149	.3139
Observations	315	308	310
R^2	0.023	0.151	0.010

Panel B: Leverage

	CAR[1,5]		
	05/22/13	06/19/13	09/18/13
Low Debt/Assets	-0.544	-2.126***	1.208***
	(0.427)	(0.394)	(0.451)
Mid Debt/Assets	-0.566	-2.195***	0.345
	(0.449)	(0.539)	(0.430)
High Debt/Assets	-1.305***	-2.959***	-0.064
	(0.455)	(0.546)	(0.582)
Pr(H-L==0)	.2233	.2127	.0825
Observations	470	467	464
R^2	0.024	0.136	0.015

Panel C: Size

	CAR[1,5]		
	05/22/13	06/19/13	09/18/13
Low Total Assets	-0.823	-1.687***	0.304
	(0.578)	(0.484)	(0.479)
Mid Total Assets	-0.409	-2.423***	0.203
	(0.381)	(0.451)	(0.484)
High Total Assets	-1.103***	-2.989***	0.972**
	(0.364)	(0.524)	(0.486)
Pr(H-L==0)	.6733	.073	.3335
Observations	476	473	470
R^2	0.022	0.139	0.010

Table 11: **Bank and related firm β's**

The table shows results from a regression wherein the FX β of publicly traded Indian banks is the dependent variable. The independent variables are the weighted FX and NIFTY β's of the firms for which the bank was the lead relationship lender at the end of the previous fiscal year. The relationship data is from Prowess. Firm assets are used as the weighting variable. All specifications have date fixed effects. The even-numbered columns also have bank fixed effects. Date-clustered standard errors are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	β (forward looking)			
	FX		NIFTY	
Wtd Firm FX Beta	0.049***	0.036***	0.009***	0.008***
	(0.007)	(0.007)	(0.002)	(0.001)
Wtd Firm Nifty Beta	-0.106***	-0.158***	0.116***	0.020***
	(0.012)	(0.014)	(0.005)	(0.004)
Time FE	Yes	Yes	Yes	Yes
Bank FE	No	Yes	No	Yes
R^2	0.354	0.380	0.366	0.555
Obs.	71,446	71,446	71,446	71,446

Appendix

Table A1: **Largest firms**

Among firms with at least 5 years of data on assets, these 20 firms have the highest inflation-adjusted average assets.

Company Name	Debt/ Assets	No. of ECB issuance	Avg. Amt. (mn USD)	Avg. Maturity	FX β (daily)
Reliance Industries Ltd.	.253	63	296.091	8.271	.149
N T P C Ltd.	.298	21	160.943	11.163	.218
Power Grid Corpn. Of India Ltd.	.553	7	149.74	13.726	.112
Tata Steel Ltd.	.273	14	275.385	8.518	.467
Bharti Airtel Ltd.	.152	7	209.858	9.262	.324
Reliance Communications Ltd.	.36	17	298.794	6.662	.224
Steel Authority Of India Ltd.	.239	4	133.769	6.063	.151
Hindustan Petroleum Corpn. Ltd.	.319	11	219.099	4.28	.259
Bharat Petroleum Corpn. Ltd.	.293	13	135.652	5.679	.203
Larsen & Toubro Ltd.	.148	28	64.354	5.515	.073
Hindalco Industries Ltd.	.267	5	39.174	5.367	.49
N H P C Ltd.	.331	1	121.885	6.167	.428
Tata Motors Ltd.	.257	8	237.124	6.198	.259
J S W Steel Ltd.	.41	41	50.005	8.671	.088
G A I L (India) Ltd.	.107	11	55.61	6.273	.146
Essar Steel India Ltd.	.528	20	41.669	9.15	.298
Essar Oil Ltd.	.499	15	86.337	10.717	.281
Jaiprakash Associates Ltd.	.502	12	100.867	7.188	.492
Wipro Ltd.	.098	2	188.536	5.083	-.282
Idea Cellular Ltd.	.453	15	87.975	7.978	.436

Table A2: **FX β of Domestic Banks**

Among Indian banks with at least 5 years of financial data and at least 200 days of return data, the table shows statistics for the 15 banks with the highest average daily FX β estimated from a multivariate market model with a 75 trading day rolling window. The sample period is from Jan. 2004 to Dec. 2015

Bank Name	FX β (daily)	NIFTY β (daily)	Debt/ Assets	De- posit/Assets	ST/ Total Deposits	Cash/ Assets
Axis Bank	.737	1.097	.89	.784	.424	.097
Federal Bank	.556	.962	.883	.838	.264	.075
Oriental Bank Of Commerce	.507	1.275	.902	.871	.265	.085
Indian Bank	.499	1.039	.888	.864	.317	.076
Canara Bank	.487	1.258	.908	.866	.29	.089
Yes Bank	.471	1.2	.864	.696	.123	.066
I D B I Bank	.45	1.286	.896	.583	.234	.059
I C I C I Bank	.449	1.242	.83	.578	.339	.081
Bank Of India	.448	1.352	.916	.84	.286	.105
Bank Of Rajasthan	.442	.919	.91	.887	.314	.186
Punjab National Bank	.44	1.141	.897	.834	.415	.09
Lakshmi Vilas Bank	.433	.758	.902	.872	.194	.078
Union Bank Of India	.355	1.238	.913	.847	.321	.074
State Bank Of India	.351	1.151	.858	.771	.448	.089
Jammu & Kashmir Bank	.346	.683	.902	.881	.377	.099
Kotak Mahindra Bank	.321	.997	.82	.628	.309	.062
South Indian Bank	.295	.853	.912	.891	.223	.088
Karur Vysya Bank	.288	.548	.885	.852	.231	.067
Vijaya Bank	.271	1.089	.919	.879	.26	.078
City Union Bank	.259	.632	.89	.88	.202	.084