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

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July 21, 2021

Abstract

We establish that macroprudential controls limiting capital flows can curb risks arising from foreign currency borrowing by corporates in emerging markets. Firm-level data show that Indian firms issue more foreign currency debt when the interest rate differential between India and the United States is higher. This "carry trade" relationship breaks down once regulators institute more stringent interest rate caps on borrowing; riskier borrowers cut issuance the most. Stock price exposure of issuers to currency risk rises after issuance, a source of vulnerability during the "taper tantrum" episode of 2013, which macroprudential controls subsequently nullified, as confirmed during the COVID-19 outbreak.

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

JEL Codes: F31; F34; G15; G30

*We thank Valentina Bruno, Stephen Cecchetti, Kristin Forbes, Manasa Gopal, Hyeyoon Jung, Jonathan Ostry, Şebnem Kalemli-Özcan, Philip Lane, Hae Kang Lee, Prachi Mishra, N.R. Prabhala, Raghuram Rajan, Jack Shim, Hyun Song Shin and participants at the Moody's/NYU Stern Salomon Center/ICRA Conference on Fixed Income Research in India, the NSE-NYU Conference on Indian Financial Markets, and the IBRN-IMF Conference for helpful comments. We are grateful for financial support provided by the NSE-NYU Stern Initiative on the Study of Indian Capital Markets. The views expressed in this paper are those of the authors and do not necessarily represent those of the NSE or NYU.

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Over the last fifteen years, non-financial corporations in emerging market economies (EMEs) have increasingly issued foreign currency debt in global markets. According to Bank for International Settlements statistics, the stock of foreign currency debt securities of EME non-financial corporations grew eightfold between 2004 and 2019.[1] The magnitude of this debt leaves the borrowing firms exposed to adverse exchange rate movements since their liabilities are in foreign currency. Additionally, given that these borrowers tend to be large local firms, increased foreign currency borrowing may have implications for domestic growth and stability of the local financial sector.[2] With a view to control these incipient risks, many EMEs have made macroprudential regulations more stringent (IMF, 2020).

What caused the surge in foreign currency borrowing by EME corporates? What are the consequences? And how effective are macroprudential controls that seek to limit capital flows in curbing the risks that arise? Much of the extant academic research has focused on hypothesizing channels of transmission and documenting aggregate trends.[3] Our paper contributes to this literature by employing detailed borrowing, accounting, and market data on Indian firms to study the causes and consequences of the rise in corporate foreign currency borrowing. To the best of our knowledge, we are also the first to tease out the impact on this borrowing of a specific macroprudential policy seeking to limit capital flows.

We start by documenting that the *same* firm is more likely to issue debt in foreign currency when the difference in short-term interest rates between India and the United States is higher, i.e., when the dollar "carry trade" is more profitable. This phenomenon is driven by the period immediately following the Global Financial Crisis of 2008.[4] Firms that borrow when the carry trade is more profitable, whom we refer to as carry trade borrowers, see their exposure to foreign exchange risk increase. During periods of market stress such

[1] See Table C3 at https://stats.bis.org/statx/toc/SEC.html.

[2] See Acharya et al. (2015); Shin and Zhao (2013); Chui, Fender and Sushko (2014); Du and Schreger (2017) for a discussion of the potential risks posed by increased corporate foreign currency borrowing.

[3] Important exceptions are Bruno and Shin (2017, 2020); Caballero, Panizza and Powell (2015); Gutierrez, Ivashina and Salomao (2020); di Giovanni et al. (2019)

[4] Prior research has documented that, globally, the carry trade explains foreign currency borrowing in the period of unconventional U.S. monetary policy following the Global Financial Crisis (Bruno and Shin, 2017). Hence, we focus on this period in the bulk of our analysis.

as the "taper tantrum" episode of 2013,[5] it is these carry trade borrowers that perform the most poorly.

However, we show that policy actions can play an important role in curbing these risks. Soon after the taper tantrum episode, the positive relationship between foreign currency debt issuance and the dollar carry trade breaks down. This change coincides with the institution of more stringent interest rate caps on corporate foreign currency borrowing by India's central bank, the Reserve Bank of India (RBI). We show that firms with higher implied interest expenses are those that cut borrowing, suggesting the regulatory constraints do bind. During periods of market stress following the stricter norms, including due to the COVID-19 outbreak in March 2020, the carry trade borrowers are not differentially affected, providing market-based evidence that macroprudential regulation can be effective in mitigating risks inherent in foreign currency borrowing.

Foreign currency borrowing is an increasingly popular source of financing for non-financial firms in emerging markets. For instance, Figure 1 documents the sustained increase in the amount of foreign currency corporate debt outstanding in India. There are three main reasons firms increase their borrowing in foreign markets: (1) if their revenues are earned in foreign currency, the sales provide a natural hedge for the debt and allow firms to access deeper international funding markets;[6] (2) firms wanting to invest in long-lived foreign assets (e.g., oil and gas companies) might want to finance those assets in the same currency as the cash flows (Caruana, 2016); and (3) 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). This carry trade is profitable if firms are able to unwind, i.e., pay off the debt

[5]The taper tantrum refers to a period of turmoil in financial markets in 2013 precipitated by U.S. Federal Reserve statements that were seen to increase the probability of the tapering of the quantitative easing program. Emerging markets, in particular, saw a surge of capital outflows and asset price declines (Sahay et al., 2014).

[6]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 topic since trade financing is generally of a short maturity.

before the currency depreciates.

Disentangling these competing hypotheses requires firm-level analysis. We construct a sample of Indian firms that borrow abroad, both through the bond market and bank loans. We first show that macro factors drive issuance more than firm-specific factors. In particular, the CT index, our proxy for the profitability of the carry trade, defined as the difference between Indian and U.S. 3-month interest rates scaled by the implied volatility of 3-month FX options (i.e., $\frac{3Mrate(IND)-3Mrate(US)}{IVof3MFXoptions}$), has a strong relationship with a firm's propensity to issue foreign currency debt even after controlling for firm fixed effects. The correlation between aggregate corporate foreign currency debt issuance and the CT index is negative before the collapse of Lehman Brothers in September 2008 but strongly positive after. The correlation reverses, however, in the period following the taper tantrum episode, a source of significant stress in emerging markets, including India.

A major innovation in this study is that we link the reversal in carry trade borrowing following the taper tantrum to macroprudential policy action. The taper tantrum led many emerging markets to significantly strengthen their external sector frameworks, viz., ex-post tools (reserves management) and ex-ante tools (capital controls).[7] Acharya and Krishnamurthy (2019) theoretically analyze these tools, and point out that they function as complements rather than substitutes. In their model, firms that contribute more to the fire-sale externality in the case of a "sudden stop"[8] should be taxed more (e.g., be subjected to stronger capital controls).

India provides a good case study to test the implications of the model as Indian capital controls were tightened in 2015. The macroprudential policy we focus on in this paper is the maximum interest rate at which firms can borrow abroad. By regulation, Indian firms can only borrow in foreign currency if the all-in-cost interest rate of the borrowing is below a certain spread over the 6-month LIBOR rate. The RBI sets the maximum allowable spread

[7] See (IMF, 2020) for a detailed summary.

[8] The externality arises because individuals firms do not internalize that, on realization of a negative shock, repaying their past debt leads to exchange rate depreciations further exacerbating the shock (Brunnermeier and Sannikov, 2015; Korinek, 2018).

for the interest rate on the debt and reduced it in 2015 to allow only high-quality borrowers access to the foreign currency debt market.

We test how these interest rate caps impact foreign currency borrowing. We show that the positive relationship between issuance and the CT index is driven wholly by periods in which the maximum allowed interest rate spread is high. When the ceiling is lowered, i.e., regulation is tightened, the relationship breaks down and is, in fact, negative, consistent with the relationship prior to the global financial crisis. This correlation suggests that the CT index stops being relevant at the same time that controls are strengthened. These results are merely correlational; the change in the maximum interest rate spread is not exogenous and is likely a reaction to corporate borrowing in the foreign currency debt market.

In order to determine the role of the macroprudential policy change itself in curtailing borrowing, we test how firms with differing interest expenses react following the change. Since the policy reduced the maximum allowable interest rate on borrowing, the effects of the macroprudential policy should only be seen among firms that issue foreign currency debt at high interest rates, i.e., riskier borrowers. We document that high interest expense firms are those that reduce issuance following the reduction in the maximum allowable interest rate. In other words, the constraint put in place by the policy action does bind and the RBI policy change in 2015 succeeds in restricting access to foreign currency debt to less risky firms.

If a non-fundamental financial factor such as the carry trade is driving foreign currency borrowing, we expect firms with the least fundamental incentive to borrow abroad to increase their borrowing more during these periods. A natural corollary to exporters having a natural hedge when borrowing in dollars is that importers are uniquely exposed. Their revenues are in local currency and they have additional non-interest expenses in foreign currency. Consistent with the asymmetry of exposure between importers and exporters, we uncover a striking aggregate pattern. We find that India's trade balance had a *negative* correlation with the CT index in the period between the onset of the global financial crisis and the

macroprudential tightening in 2015, a correlation that reverses right after. We confirm in firm-level analysis that importers are more likely to borrow when policy is looser, and more stringent interest rate caps are able to prevent these ex ante riskier borrowers from taking advantage of the carry trade.

Having established the characteristics of carry trade borrowers, we investigate the effects on firm outcomes. We show 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 significantly lower in the period between the financial crisis and the taper tantrum. Firms borrow abroad even when they have sufficient sources of funds at home. However, following the taper tantrum, foreign currency borrowing once again serves as a substitute for other sources, and we show that macroprudential tightening is responsible for this change. Carry trade borrowers use the raised funds for investment, the most popular stated rationale, but more importantly to increase cash holdings. Once macroprudential policy restricts their access to the foreign currency debt market, their investment and cash holdings decline while profitability remains unaffected.

Corporate foreign currency borrowers face rollover risks arising from dollar appreciation and tightening international funding conditions. The final step of our analysis is to measure these risks. A stock market-based measure of a corporation's foreign exchange rate exposure (an FX β) rises right after issuance in the post-crisis and pre-taper tantrum period, suggesting firms do not totally hedge their exposure. However, borrowers in the post-taper tantrum period do not see their FX β rise.[9] Once again, we demonstrate that this is due to the imposition of tighter capital controls following the taper tantrum, evidence that a targeted policy action can ameliorate the potential risks of foreign currency borrowing. And again, the entire effect is driven by the firms that are targeted by the policy action – carry trade borrowers and high interest expense firms.

We also confirm this risk reduction via macroprudential policy using the event study

[9] A positive FX β indicates a positive correlation between the firm's stock market return and the Indian Rupee's performance relative to the U.S. Dollar.

methodology. The taper tantrum episode of Summer 2013 was an unexpected negative shock to the exchange rate and equity markets (Chari, Stedman and Lundblad, 2020) during a time when capital controls were looser. The results of our event study show that firms that are more likely to borrow when the CT index is higher are more adversely affected during the taper tantrum stress period. 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 the most vulnerable during times of stress.

We complement the taper tantrum event study with an analysis of two periods of market stress that arose after the tightening of capital controls. The first period of market stress was in October 2018 when there was a sudden depreciation in the Indian Rupee and a spurt of outflows due primarily to an increase in oil prices[10]. The second period of market stress was in March 2020 when Indian markets were roiled by the uncertainty caused by the COVID-19 pandemic. Our analysis of market reactions to both these events suggests that high CT issuers are no longer more vulnerable than other issuer during times of stress. By restricting access to foreign currency debt markets, the RBI policy change appears to have succeeded in mitigating the risks inherent in foreign currency borrowing.

1 Related Literature

Our results fit into a burgeoning literature on the risks to local growth and financial stability from the worsening external debt position of the corporate sector. Du and Schreger (2017) show, in a cross-country setting, that higher corporate foreign currency borrowing is associated with higher sovereign default risk. A set of closely related papers do a firm-level analysis to distinguish between the different hypotheses regarding foreign currency borrowing by EME firms. Bruno and Shin (2017) find that emerging market firms with high cash holdings tend to issue dollar-denominated bonds and add to their cash pile. This behavior

[10]See https://www.business-standard.com/article/markets/rupee-crashes-to-all-time-low-of-73-81-on-capital-outflows-oil-prices-118100400991_1.html

is more pronounced during times when the (financial) carry trade is more profitable.[11]. The profitability of the carry trade is a failure of the uncovered interest rate parity (UIP) condition. Potential explanations in terms of corporate dollar borrowing include household dollar deposit demand (Gutierrez, Ivashina and Salomao, 2020) and bank funding costs (di Giovanni et al., 2019). Caballero, Panizza and Powell (2015) show that this motive is concentrated in countries with higher capital controls on inflows, i.e., regulatory arbitrage is driving this behavior since non-financial firms are better able to circumvent capital controls.

Most of the above 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 and bond financing. The vast majority of foreign currency debt issuance by Indian firms in our sample is through bank loans. Since firms with access to bond markets tend to be larger, our study covers a more representative sample of firms. Importantly, our bank-driven results provide a complement to the hypothesis that the Second Phase of Global Liquidity (Shin, 2014) is driven primarily by global asset managers "reaching for yield" in international debt markets. Our results show that global liquidity transmission is still at work through the bank lending channel. The richness of our data allows us to incorporate firm fixed effects in all our tests. Controlling for unobserved time-invariant firm-specific heterogeneity, our results indicate how the same firm behaves under different macroeconomic and financial conditions.

We also study how the risks arising from foreign currency borrowing manifest during times of market stress. Kaminsky and Reinhart (1999); Goldstein (2005), and Kalemli-Özcan, Kamil and Villegas-Sanchez (2016) study the causes and consequences of currency crises accompanied by banking crises. Bruno and Shin (2020) find that when the local currency depreciates, firms that borrowed in foreign currency when financing conditions were favorable are the ones that experience higher stress in terms of market values. We find similar results when we examine stock market returns for Indian firms around the taper tantrum

[11]There is a vast literature on the classic carry trade wherein financial market participants borrow in a low interest rate currency and invest in a high interest rate currency (e.g., Brunnermeier, Nagel and Pedersen (2008), Lustig, Stathopoulos and Verdelhan (2019)).

episode. Eichengreen and Gupta (2015); Chari, Stedman and Lundblad (2020); and Sahay et al. (2014) study the 'taper tantrum' episode and its impact on asset prices, particularly in emerging markets. Sahay et al. (2014) find that the U.S. Federal Reserve's monetary policy announcement is strongly correlated with asset prices and capital flows in emerging markets, and this phenomenon strengthened during the post-crisis phase of unconventional monetary policy. Our analysis goes a step further by comparing market reactions during periods of stress when domestic macroprudential was looser (taper tantrum) to when it was tighter (COVID-19 crisis).

Our analysis contributes to a wider literature on the centrality of dollar funding and U.S. monetary policy in driving cross-border flows (Rey, 2013; McCauley, McGuire and Sushko, 2015; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020; Bräuning and Ivashina, 2020). Rey (2013) argues that surges and retrenchments in capital flows are driven by a common global factor that can be linked to U.S. monetary policy. This global financial cycle, intermediated by global banks, affects risky asset prices and leverage in recipient countries. Domestic monetary policy or exchange rate management is unable to undo the effects of U.S. monetary policy spillover. Kalemli-Özcan (2019) argues, instead, that U.S. monetary policy spills over into other countries through global investors' risk perceptions and its effect can be undone by allowing exchange rate flexibility. di Giovanni et al. (2019) show the transmission of the global financial cycle to local EME credit markets in the context of Turkey.

Within this broader framework, macroprudential regulations can mitigate the domestic effects of the global financial cycle of capital flows. Ahnert et al. (2020) provide cross-country panel evidence showing that macroprudential regulations reduce bank foreign exchange exposure that leads to more issuance in bond markets. Brunnermeier and Sannikov (2015); Korinek (2018), and Acharya and Krishnamurthy (2019) provide a theoretical analysis of the potential benefits of these tools. In their models, foreign currency borrowing on the part of individual firms creates a negative pecuniary externality since, when the risk of a sudden stop arises, firms scramble to make large dollar repayments, further amplifying the shock.

Prudent macroprudential policy can dampen these risks by discouraging the use of excessive dollar debt. Our detailed firm-level analysis for India provides strong evidence of such dampening in the context of a particular interest rate policy regulating corporate foreign currency debt.

Other papers analyzing macroprudential regulations, in a cross-country panel setting, include Ahnert et al. (2020), Ostry et al. (2012), and Bruno, Shim and Shin (2017). Erten, Korinek and Ocampo (2021) provides a comprehensive survey on capital controls. These policies often have leakages or unintended consequences, as discussed in Reinhardt and Sowerbutts (2015), Keller (2019), and Jung (2016). We do not attempt to quantify the welfare effects of the policies we study but the direct consequence seems to be as intended in the Indian case.

2 India's External Debt: Institutional Background

India's total external debt at the end of March 2019 was $543 billion[12] of which 38% was made up of borrowing for corporate purposes. These borrowings are the largest component of the external debt followed by deposits of non-resident Indians (24%), short-term trade credit (18.9%), and loans from multilateral or bilateral agencies (15.4%).

The share of external corporate debt in the country's overall external borrowing has increased sharply since 2005. In 1995, this ratio was 13.1%. It had risen to only 19.7% by 2005 before escalating to 38% at the end of 2015. It has been around that level since then. 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.

The external commercial debt currently has three major components: (1) Corporate loans

[12]See https://dea.gov.in/sites/default/files/STATUSREPORT2018-19.pdf

and bonds denominated in foreign currency; (2) foreign investment in domestic corporate bonds; and (3) Rupee-denominated bonds issued overseas. We focus on the first component since the latter two refer to domestic currency debt.

One of the features of the Indian market for foreign currency commercial debt is the relative scarcity of bond issuance compared to bank debt. Over 90% of issuance by volume is through the bank route. Given the scarcity of bond issuance, we do not distinguish between the two types of debt in our analysis, and include both types in all our tests. Foreign currency debt is issued to facilitate the import of capital goods, modernization, rupee expenditures on local capital goods, overseas acquisitions, new projects and refinancing of existing debt.

Macroprudential Regulation

Foreign currency corporate debt issuance is regulated by India's central bank, the RBI. The goal of the regulations is to guard against the debilitating effects of a sudden stop (Acharya and Krishnamurthy, 2019). Along with reserve accumulation, capital controls are the primary tools of macroprudential regulation.

In addition to aggregate limits on the volume of foreign currency borrowing by corporations, individual debt issues are also regulated. Limits exist on issue size, maturity, use of funds, and interest rate.[13] All issue sizes above $750 million need central bank approval. The minimum maturity allowed is three years. On-lending or investment of proceeds in capital markets in India is generally not permitted.

The RBI sets the maximum allowed interest rate on borrowing, as a spread over the 6-month LIBOR rate, with a view to controlling access to foreign currency debt markets. These all-in-cost (AIC) interest rate limits vary by maturity and over time. In Figure 2, we plot how the AIC limits have changed over time for issues with maturities of less than five years (Panel (a)) and maturities more than five years (Panel (b)). In October 2008, the maximum AIC limit for longer maturity issues was increased from 350 bps over 6-month

[13]The updated regulations are available at https://www.rbi.org.in/Scripts/BS_ViewMasDirections.aspx?id=11510.

LIBOR to 500 bps over 6-month LIBOR. In November 2015, the maximum AIC limit was reduced to 450 bps over 6-month LIBOR.[14] We use the variation of this limit in the post-crisis period as our measure of the stance of macroprudential policy. A higher (lower) AIC interest rate limit reflects looser (tighter) macroprudential policy.

A potential concern with macroprudential policy action is regulatory arbitrage leading to effects spilling into alternate markets (Ahnert et al., 2020). The policy change we analyze, the change in AIC interest rate limits, applies to all forms of foreign currency debt suggesting that this should not be as major a concern in our setting. However, in Section 8, we also briefly study the effects on domestic currency bonds issued abroad which are not subject to the interest rate caps we study.

3 Data and Summary Statistics

The RBI maintains a public database on the foreign currency borrowing of Indian firms.[15] The data, available from January 2004 onwards, has the following information on all instances of issuance: the identity of the borrower, issue size in U.S. dollars, maturity, and calendar month and year of issue. Our sample covers debt issued between January 2004 and October 2019. Over this period, there were 12,452 instances of foreign currency borrowing by 5,355 distinct firms.

Accounting and stock price data are from the Prowess database which has annual balance sheet and income statement data as well as daily data on stock prices. Since the financial year ends on March 31 for the vast majority of Indian firms, our Prowess sample covers the period from March 2004 to March 2019. We also collect data on exchange rates and interest rates from Datastream.

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 two data sources, we match names

[14] The AIC interest rate limit on issues with maturities of less than five years was also increased in November 2011. In the empirical tests, we use the AIC limit corresponding to the maturity of the issue.

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

using a string-matching algorithm and supplement this approach with a manual match for verification and completeness. This process results in a match of 1,786 firms between the two databases. Although these 1,786 firms are only 33.4% of the firms in the RBI database, they account for 46.7% of the issuances and 82.6% of the total amount issued. The firms that are not matched are mainly financial firms, which we exclude from our analysis, and smaller private firms for which financial data are unavailable in Prowess. The matched Prowess-RBI sample is the basis of all the analysis from here forward.

Figure 3 shows some of the characteristics of the foreign currency debt issued by firms in the matched sample. Panel (a) shows that the average (inflation-adjusted) issue amount rose from less than $30 million to over $50 million in a four-year span (2004-2007) just before the financial crisis. Issue sizes decreased during the crisis and right after but started rising around 2012. There was another sharp decrease in 2015-2016 but they started climbing again and reached their highest level at the end of the sample period in October 2019.

Compared to issue size, maturity is much less volatile, averaging near six years throughout the sample. Panel (b) of Figure 3 is a histogram of issue maturities. Issues of a maturity less than three 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 time 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 years are, by far, the most popular kind of claim issued.

Panel A of Table 1 provides summary statistics for the issuance characteristics of the firms in the matched Prowess-RBI sample. From 2004 to 2019, these 1,786 firms issued 5,821 foreign currency debt claims. The median firm borrowed twice in the period, while the firm at the 95th percentile borrowed ten times. There is a significant positive skew in issue size as the median size is $13 million but the average size is $59.4 million.

In Panel B of Table 1, we examine key balance sheet measures and ratios for the sample firms. Current and fixed assets are held in similar proportions (0.370 vs. 0.341). On the liabilities side, the median firm-year has a debt-to-asset ratio of 0.353. Most of the debt is long-term, i.e., not due within the next year. The median long-term to total debt ratio is 0.727. Prowess also has some data on the outstanding foreign currency debt of firms. Their definition of foreign currency debt 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 0.290 for the median firm-year. There is a wide variance in this ratio, with the standard deviation being 0.291, almost the same as the median. Interestingly, foreign currency borrowing is not dominated by export-dominated firms. In fact, the median firm-year in our sample of foreign currency debt issuers has an exports-to-sales ratio of less than 3%. A majority of the firms that borrow abroad do not have a natural hedge through the channel of foreign currency revenues.

4 Carry Trade and Foreign Currency Debt Issuance

In this section, we test the determinants of the issuance decision. Motivated by the results in Bruno and Shin (2017) and Caballero, Panizza and Powell (2015), 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 is that Indian firms issue more foreign currency debt 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:

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

The left-hand side variable takes the value 1 if firm i issues foreign currency debt 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 (2017), 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 U.S. standardized by the implied volatility of 3 month INRUSD options. It can be thought of as the Sharpe ratio of the carry trade. We control for the aggregate stock market return using the NIFTY index return and for the foreign exchange return using the INRUSD return defined as $\frac{P_t - P_{t-1}}{P_{t-1}}$ where P_t is the number of U.S. dollars required to buy 1 Indian rupee at the end of period t. A negative INRUSD return indicates depreciation of the Indian rupee relative to the U.S. dollar. To control for firm-level determinants, we include a set of accounting measures recorded at the previous fiscal year-end. These are total assets, leverage, cash-to-assets ratio, and exports-to-sales ratio. 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. Standard errors are clustered at the firm level.

Results

Figure 4 shows how aggregate issuance and our carry trade index (CT) move over time. The figure is quite stark - before the financial crisis of 2008 (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 foreign currency debt issuance and the profitability of the carry trade seem to be strongly positively correlated. That is, until the taper tantrum episode of Summer 2013 (indicated by the dashed green lines). During May-September 2013, the U.S. Federal Reserve made a series of statements about the probability of the tapering of their quantitative easing (QE) program. Sahay et al. (2014) show that the taper tantrum led to a surge of capital outflows from emerging markets, creating turmoil and a sharp decline in asset prices including in equities. Dollar liquidity declined precipitously, and tighter funding conditions were anticipated.

Following the taper tantrum, the correlation between foreign currency debt issuance and

the CT index is considerably weakened. The table below Figure 4 reports the monthly pairwise correlations between issuance activity (both counts and volume) and the CT index. Over the whole sample, the correlation is near zero. However, this masks widely differing correlations across three distinct periods. From January 2004 to August 2008 ('pre-crisis'), the correlation is moderately negative. Between September 2008 and September 2013 ('post-crisis'), the correlation is strongly positive but weakens starting October 2013 ('post-taper') and after the macroprudential tightening of November 2015, it turns strongly negative.

We systematically confirm these patters at the firm-month level by estimating Equation 1. The results are in Table 2. Excluding the firm-level market return allows us to include private firms in these tests. In the first four columns, we analyze the extensive margin by using an indicator for whether the firm issued in a given month as our dependent variable. In columns (5)-(8), we analyze the intensive margin by using the log of the amount of foreign currency debt issued in a month by a firm as our dependent variable.

The results in columns (1) and (3) show that a higher value of the CT index predicts higher foreign currency borrowing in the next month. The effect is statistically significant at the 1% level. In the specifications with firm fixed effects (column (3)), it means that the same firm is more likely to issue foreign currency debt 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) of Table 2, a one standard deviation increase in the CT index (The CT index has a standard deviation of 0.263 during the sample period) would increase a firm's probability of issuing by 11.8%. On the extensive margin, the results are also significant indicating larger amounts borrowed when the carry trade is more profitable. A one standard deviation increase in the CT index would increase the amount borrowed by 3.9%. Interestingly, the magnitudes are larger on the extensive margin than the intensive. This indicates that the issuance decision itself is more sensitive to the carry trade than the amount of issuance. Overall, these results strongly support our first hypothesis that firms in India borrow in foreign currency when the carry trade is more profitable.

Does the propensity to issue when the carry trade is more profitable change over time? The aggregate evidence in Figure 4 seems to suggest so, but is this true at the firm level? To test this, we re-estimate equation 1 but with a couple of additional variables included. The first is the interaction of the CT index with a dummy variable that takes the value 1 for the period between September 2008 and September 2013 ('post-crisis'). The coefficient on this interaction term is the differential probability of issuing in the post-crisis period. The second is the interaction of the CT index with a dummy variable that takes the value 1 for the period after September 2013 ('post-taper'). The coefficient on this interaction term is the differential probability of issuing in the post-taper tantrum period. The differential effect for both interaction terms is relative to the effect of the CT index in the baseline or pre-crisis period.

The results are in columns (2) and (4) (for issuance indicator) and columns (6) and (8) (for issuance amount) of Table 2. The results are again consistent across specifications. In column (4), the coefficient on CT is insignificant though negative in magnitude. In the pre-crisis period, issue propensity is not significantly related to the carry trade profitability. However, in the post-crisis period, the coefficient is positive and significant. The magnitude is large – the coefficient of 1.286 implies that a one standard deviation increase in the CT index would increase a firm's probability of issuing by 33.8%. For the post-taper tantrum period, the coefficient on the interaction is small and insignificant suggesting the effect of the CT index on issuance is similar to that before the crisis. We find similar results when the amount issued is the dependent variable. The result in column (8) suggests that the amount of foreign currency borrowing is significantly related to the carry trade only during the post-crisis period. Once again, the sensitivity of the amount issued is smaller than the issuance decision itself.

5 The Effect of Macroprudential Policy Action

The analysis in the previous section shows that there were three clear phases of foreign currency borrowing in India. The first was prior to the global financial crisis. During this phase, the carry trade was not a determinant of corporate foreign currency debt issuance. In the second phase, during and immediately following the crisis, the carry trade became a strong predictor of issuance. Finally, in the period following the taper tantrum, the carry trade again became less important. The transition from the first to the second phase seems to be a result of the crisis and ensuing monetary policy expansion in the U.S. (Rey, 2013; Bruno and Shin, 2017). Our interest is in the transition from the second to third phase and the role played by local macroprudential policy, if any.

In response to risks arising from enhanced foreign currency borrowing, many EMEs tightened macroprudential regulation (IMF, 2020). India was among them, tightening limits on aggregate borrowing, investments by investor type, debt maturity, and cost of borrowing (Acharya and Krishnamurthy, 2019). Of these measures, we test the effects of reducing the ceiling on the all-in-cost (AIC) interest rate of foreign currency borrowings. We hypothesize that this tightening, soon after the taper tantrum episode, prevented riskier firms from using foreign currency borrowing as carry trades. Figure 2 shows how the maximum AIC limits vary over time. There are different limits for issuances of less than 5 years and those more than 5 years. The maximum AIC limits are specified as spreads are over the 6-month LIBOR rate.

To test our hypothesis, we estimate a variant of our baseline Equation 1. We include a dummy for whether the AIC spread is over its sample median in the post-crisis period from September 2008 onwards.[16] A *High AIC* spread signals looser macroprudential regulation. We also include a term which is the interaction of *CT* and *High AIC* spread. This coefficient on this interaction term is our coefficient of interest. We hypothesize that this coefficient

[16] We restrict ourselves to the period from September 2008 onwards as our interest is in the transition from the second to third phase.

should be positive. If the AIC spread is high, the carry trade plays a greater role in explaining issuance. Conversely, when the AIC spread is low, i.e., regulation is tight, the carry trade motive is less important.

Results

Before we present the results, we provide evidence that the macroprudential policy action of reducing the maximum AIC limit did have an effect on the distribution of foreign currency borrowers. Since the policy action targets the maximum allowable interest rate, we would expect that, following tightening of policy, the distribution of borrower interest costs would be narrower and the effect would be driven by the right hand side of the distribution. This is exactly what we find, a result we show both graphically and through regression analysis.

In Figure 5, we show kernel density estimates of the distribution of (standardized) borrower interest costs.[17] The solid (dashed) line show the distribution when the maximum AIC limit is above (below) its sample median. The right tail of the distribution is fatter for the High AIC distribution compared to the Low AIC distribution.

In Panel A of Table 3, we regress a proxy for the spread of the interest costs in the right tail of the interest cost distribution on the stance of macroprudential policy. The proxy we use is the difference in interest costs between the borrower at the 90th percentile and the median borrower in a month scaled by the standard deviation of interest costs in that month. The results for the post-taper period are particularly instructive - in the period before the macroprudential tightening in 2015, the spread is significantly higher than after the tightening, indicating that the distribution of borrowers does change following the macroprudential action.

As a placebo test, in Panel B of Table 3 we regress a proxy for the spread of the interest costs in the left tail of the interest cost distribution on the stance of macroprudential policy. Here, the proxy is the difference in interest costs between the borrower at the 10th percentile

[17]Since we do not have the interest rate per issuance, we use the interest expense in a year scaled by debt to get the borrower interest cost

and the median borrower in a month scaled by the standard deviation of interest costs in that month. In contrast to the right tail, in none of the periods does macroprudential policy affect the left tail which is what we would expect since the policy placed interest rate caps for high interest cost borrowers. The results in Panel B also help rule out that what we capture is some other shock contemporaneous with the macroprudential policy.

Together, the results in Figure 5 and Table 3 provide us with evidence that the macroprudential tightening was a relevant shock to higher risk foreign currency borrowers in India.

Next, we test our hypothesis that macroprudential policy reduced carry trade borrowing. The results are presented in Table 4. The coefficient on the interaction term of CT and *High AIC Spread* is positive and highly significant in all specifications - with and without firm fixed effects and on the extensive margin (issuance decision) and intensive margin (issuance amount). The results imply that, from 2008 onwards, the carry trade motive explains issuance only when macroprudential regulation was loose. In periods when limits on borrowing costs were tight, the carry trade's relationship with issuance was actually negative. Given that tighter limits were introduced only after the taper tantrum episode (Figure 2), these results potentially explain the dichotomy we find in the post-crisis and post-taper periods in our earlier results. The carry trade motive became less important due to macroprudential regulation.

To confirm that the macroprudential regulation is responsible for curbing carry trade borrowing, we conduct another test. Since the regulation we study is a cap on the cost of borrowing, we would expect it to reduce borrowing among firms with high costs of borrowing. Although we do not see actual borrowing costs in the RBI issuance data, we can use Prowess financial data to get an implied annual interest cost for each firm.[18] Our assumption is that riskier firms will have higher interest costs in both domestic and foreign borrowing markets. Our hypothesis is that firms with high interest costs are more likely to borrow when regulations are loose (*High AIC Spread*) and CT is high. To implement this, we

[18]This is simply the annual interest expense divided by the average debt outstanding over the year.

extend the previous methodology to include a triple difference term which is the interaction of *CT*, *High AIC Spread* and the firm's implied interest cost.

The results are in Table 5. The triple interaction of interest is in column (2) for the issuance decision and column (4) for the issuance amount. In column (2), the coefficient is positive and significant implying that when the carry trade is profitable and regulations are looser, firms with high interest costs, i.e., riskier firms are more likely to issue foreign currency debt than firms with lower interest costs. Conversely, the negative coefficient on the interaction of *CT* with *Interest Cost* indicates that when carry trade is profitable but regulations are tighter, firms with higher interest costs, i.e., riskier firms are less likely to issue foreign currency debt than firms with lower interest costs. Overall, these results confirm that the regulations do bind and do prevent riskier firms from taking advantage of the carry trade. The insignificant coefficient on the triple interaction term in column (4) further supports our conjecture that the role of the macroprudential policy is preventing riskier firms from accessing foreign currency debt markets. For firms that are still able to access such markets, the effect on issuance size is insignificant.

Importers are naturally exposed to foreign currency appreciation. Their revenues are local but expenses are in foreign currency. Importers who borrow in foreign currency are thus uniquely exposed to exchange rate risk.[19] If a non-fundamental financial factor such as the carry trade is driving borrowing, we expect firms with the least fundamental incentive to borrow abroad (importers) to increase their borrowing more during these periods compared to exporters and purely domestic firms.

A striking aggregate pattern we uncover on plotting India's trade balance against *CT* is that in the period between the onset of the financial crisis and the macroprudential tightening of 2015 (Figure 6), the correlation is strongly negative. Before the crisis, it was nearly zero. Following the imposition of capital controls in the form of interest rate caps on foreign currency borrowing, the correlation becomes strongly positive. These results suggest that

[19]This is a corollary of exporters having a natural hedge when they borrow in foreign currency

imports surge relative to exports when funding conditions are favorable and macroprudential policy is loose. The surge in imports could be due to importers using foreign currency debt to fund expansion.

We conduct a firm-level analysis to confirm this finding. We set up a similar specification as in Table 5 but replace *Interest Cost* with the fraction of raw materials that are imported (*Imp/RawMat*). The results are in Table 6. The coefficients on the triple interaction in columns (2) and (4) provide strong evidence that when AIC spreads are high and the CT index is high, firms with a higher fraction of imports are more likely to issue foreign currency debt and to borrow more. These results confirm that easier funding conditions invite ex ante riskier firms[20] into the issuance market but macroprudential tightening can reverse this phenomenon.

6 Effects on Firm Outcomes

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 state 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 foreign currency debt proceeds are being used in practice, we follow the methodology of Kim and Weisbach (2008), which allows us to benchmark the U.S.e of foreign currency debt proceeds with funds raised by the firm through other sources. We define two new variables: firstly, $Log(1 + \frac{FCDebtAmount_{it}}{TotalAssets_{i,t-1}})$ where $FCDebtAmount_{it}$ is the total amount (in INR) that the firm i raised through the foreign currency debt route in year t[21]; and secondly, $Log(1+\frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$. We measure other sources of funds as the difference

[20] Here they are risky since they are naturally exposed to adverse exchange rate movements

[21] The RBI data has these amounts in U.S. dollars. We convert to Indian rupees using the INRUSD

between total sources and the amount raised through foreign currency debt 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 amounts by beginning-of-year assets, and take logs to minimize the impact of outliers. Before we test how foreign currency debt funds are used, we analyze the substitutability between foreign currency debt and other sources of funds. We estimate the following equation by OLS:

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

Controlling for beginning-of-year assets as well as firm and year fixed effects, we use this model to examine how sensitive foreign currency 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 foreign currency debt route. Since the other sources of funds are primarily comprised of internally generated funds and domestic debt, using the pecking order theory (Myers and Majluf, 1984), we expect them to be prioritized as a source of funds compared to foreign currency debt.

Next, we test how firm outcomes evolve for firms that borrow when the carry trade is more profitable. We compare outcomes in the post-taper period to the post-crisis period, as well as when policy is loose compared to when it is tight. To identify carry trade borrowers we define a *Firm CT* index which is a weighted average of the *CT* index in the months when the firm borrows abroad. The weights are the volume of foreign currency debt issued. To construct *Firm CT*, we only use firms with at least 4 issuances in the sample. We estimate the following regression by OLS at the firm-fiscal year level:

$$Y_{ijt}=\alpha_i+\beta\text{Post-Taper}_t\times\text{Firm CT}_{ij}+\gamma X_{ijt}+\delta_{jt}+\varepsilon_{ijt} \tag{3}$$

exchange rate at the end of the calendar month in which the issuance was undertaken

The dependent variable, Y_{ijt}, can be (i) gross investment (change in gross fixed assets from year t-1 to t) in year t, (ii) cash holdings at end of year t, (iii) debt at end of year t, and (iv) profits in year t. All dependent variables are scaled by year t assets.

The independent variable of interest is the interaction of a *Post-Taper* dummy with the value of the *Firm CT* index. The coefficient β tells us how the outcome changes in the post-taper period for a company which generally issues when the CT index is high compared to one which issues when the CT index is low. Industry-year fixed effects are included to control for industry-wide macroeconomic shocks and ensure all comparisons are between firms in the same industry 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 7. In column (1) the coefficient on $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$, i.e., β is -0.076 and is significantly different from zero at the 1% level. When funds raised through other sources are higher, proceeds from foreign currency debt 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 due to favorable funding conditions, we expect the substitutability between foreign currency debt 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 between September 2008 and September 2013, we find that the coefficient on this interaction term is positive and significant, and its magnitude is nearly half that of β in the same regression (0.036 vs. -0.086). The substitutability between the two types of funds is significantly lower (though still present) post the financial crisis. However, in the post-taper period, the substitutability returns to the pre-crisis level. The coefficient on the interaction between $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$ and *PostTaper* is insignificant.

Was the return to the pre-crisis level a result of the macroprudential regulation of the

RBI? In the previous section, we saw that the positive link between the CT measure and foreign currency debt issuance was broken once tighter borrowing norms were imposed. We test whether the decline in substitutability is also reversed following the lowering of maximum borrowing costs. In column (3) of Table 7, we interact $Log(1 + \frac{OtherSources_{it}}{TotalAssets_{i,t-1}})$ with *Hi AIC*, a dummy taking the value 1 when maximum borrowing costs are above their sample median. We find that the coefficient on this interaction is negative, indicating that when macroprudential policy is loose, the substitutability between sources is lower; firms are borrowing abroad even though they might have sufficient funds from other sources. Another way to look at this is that the post-taper reversal is driven by the tightening of policy.

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-estimate the regressions but restrict the sample to only those firm-years in which the firm issued abroad. These results are in columns (4)-(6) of Table 7. We see that the coefficient β is still negative and significant, and is larger in magnitude (-0.145 in column (3) vs. -0.076 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. The results in column (5) and (6) are also consistent with this. In the post-crisis period, the association between other funds and the foreign currency debt amount is less negative than in the pre-crisis period.

How do we interpret the magnitudes in these tables, such as the -0.145 coefficient in column (4)? The median firm-year has a ratio of other sources to beginning-of-year assets of 0.136 (Panel B of Table 1). If there is a 20% positive shock (0.0272) to this value, keeping all else equal, the reduction in foreign currency debt amount would be from median value 0.096 of total assets to 0.092, a decrease of about 4%. Perhaps surprisingly, the magnitude

of the substitution is not as large as one might expect.

Next, we turn to firm outcomes. The results are in Table 8. In Panel A, we find that firms with a high *Firm CT* index see a reduction in investment and, more strongly, cash holdings in the post-taper period. There is no effect on leverage or ROA. We've seen earlier that the sensitivity of issuance to carry trade profitability reduces following the taper tantrum, and now we confirm that the firms which are likely to have taken advantage of the carry trade cut down on investment but more strongly on cash holdings, a result consistent with carry trade behavior (Bruno and Shin, 2017).

In Panel B of Table 8, we examine whether the difference between the post-crisis and post-taper period is due to macroprudential policy. When the AIC spread is high, i.e., policy is loose, issuers with a high *Firm CT* index have higher investment and cash holdings. Equivalently, when policy is tightened, their investment and cash holdings are lower. This confirms that tighter macroprudential policy constrains issuers who take advantage of carry trade borrowing, and affects their investment and liquidity position.

7 Firm Exposure to FX Risk

Having studied the determinants and uses of foreign currency borrowings, we now examine how these borrowings affect firm risks, particularly foreign exchange risk. A primary concern that regulators express about the rise in foreign currency debt issuance is that borrowers leave the resulting foreign currency exposure unhedged (Ministry of Finance, 2015). Two primary reasons are identified as to why companies might not hedge this exposure: first, the local derivatives market is illiquid and firms lack access to offshore markets; and second, firms imagine an implicit guarantee from the RBI that it will not let the currency depreciate outside a narrow band.[22] To measure the extent of exposure that is left unhedged, we look at market-based measures obtained from stock returns.

To obtain a market-based measure of foreign exchange risk, we estimate the following

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

market model separately for each firm:

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

where r_{it} is the return for firm i in month t, r_{Mt} represents the return on the broader Indian stock market and is proxied by the NIFTY index return, and $r_{FX,t}$ is the INRUSD monthly return. The model is estimated using OLS with an estimation window of 60 months,[23] which allows us to obtain rolling estimates of β_{FX} for each firm. Low FX β firms, presumably exporters, are the ones that do well when the Indian rupee depreciates against the U.S. dollar while high FX β firms are the ones that do badly. Summary statistics in Panel C of Table 1 suggest that the median firm in our sample has an FX β of 0.11, indicating that the median firm would lose value on a currency depreciation.

Motivated by concerns expressed by policymakers, we hypothesize that firms that borrow abroad do not fully hedge their foreign exchange exposure. This leads to the hypothesis that firm FX $\beta's$ increase following foreign currency debt 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 60-month trading window starting at the beginning of month t. The independent variable is a dummy that takes a value of 1 if firm i issued foreign currency debt in month $t-1$. We include firm and month fixed effects since the analysis is at the firm-month level.

The results from this estimation are presented in Table 9. In column (1), we see that the FX β does not change right after foreign currency debt issuance in the full sample. We next introduce interaction terms to test whether the lack of a change in foreign exchange risk exposure after issuance holds during different periods. Motivated by our prior

[23] Results are similar with 36 and 48-month estimation windows.

analysis, we introduce two interaction terms so we can test across three time periods. $Issue \times PostCrisis$ is 1 if the issuance takes place between September 2008 and September 2013 while $Issue \times PostTaper$ is 1 if the issuance takes place after September 2013. On estimating this regression, we find that the the coefficient on $Issue$ is negative and significant (column (2)), suggesting that in the base pre-crisis period, foreign currency debt issuance is associated with a *decline* in FX β, perhaps reflecting a selection effect, i.e., firms start borrowing abroad exactly when their risk exposure to currency depreciation reduces, perhaps through an expansion in their export business. However, in the post-crisis period, this phenomenon is reversed with FX β rising post issuance. The positive, significant coefficient of 0.118 on the interaction term is large given a median FX β of 0.109. This result suggests that currency risk for foreign currency borrowers increases only in the post-crisis period. In the post-taper period, risk changes are not significantly different from the pre-crisis period.

The reversion to the pre-crisis pattern in the post-taper period is consistent with our prior analysis that macroprudential policy tightening soon after the taper tantrum changed aggregate borrowing behavior by restricting riskier firms from accessing foreign currency debt. In column (3) of Table 9, we directly test for this phenomenon by introducing an interaction term $Issue \times HiAIC$ which is 1 when the max AIC allowed is above its sample median, i.e., when policy is loose. We find the coefficient on this interaction term to be positive and significant. This means that when policy is less stringent, the firms that borrow see their foreign exchange exposure go up. In other words, when policy is stricter, riskier firms are unable to access the foreign currency debt market, hence firm-level foreign exchange risk does not increase during these periods.

Next, we conduct the same tests but use the NIFTY (or market) β as the dependent variable. In columns (4)-(6) of Table 9, we find that there is no significant change of the market β in either the full sample or any of the three distinct periods. These results serve as a placebo test and emphasize that the effects we detect are indeed due to the foreign currency debt issuance, not to some fundamental change in the firm's business risk.

Next, we test how the FX β post-issuance changes for different sets of firms. In Panel A, we split firms by their *Firm CT* measure while in Panel B, we use the *Interest Cost*. Do firms which borrow when funding conditions are favorable (*High Firm CT*) or firms which pay higher interest rates (*High Interest Cost*) see more of an increase in FX β following issuance?

The results in Table 10 suggest that this is true. All the increase in post-issuance FX β that we see in Table 10 comes from *High Firm CT* and *High Interest Cost* issuers. The macroprudential policy is effective because it constrains exactly these firms and hence is able to keep FX risks down.

These results are consistent with models that emphasize that firms do not internalize the pecuniary externality created by their individual borrowing (Brunnermeier and Sannikov, 2015; Korinek, 2018). It is exactly when the risk of a sudden stop rises that these firms need to scramble for foreign currency to pay off their debts putting additional downward pressure on the local currency, further stressing their balance sheets. A direct implication is that the local currency should depreciate more when more corporate foreign currency debt is due to be repaid analogous to carry trade unwinding by financial market participants leading to currency crashes (Brunnermeier, Nagel and Pedersen, 2008). We test this time series implication and present the results in Appendix Table A.1. Our issuance data tells us the month in which the bond or loan matures. We calculate the total amount of corporate foreign currency debt maturing in each month. This number is determined years in advance of the maturity date itself. But we find that the change in the log amount of foreign currency debt maturing negatively predicts the change in the logged exchange rate, i.e., it predicts a rupee depreciation. The effects are stronger for issuances that take place following the crisis and before the tightening of macroprudential policy.

Taper Tantrum and COVID-19 as Natural Experiments

A tightening of international funding conditions and dollar appreciation pose rollover risks to corporations that borrow abroad (Acharya et al., 2015). Capital controls and reserve accumulation on the part of the monetary authority are strategies that may help countries cope with the risks posed by a sudden stop (Acharya and Krishnamurthy, 2019). In the previous section, we saw that the tightening of borrowing cost ceilings in India was effective in ameliorating the carry trade motive when it came to foreign currency borrowing. However, was it successful in reducing the risks associated with foreign currency borrowing? To test this, we conduct tests in the spirit of Bruno and Shin (2020) who find that local currency depreciation is associated with higher market stress for firms that use foreign currency borrowing as carry trades, i.e., borrow cheaply abroad and invest in liquid assets locally. We conduct our analysis using the event study methodology focusing on discrete, unexpected events characterized by capital outflows and sharp depreciation in the Indian rupee.

The first set of events involve the 'taper tantrum'. We use U.S. Federal Reserve statements on the probability of tapering of the quantitative easing program 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 of, the Indian rupee declined almost 14% against the U.S. dollar while the NIFTY market index fell about 2.35%. In fact, the RBI responded in August 2013 by imposing capital controls on outflows by residents.[24]

We use an event study to analyze which foreign currency borrowers experienced the largest abnormal stock returns, and how this was related to their propensity to borrow when the carry trade is favorable. To identify the effects of the taper tantrum episode, we focus on three events that market participants identify as having significantly altered the probability

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

of tapering:

- *May 22, 2013*: In a testimony to the Joint Economic Committee of the U.S. Congress, Federal Reserve Chairman Ben Bernanke suggested that tapering could begin after the next couple of meetings of the Federal Open Market Committee (FOMC).[25]

- *June 19, 2013*: In a press conference following the FOMC meeting, Chairman Bernanke again suggested that asset purchases would be reduced later in 2013.[26]

- *September 18, 2013*: After the FOMC meeting, Chairman Bernanke unexpectedly announced that the Fed was going to delay tapering till economic conditions improved.[27]

We consider the first two dates as having increased the probability of tapering while the third decreased it. Consistent with this interpretation, we find that the Indian rupee 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.[28] In the results that follow, for the sake of brevity, we only report results from the events of June 19, 2013. Market reactions were strongest on that date and we believe that date provides the cleanest shock related to tapering.

The'taper tantrum episode divides the post financial crisis period into two parts in our prior analysis. At the time of the taper tantrum, capital controls were looser. Following the episode, they were tightened. We complement our taper tantrum event study analysis with two events that took place in the post taper tantrum period, specifically in the period after the tightening of capital controls. These are:

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

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

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

[28] 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

- *October 3, 2018*: In October 2018, there was a sudden depreciation in the Indian rupee and a spurt of outflows owing primarily to an increase in oil prices.[29]

- *March 11, 2020*: In light of the intensifying COVID-19 pandemic, U.S. President Donald Trump announced a series of restrictions including bans on travel from most of the European Union. This led to a sharp decline in global markets including India.[30]

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 date. The estimated market and FX βs 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 three trading days following the event (CAR[0,3]).

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 measures the propensity of firms to issue when the CT value is high. For each firm that has at least four 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 measure are those with a higher propensity to issue when the carry trade is more profitable. Our second sorting metric is the implied *Interest Cost* in the period before the event.

Event Study Results

Table 11 presents the event study results. Panel A presents the results based on the firm-specific CT measure; in Panel B, the results are based on the implied *Interest Cost*.

The results in column (1) of 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 negative

[29] See https://www.business-standard.com/article/markets/rupee-crashes-to-all-time-low-of-73-81-on-capital-outflows-oil-prices-118100400991_1.html

[30] https://www.livemint.com/market/live-blog/sensex-nifty-live-today-12-03-2020-nifty-nse-bse-news-updates-11583982298421.html

abnormal reaction to the taper tantrum (6/19/13). Their CAR is smaller than -2%, about 2% worse than low CT issuers. Figure 7 shows the difference in CAR for high and low CT issuers as it develops over the five days before and after the event date. The difference in CAR between high and low CT issuers is large in magnitude and statistically significant (at the 10% level), although we have a small sample of firms since we need firms that have issued at least four 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 June 19, 2013). Since we are controlling for the overall market reaction in the market model, this implies that foreign currency borrowers perform worse as compared to non-borrowers, who can be thought of as the omitted group.

The results in Panel B of Table 11 suggest that the abnormal reaction post event is sharpest for the firms with high interest costs. Over the three-day period following June 19, 2013, the CAR for low FX β firms was 0.5% points more negative than that for low interest cost firms; however, this difference is statistically insignificant.

When we turn to our two post-taper events, the results in columns (2) and (3) suggest that high CT issuers now no longer react significantly worse to negative events. The magnitude of the difference across firms is significantly lower, suggesting that in an environment of tighter capital controls, the difference in risk exposure between high and low CT issuers is significantly lower. The same lack of difference exists between high interest cost and low interest cost firms.

8 Other Macroprudential Policies and Time Periods

The results so far provide strong support for our hypothesis that the RBI's tightening of macroprudential policy in 2015 via lower interest-rate caps for foreign currency borrowing led to a decline in such borrowing by carry trade borrowers. There are, however, a couple of alternate explanations that could be consistent with the results we obtain. We attempt to rule them out in turn. In this section, we briefly discuss other policy changes made by

the RBI around the same time as the policy we study. We also test whether reductions in borrowing costs prior to the crisis had similar effects as in the post-crisis period.

Other policies targeted at external debt may have induced an indirect effect in foreign currency debt issuance. We focus on two key changes: guidelines on the issuance of rupee-denominated bonds in overseas markets and the relaxation of limits on foreign investment in domestic corporate bonds. The rupee bond guidelines were introduced in September 2015 and the first set of bonds were issued in the third quarter of 2016. To rule out the decline in foreign currency debt issuance we document is not just substitution to overseas rupee bonds, we collect data on the latter. Appendix Figure B.1 shows the evolution of rupee bond issuance since 2016, along with the foreign currency debt issuance over the same period. The figure shows that rupee bond issuance is significantly lower than foreign currency debt and the volume of rupee bonds has declined significantly over time. The volume of non-financial rupee bond issuance averages only 5% of the volume of foreign currency debt issuance from 2016 to 2019. Many rupee bond issuers are financial firms, a category we exclude in our analysis.

The RBI imposes capital controls through the imposition of limits on foreign investment in Indian debt and equity markets. In Appendix Figure B.2a, we plot foreign investment against the maximum limits. The limits were fixed from 2013 to 2017 but in early 2018, the RBI started gradually loosening them and has continued to loosen them. Foreign investment in domestic debt reached its peak in August 2019, at almost the maximum limit, but has declined since then and is well below 50% of the maximum limit at the moment. In Appendix Figure B.2b, we plot net foreign investor flows in domestic debt over our entire sample period. The graph indicates that flows have become significantly larger and more volatile since the financial crisis. There were significant outflows due to the taper tantrum, but these reversed soon after. Importantly, the macroprudential tightening of foreign currency borrowing in November 2015 is not accompanied by significant inflows. This enables us to rule out that the results we document are an artifact of foreign investors substituting foreign currency

corporate debt with domestic currency debt.

Lastly, we test how macroprudential tightening affected issuance in the pre-crisis period. Since tightening is economy-wide, it is possible that some unobserved time-varying shock is driving our results. Although our cross-sectional tests using interest costs and import share point against this explanation, we also conduct a placebo test to rule it out further. Since we have already shown that *CT* did not predict issuance in the pre-crisis period, we would not expect macroprudential tightening in this period to affect carry trade borrowing. The RBI did lower AIC limits on borrowing in 2007. In Appendix C, we report the results from the pre-crisis complements to Tables 4, 5, and 6 and find no evidence of the interaction of *CT* and *High AIC Spread* playing any role in issuance behavior. In Appendix Table C.2, we find that the total effect of tightening on *High Interest Cost* firms is near zero. This suggests that the AIC limits in the pre-crisis periods were not binding. This could be due to the difference in the type of firms borrowing in the pre-crisis period. The median interest cost of *High Interest Cost* firms in the pre-crisis period is 3 percentage points lower than of those firms in the post-crisis period, further suggesting that favorable funding conditions following the crisis attracted riskier firms to the foreign currency debt market.

9 Conclusion

In this paper, we examine the foreign currency borrowing of Indian firms from 2004 to 2019. We find that firms are more likely to borrow in foreign currency when the dollar carry trade is more profitable. Carry trade borrowers are riskier and significantly more likely to suffer poor stock market returns during periods of market stress. However, macroprudential regulation can play a role in alleviating the risk arising due to foreign currency borrowing. We show that the imposition of tighter capital controls in 2015, in the form of interest rate caps on foreign currency debt issues was successful in restricting access to higher quality borrowers. Subsequently, during periods of market stress, carry trade borrowers were no longer harder hit than other borrowers.

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 currency borrowings. Given that we find favorable funding conditions to be a much stronger determinant of issuance than any firm-level factors, it is reasonable to conclude that these risks will re-emerge as we enter another U.S. monetary policy easing cycle owing to the COVID-19 pandemic. Our results indicate that capital controls can be a means of curbing risk-taking on the part of the corporate sector. However, this must be balanced against the imperative of allowing local firms access to sources of funding that may be cheaper than local sources. Proper targeting of macroprudential regulation is required to balance these competing interests.

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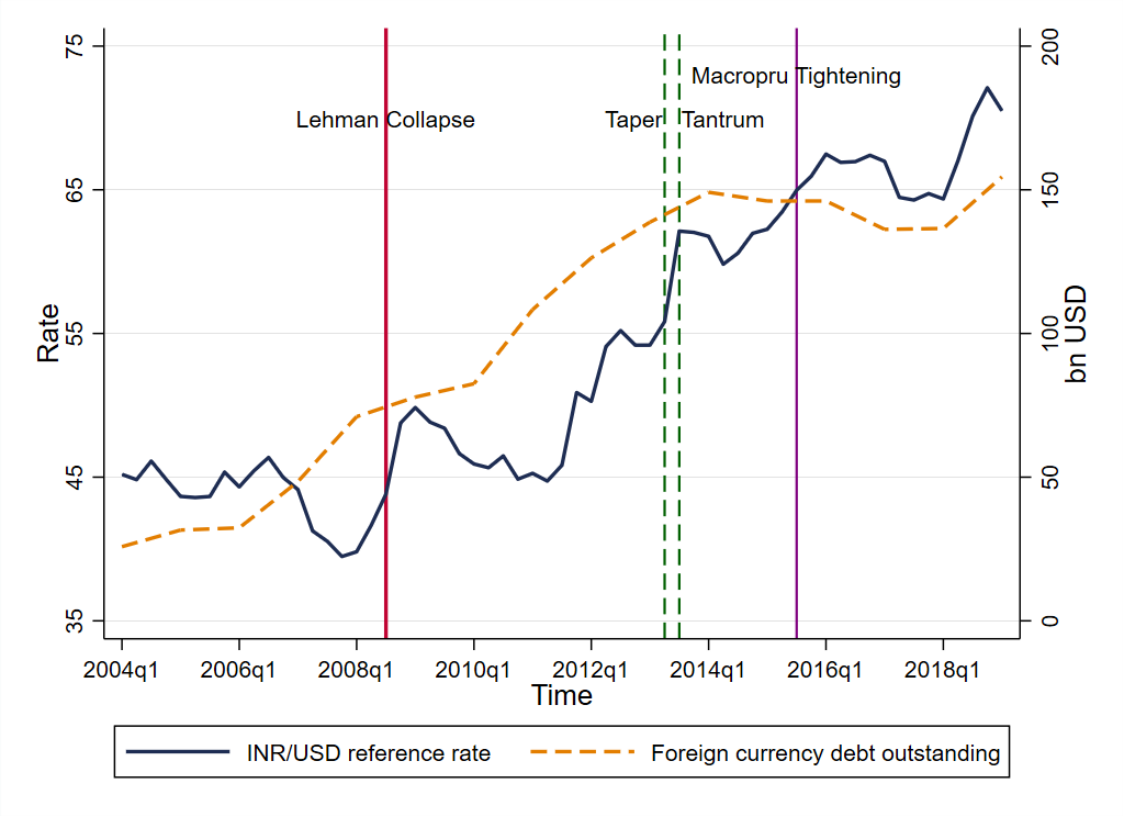
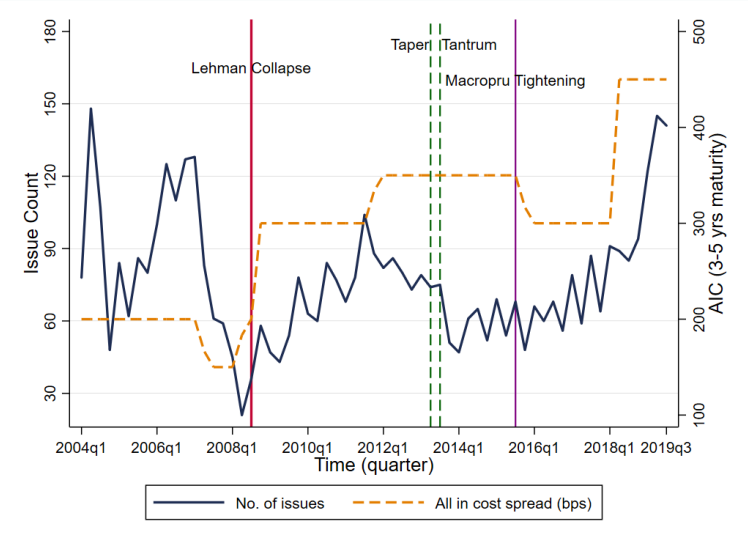


Figure 1: **INR/USD Exchange Rate and Foreign Currency Debt Outstanding**
The figure shows the evolution of the INR/USD exchange rate and the stock of foreign currency debt outstanding from March 2004 to March 2019.

(a) Max All-In-Cost for maturity less than 5 Years and Number of Debt Issues



(b) Max All-In-Cost for maturity more than 5 Years and Number of Debt Issues

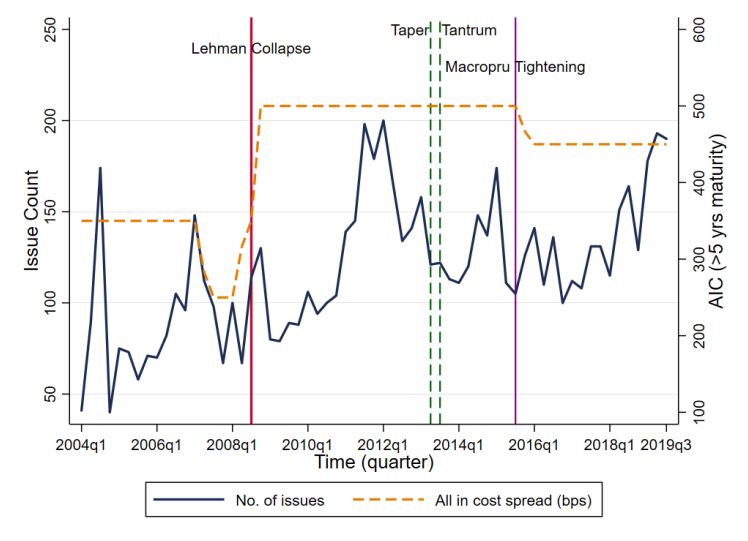
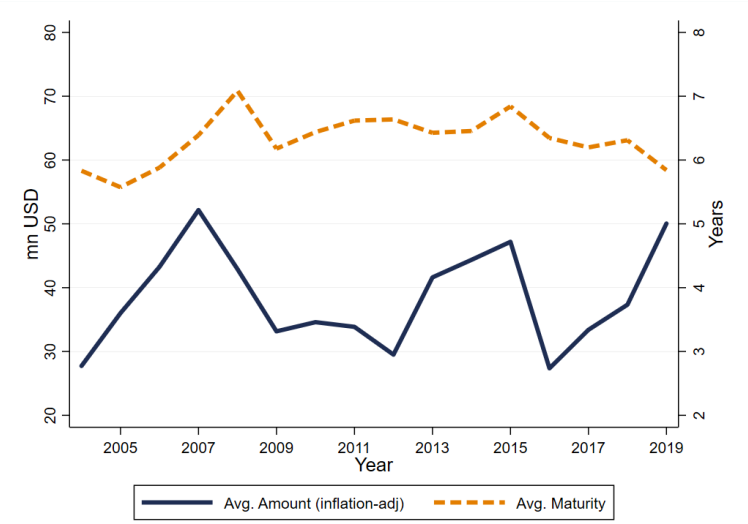


Figure 2: **Macroprudential Policies and Debt Issuance**

The figure depicts the evolution of foreign currency debt issuance activity and the maximum permissible all-in-cost (AIC) spread over the 6-month LIBOR rate for issuances. A higher AIC spread is our proxy for looser macroprudential regulation. The sample period is from January 2004 to September 2019. Figure (a) depicts issuances with maturity of less than five years. Figure (b) depicts issuances with maturity of more than five years.

(a) Average amount and maturity of debt issuance



(b) Distribution of maturity of debt issuance

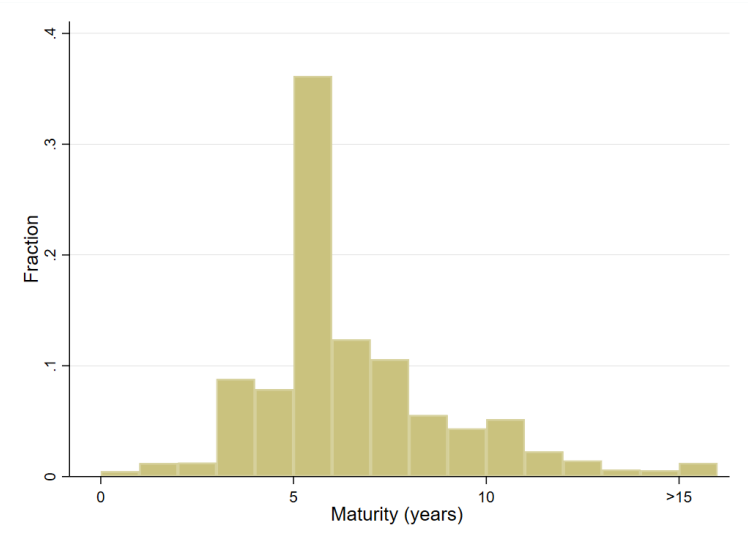


Figure 3: **Characteristics of foreign currency debt issuance**
The figure depicts the salient characteristics of foreign currency borrowing of firms that can be matched to the Prowess database. The sample period is from January 2004 to September 2019. Figure (a) shows how the inflation-adjusted average issuance amount and maturity vary over time. Figure (b) is a histogram showing the distribution of maturities of the borrowings.

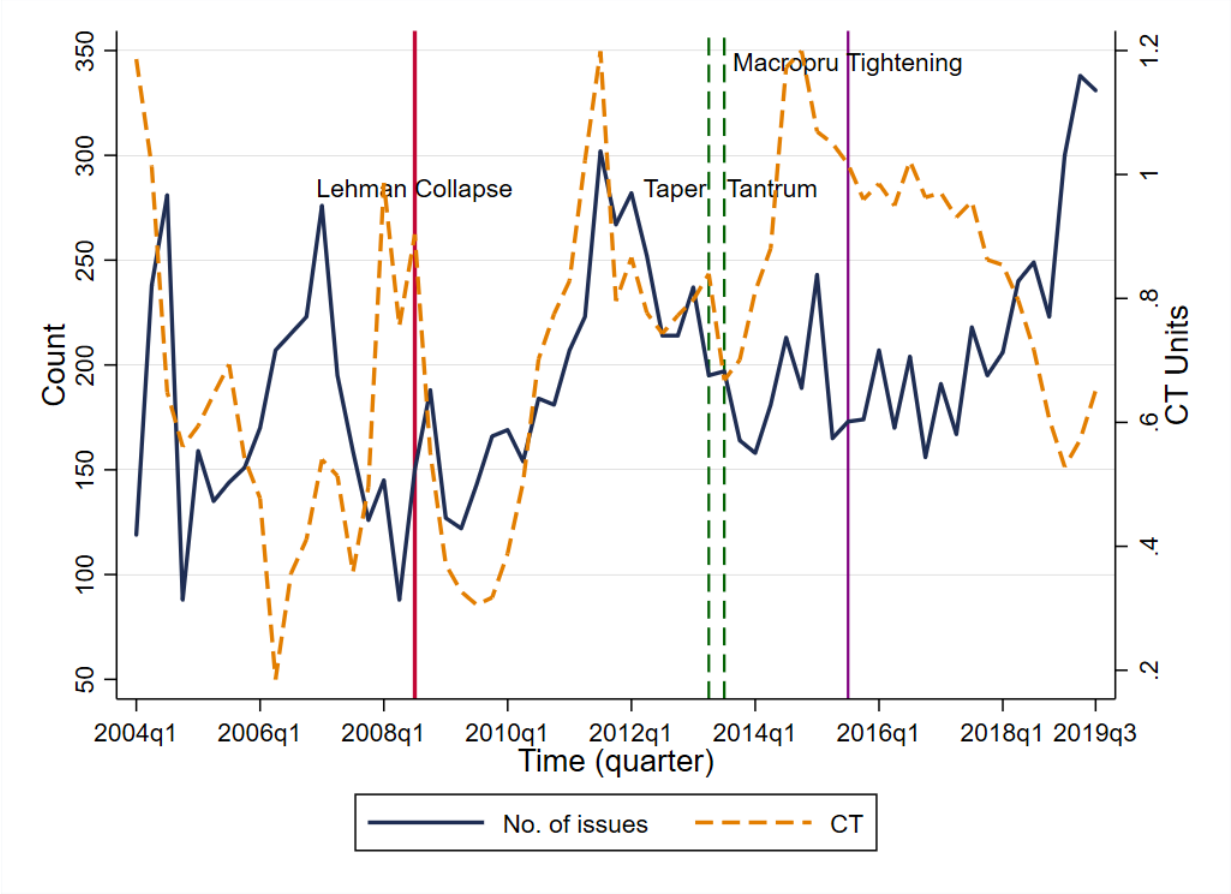


Figure 4: **Carry Trade and Aggregate Issuance**

The figure plots the total number of foreign currency debt issues each quarter against CT, a proxy for the difference in short-term rates between India and the US. CT is the difference in 3-month interest rates between India and the U.S. scaled by the implied volatility of 3-month FX options. The sample period is from January 2004 to September 2019.

The table below lists the correlation between the monthly CT index and the monthly issuance count and total amount issued. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01).

ρ (monthly)	Jan 04-Sep 19	Jan 04-Aug 08	Sep 08-Sep 13	Oct 13-Oct 15	Nov 15-Sep 19
ρ(Issues, CT)	0.080	-0.173	0.559***	0.461**	-0.684***
ρ(Amount, CT)	0.003	-0.298**	0.454***	-0.197	-0.540***

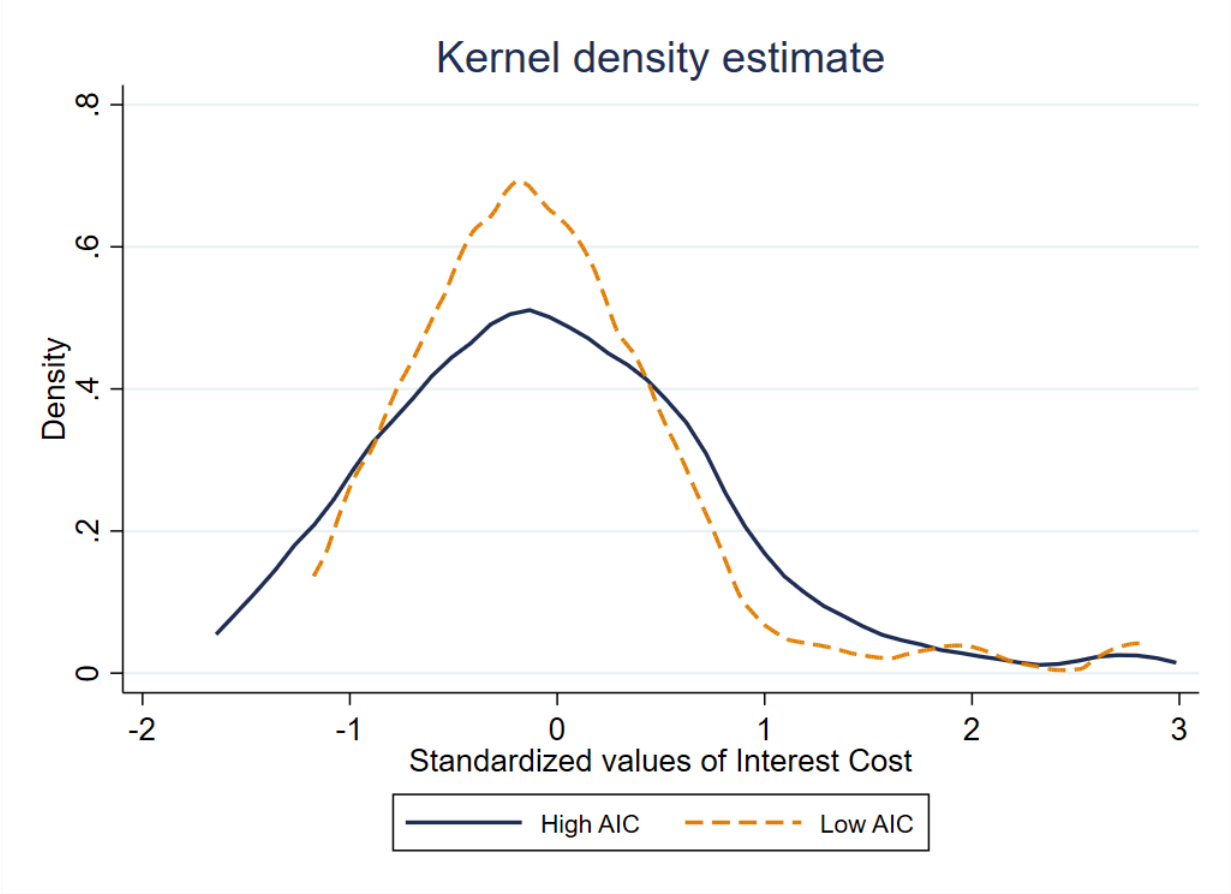


Figure 5: **Macroprudential Policies and Borrower Interest Cost Distribution** The figure plots the kernel density estimates of the borrower interest cost distribution in the post-crisis period. The solid (dashed) graph shows the distribution of interest costs when the maximum AIC limit is above (below) its sample median. The interest costs are standardized by subtracting the mean and scaling by their standard deviation. The time period is from September 2008 to October 2019.

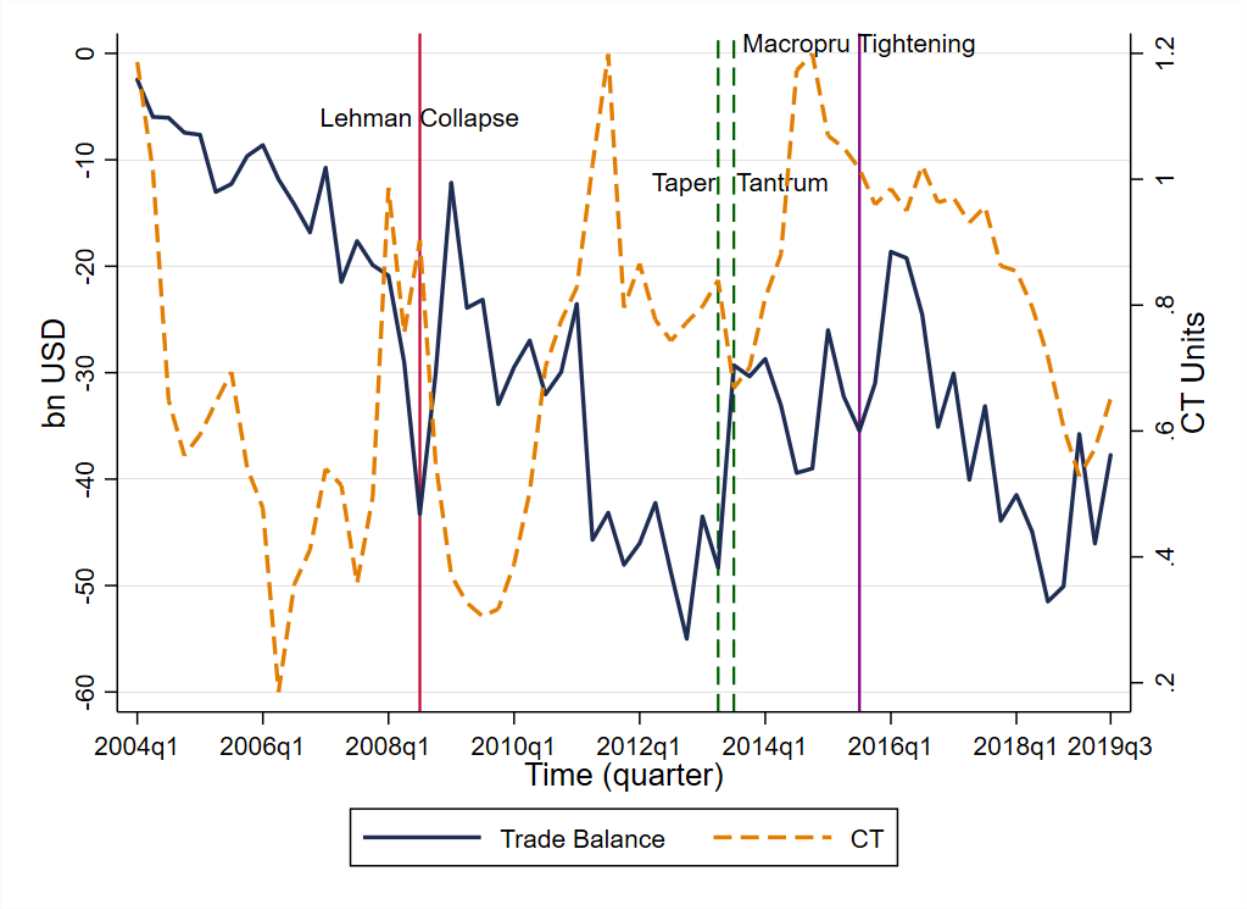


Figure 6: **Carry Trade and Trade Balance**
The figure plots India's quarterly trade balance, in billions of dollars, against CT, a proxy for the difference in short-term rates between India and the U.S. CT is defined as the difference in 3-month interest rates between India and the U.S. scaled by the implied volatility of 3-month FX options. The sample period is from January 2004 to September 2019.

The following table shows the correlation between the monthly CT index and trade balance. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01).

ρ (monthly)	Jan 04-Sep 19	Jan 04-Aug 08	Sep 08-Sep 13	Oct 13-Oct 15	Nov 15-Sep 19
ρ(Trade Bal, CT)	-0.310***	0.004	-0.590***	-0.466**	0.546***

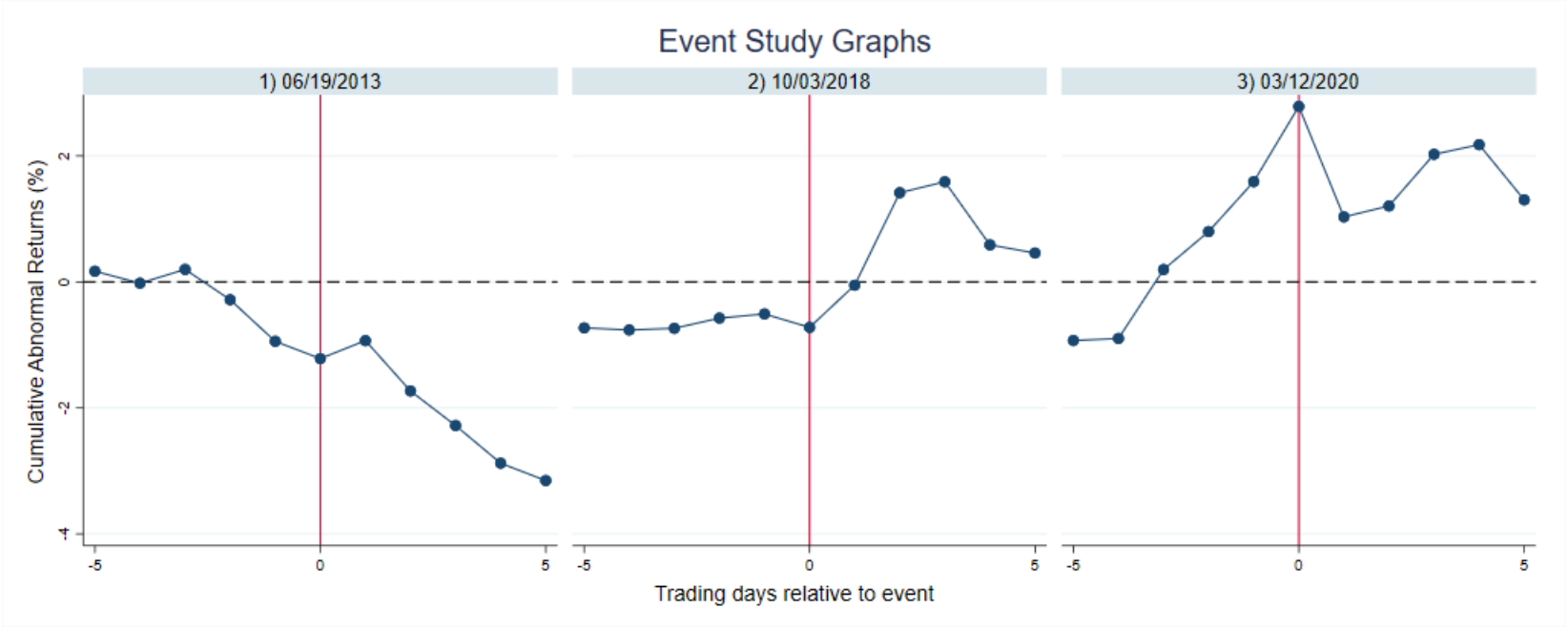


Figure 7: **Event Study: CAR of high CT issuer (top tercile) relative to low CT issuer (bottom tercile)** The figure shows the cumulative abnormal return (CAR) for high CT issuer stocks relative to low CT issuer stocks, for three event dates, from five days prior to the event date to five days after. June 19, 2013 is a date on which the likelihood of tapering went up; October 3, 2018 is a date when the rupee fell sharply owing to a spike in oil prices and March 12, 2020 was the date after the U.S. imposed travel restrictions from Europe owing to the COVID-19 pandemic. A multivariate market model is used for estimation with the NIFTY return proxying for the market return while INRUSD return proxies for FX return. The estimation window is 180 calendar days and ends five trading days before the event date.

Table 1: **Summary Statistics**

Panel A provides statistics on foreign currency debt issuance by Indian corporates as per data from the Reserve Bank of India (RBI). The sample has the 1,786 firms that can be matched to the Prowess database and is from January 2004 to September 2019. Panel B provides summary statistics on the balance sheet of firms that appear both in Prowess and in the RBI data. The foreign currency borrowing is as per Prowess. Panel C provides daily market returns data and the monthly CT index.

Panel A: Foreign Currency Debt Facilities

	N	Mean	Median	St. Dev.	P5	P95
Amount (mn USD)	5,821	59.359	13.000	154.089	0.852	300.000
Maturity (Years)	5,821	6.344	5.500	2.879	3.000	11.417
No. of facilities (per firm)	1,786	3.259	2	4.653	1	10

Panel B: Firm Balance Sheets

	N	Mean	Median	St. Dev.	P5	P95
Total Assets (bn INR)	17,516	26.19	4.57	74.49	0.19	116.64
Cash/Assets	17,510	0.052	0.00	0.31	0.00	0.09
Fixed/Total Assets	17,248	0.354	0.341	0.203	0.038	0.721
Current/Total Assets	17,467	0.377	0.370	0.208	0.044	0.737
Total Debt (bn INR)	16,586	10.18	1.447	29.825	0.036	48.129
Foreign Currency Debt (bn INR)	7,432	4.61	0.719	13.022	0.034	19.845
Long-Term/Total Debt	16,584	0.668	0.727	0.298	0.049	1.000
Foreign Currency/Total Debt	7,432	0.370	0.290	0.291	0.029	0.990
Debt/Assets	16,585	0.372	0.353	0.232	0.037	0.756
Dividends/Total Assets	8,290	-0.016	-0.010	0.020	-0.050	-0.001
Return on Assets	15,560	0.150	0.141	0.132	-0.023	0.367
Exports/Sales (%)	17,401	16.282	2.966	25.586	0.000	80.287
Total Sources$_t$/Total Assets$_{t-1}$	14,313	0.220	0.150	0.337	-0.035	0.644
FC Debt Amt$_t$/Total Assets$_{t-1}$ (Issue Years)	2,536	0.339	0.096	1.136	0.016	1.004
Other Sources$_t$/Total Assets$_{t-1}$	14,313	0.185	0.136	0.304	-0.090	0.586

Panel C: Returns Data

	N	Mean	Median	St. Dev.	P5	P95
Stock return (%)	1842081	0.072	-0.084	3.180	-4.550	5.028
NIFTY Return (%)	4,021	0.075	0.087	1.421	-2.120	2.132
USDINR Return (%)	4,021	-0.008	0.000	0.419	-0.698	0.618
NIFTY β	1794005	0.857	0.800	0.624	0.058	1.877
FX β	1794005	0.108	0.109	1.867	-1.855	2.039
CT	183	0.745	0.784	0.263	0.322	1.158

Table 2: **Determinants of Issuance: Carry Trade and the Post-crisis Period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt. All observations are at the firm-month level. The dependent variable in the first four columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next four columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the U.S. scaled by the implied volatility of 3-month FX options. *CT*PostCrisis* is the value of *CT* interacted with a dummy that takes the value 1 if the month is between September 2008 and September 2013, and 0 otherwise. *CT*PostTaper* is the value of *CT* interacted with a dummy that takes the value 1 if the month is after September 2013, and 0 otherwise. The INRUSD 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 exports to sales, and cash to asset ratio. These are measured at the end of the previous fiscal year. Firm-clustered standard errors are in parentheses. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)				Log(1+FC Borr)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CT	0.402***	-0.299*	0.448***	-0.266	0.133***	-0.116*	0.145***	-0.095
	(0.100)	(0.177)	(0.106)	(0.183)	(0.033)	(0.070)	(0.035)	(0.070)
CT*post-crisis		1.258***		1.286***		0.472***		0.466***
		(0.223)		(0.228)		(0.086)		(0.085)
CT*post-Taper		0.009		0.004		0.060		0.041
Tantrum		(0.305)		(0.314)		(0.087)		(0.087)
FX Return	0.006	0.008	0.007	0.008	0.003	0.003	0.003	0.003
	(0.010)	(0.010)	(0.010)	(0.010)	(0.003)	(0.003)	(0.003)	(0.003)
NIFTY return	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
	(0.004)	(0.004)	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Post-crisis	-0.216***	-1.016***	-0.122	-0.937***	-0.085***	-0.376***	-0.049*	-0.335***
	(0.063)	(0.155)	(0.079)	(0.165)	(0.025)	(0.058)	(0.028)	(0.058)
Post-Taper	-0.981***	-0.741***	-0.899***	-0.641**	-0.301***	-0.266***	-0.257***	-0.204***
Tantrum	(0.081)	(0.254)	(0.115)	(0.282)	(0.028)	(0.068)	(0.033)	(0.074)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	133106	133106	123326	123326	133106	133106	133106	133106
PseudoR^2	0.034	0.036	0.016	0.018				
Adj.R^2					0.007	0.008	0.028	0.029

Table 3: **Macroprudential Policies and Borrower Interest Cost Distribution**

This table shows results from OLS regressions associating the interest cost distribution of foreign currency borrowers with macroprudential policy. All observations are at the month level. Panel A (Panel B) analyzes the right (left) side of the interest cost distribution. For foreign currency borrowers who issue in a given month, $\frac{P90-P50}{\sigma}$ ($\frac{P10-P50}{\sigma}$) measures the difference in interest costs between the borrower at the 90th (10th) percentile and the median borrower scaled by the standard deviation of the interest costs. Pre-crisis covers the period between January 2004 and August 2008; Post-crisis is the period between September 2008 and September 2013; Post-taper tantrum is the period between October 2013 and October 2019. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

Panel A: Right Side

	Interest Cost Distribution		
	$\frac{P90-P50}{\sigma}$		
	Pre-crisis	Post-crisis	Post-taper
High AIC	-0.016	-0.194*	0.235**
	(0.160)	(0.107)	(0.099)
Constant	1.238***	1.408***	1.166***
	(0.141)	(0.084)	(0.069)
Observations	53	97	92
R^2	0.000	0.033	0.058

Panel B: Left Side

	Interest Cost Distribution		
	$\frac{P10-P50}{\sigma}$		
	Pre-crisis	Post-crisis	Post-taper
High AIC	-0.162	-0.141	-0.079
	(0.146)	(0.107)	(0.097)
Constant	-0.955***	-1.050***	-1.043***
	(0.129)	(0.084)	(0.067)
Observations	53	97	92
R^2	0.023	0.018	0.007

Table 4: **Carry Trade and Macroprudential Policies in the Post-crisis Period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt between September 2008 and March 2019. All observations are at the firm-month level. The dependent variable in the first two columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next two columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the U.S. scaled by the implied volatility of 3-month FX options. *High AIC* is a dummy that takes the value 1 if the maximum All-In-Cost interest rate spread was above its sample median for the post-crisis period, indicating looser policy. *CT*Hi AIC* is the value of *CT* interacted with *High AIC*. The INRUSD 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 exports to sales, and cash to asset ratio. These are measured at the end of the previous fiscal year. Firm clustered standard errors are in parentheses. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)		Log(1+FC Borr)	
	(1)	(2)	(3)	(4)
CT [β_1]	-2.841***	-2.816***	-0.897***	-0.931***
	(0.399)	(0.372)	(0.150)	(0.151)
High AIC	-2.749***	-3.298***	-0.877***	-1.038***
Spread	(0.346)	(0.356)	(0.139)	(0.148)
CT*Hi AIC	3.328***	3.668***	1.033***	1.150***
Spread [β_2]	(0.418)	(0.405)	(0.156)	(0.161)
FX Return	-0.014	-0.012	-0.003	-0.002
	(0.013)	(0.013)	(0.004)	(0.004)
NIFTY return	0.000	0.003	-0.001	0.000
	(0.006)	(0.005)	(0.002)	(0.002)
$Pr(\beta_1 + \beta_2 = 0)$	0	0	0	0
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes
Observations	106014	77801	106014	106014
PseudoR^2	0.029	0.021		
Adj.R^2			0.006	0.033

Table 5: **Carry Trade, Macroprudential Policies, and Interest Costs in the Post-crisis Period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt between September 2008 and March 2019. All observations are at the firm-month level. The dependent variable in the first two columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next two columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the U.S. scaled by the implied volatility of 3-month FX options. *High AIC* is a dummy that takes the value 1 if the maximum All-In-Cost interest rate spread was above its sample median for the post-crisis period, indicating looser policy. *CT*Hi AIC* is the value of *CT* interacted with *High AIC*. *Int Cost* is the ratio of total interest expense to debt outstanding. One-month lagged values of the INRUSD and NIFTY market returns are included in all specifications. Firm-level controls include total assets, debt to asset ratio, ratio of exports to sales, and cash to asset ratio measured at the end of the previous fiscal year. Firm clustered standard errors are in parentheses. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)		Log(1+FC Borr)	
	(1)	(2)	(3)	(4)
CT	0.414**	-2.344***	0.128**	-2.378***
	(0.203)	(0.555)	(0.051)	(0.422)
Int Cost	-0.020	0.049**	-0.003*	0.006
	(0.014)	(0.022)	(0.001)	(0.006)
High AIC Spread		-4.330***		-3.496***
		(0.524)		(0.501)
CT*Hi AIC		2.799***		2.805***
		(0.583)		(0.464)
CT*Int Cost	0.011	-0.064**	0.002	-0.007
	(0.016)	(0.032)	(0.002)	(0.007)
Hi AIC*Int Cost		-0.120***		-0.012*
		(0.029)		(0.006)
CT*Hi AIC*Int Cost		0.120***		0.011
		(0.037)		(0.007)
Controls	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
Observations	119045	119045	165983	165983
PseudoR^2	0.016	0.048		
Adj.R^2			0.030	0.038

Table 6: **Carry Trade, Macroprudential Policies, and Importers in the Post-crisis Period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt between September 2008 and March 2019. All observations are at the firm-month level. The dependent variable in the first two columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next two columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. The independent variable, *CT*, captures the difference in 3-month interest rates between India and the U.S. scaled by the implied volatility of 3-month FX options. *High AIC* is a dummy that takes the value 1 if the maximum All-In-Cost interest rate spread was above its sample median for the post-crisis period, indicating looser policy. *CT*Hi AIC* is the value of *CT* interacted with *High AIC*. *Imp/Raw Mat* is the fraction of raw materials imported by the firm. One-month lagged values of the INRUSD and NIFTY market returns are included in all specifications. Firm-level controls include total assets, debt to asset ratio, ratio of exports to sales, and cash to asset ratio measured at the end of the previous fiscal year. Firm clustered standard errors are in parentheses. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Issue (0/1)		Log(1+FC Borr)	
	(1)	(2)	(3)	(4)
CT	0.415**	-2.094***	0.123***	-1.950***
	(0.166)	(0.556)	(0.046)	(0.386)
Imp/RawMat	-0.002	0.039***	-0.001	0.040***
	(0.003)	(0.007)	(0.001)	(0.006)
High AIC Spread		-4.222***		-3.015***
		(0.547)		(0.458)
CT*Hi AIC		2.676***		2.311***
		(0.575)		(0.424)
CT*Imp/RawMat	0.005	-0.039***	0.002	-0.041***
	(0.003)	(0.009)	(0.001)	(0.007)
Hi AIC*Imp/RawMat		-0.052***		-0.043***
		(0.008)		(0.006)
CT*Hi AIC*Imp/RawMat		0.053***		0.045***
		(0.009)		(0.007)
Controls	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
Observations	135507	135507	181078	181078
PseudoR^2	0.014	0.046		
Adj.R^2			0.028	0.037

Table 7: **Foreign Currency Debt Issuance and Other Sources of Funds**

This table shows results from a OLS regression relating the amount of funds raised through the foreign currency debt route to other sources of funds. All observations are at the firm-year level. The dependent variable is $Log(1+\frac{FCDebtAmount}{TotalAssets})$ where $FCDebtAmount$ is the total amount (in INR) that the firm i raised through the foreign currency debt 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 foreign currency debt 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. In the regression for columns (2) and (5), we include the interaction of $Log(1+\frac{OthAmount}{TotalAssets})$ with *PostCrisis*, a dummy taking the value 1 in the period from September 2008 to September 2013. We also include the interaction of $Log(1+\frac{OthAmount}{TotalAssets})$ with *PostTaper*, a dummy taking the value 1 in the period from October 2013 onwards. In the regression for columns (3) and (6), we include the interaction of $Log(1+\frac{OthAmount}{TotalAssets})$ with *Hi AIC*, a dummy taking the value 1 if the maximum All-In-Cost interest rate spread is above its sample median. Year and firm fixed effects are included in all specifications. The sample in the last three columns is restricted to those firm-years in which foreign currency debt 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+FC Debt Amt/Total Sources)					
	All firm-years			Issue firm-years only		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1+Oth Amt/Total Assets)	-0.076***	-0.087***	-0.089***	-0.145***	-0.207***	-0.194***
	(0.008)	(0.011)	(0.010)	(0.034)	(0.045)	(0.038)
Log(1+Oth Amt/Total Assets)*PostCrisis		0.037**			0.123**	
		(0.017)			(0.060)	
Log(1+Oth Amt/Total Assets)*PostTaper		-0.017			0.069	
		(0.019)			(0.070)	
Log(1+Oth Amt/Total Assets)*Hi AIC			0.028*			0.102**
			(0.015)			(0.049)
PostCrisis		-0.019*			-0.040	
		(0.011)			(0.025)	
PostTaper		-0.021			-0.034	
		(0.013)			(0.029)	
High AIC Spread			-0.014*			-0.011
			(0.008)			(0.029)
Year FE & Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14176	14176	14176	1782	1782	1782
R^2	0.198	0.201	0.200	0.605	0.609	0.609

Table 8: **Firm Outcomes and Foreign Currency Debt Issuance in the Post-crisis Period**

This table shows results from a OLS regression relating firm outcomes to the firm's propensity to issue foreign currency debt when the CT index is high. All observations are at the firm-year level. The dependent variable, Y_{it}, can be (i) gross investment (change in gross fixed assets from year t-1 to t) in year t, (ii) cash holdings at end of year t, (iii) debt at end of year t, and (iv) profits in year t. All dependent variables are scaled by year t assets. In Panel A, the independent variable of interest is the interaction of *PostTaper*, a dummy taking the value 1 in the period from October 2013 onwards with the weighted firm-level CT measure. In Panel B, the independent variable of interest is the interaction of *Hi AIC*, a dummy taking the value 1 if the maximum All-In-Cost interest rate spread is above its sample median with the weighted firm-level CT measure. We include only firms that issue at least 4 times. Industry-Year and firm fixed effects are included in all specifications. Standard errors clustered at the firm level are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

Panel A: Post-taper

	Investment		Cash		Leverage		ROA	
Post-Taper × Hi Firm CT	-0.038*		-0.025***		0.023		0.006	
	(0.020)		(0.008)		(0.020)		(0.010)	
Post-Taper × Firm CT		-0.145**		-0.071**		0.085		0.010
		(0.066)		(0.028)		(0.059)		(0.028)
Ind-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3007	3007	3191	3191	3190	3190	3021	3021
R^2	0.288	0.289	0.470	0.470	0.657	0.657	0.515	0.515

Panel B: Impact of Macroprudential policies

	Investment		Cash		Leverage		ROA	
Hi AIC × Hi Firm CT	0.032*		0.025***		-0.021		-0.006	
	(0.019)		(0.010)		(0.020)		(0.010)	
Hi AIC × Firm CT		0.113		0.087**		-0.108		-0.017
		(0.070)		(0.040)		(0.076)		(0.031)
Ind-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3007	3007	3191	3191	3190	3190	3021	3021
R^2	0.288	0.288	0.470	0.470	0.657	0.657	0.515	0.515

Table 9: **Forward-looking β and Foreign Currency Debt Issuance**

The table has results from the OLS estimation of the following equation:

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

The dependent variable is the β estimated for firm i from the market model in a 60-month trading window starting in month t. The independent variable is a dummy that takes value 1 if firm i issued foreign currency debt in month $t-1$. Fixed effects are as indicated. The sample period is from January 2004 to September 2019. Standard errors clustered at both firm and month level are reported in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	β (forward looking)					
	FX			NIFTY		
Issue	-0.026	-0.081**	-0.069**	0.010	0.026	0.024
	(0.020)	(0.035)	(0.030)	(0.012)	(0.017)	(0.015)
Issue*PostCrisis		0.118**			-0.030	
		(0.049)			(0.025)	
Issue*PostTaper		-0.051			-0.015	
		(0.166)			(0.067)	
Issue*Hi AIC			0.100**			-0.032
			(0.048)			(0.026)
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.161	0.161	0.161	0.203	0.203	0.203
Obs.	62,431	62,431	62,431	62,431	62,431	62,431

Table 10: β **and Foreign Currency Debt Issuance by CT measure and Interest Cost**

The table has results from the OLS estimation of the following equation:

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

The dependent variable is the β estimated for firm i from the market model in a 60-month trading window starting in month t . The independent variable is a dummy that takes value 1 if firm i issued foreign currency debt in month $t-1$. In Panel A, the dependent variable of interest is 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, the dependent variable of interest is based on the firm's implied interest cost.Fixed effects are as indicated. The sample period is from Jan 2004 to Sep 2019. Standard errors clustered at both firm and month level are reported in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

Panel A: Firm CT

	β (forward looking)			
	Low CT Index Issuers		High CT Index Issuers	
	FX β	NIFTY β	FX β	NIFTY β
Issue	0.051	-0.009	-0.123**	0.043
	(0.037)	(0.020)	(0.053)	(0.031)
Issue*Hi AIC	-0.076	0.015	0.135	-0.087
	(0.071)	(0.035)	(0.088)	(0.059)
Month FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
R^2	0.338	0.427	0.316	0.429
Obs.	13,157	13,157	9,092	9,092

Panel B: Interest Cost

	β (forward looking)			
	Low Int Cost Firms		High Int Cost Firms	
	FX β	NIFTY β	FX β	NIFTY β
Issue	-0.016	-0.020	-0.123***	0.061**
	(0.037)	(0.017)	(0.045)	(0.024)
Issue*Hi AIC	0.032	0.026	0.133*	-0.088
	(0.060)	(0.028)	(0.070)	(0.060)
Month FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
R^2	0.442	0.516	0.132	0.145
Obs.	29,013	29,013	27,339	27,339

Table 11: **Event Study of Taper and Post-taper Events: CT Measure and Interest Costs**

The sample consists of companies that are present in the RBI data and that have stock return data to estimate the model. A multivariate market model is used for estimation with the NIFTY return proxying for the market return while INRUSD 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. June 19, 2013 is a date on which likelihood of tapering went up; October 03, 2018 is a date when the rupee fell sharply owing to a spike in oil prices; and March 12, 2020 was the date after the U.S. imposed travel restrictions from Europe owing to the COVID-19 pandemic. 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 four issuances over the sample period. In Panel B, firms are sorted into terciles based on their implied interest cost. Robust standard errors are in parentheses. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

Panel A: Firm CT

	CAR[0,3]		
	06/19/13	10/03/18	03/12/20
Low CT Issuer	-0.202	2.780*	-0.669
	(1.048)	(1.455)	(1.353)
Mid CT Issuer	-0.897	0.761	-0.837
	(0.606)	(0.907)	(1.403)
High CT Issuer	-2.154***	3.400***	-0.433
	(0.572)	(0.721)	(1.218)
Pr(H-L==0)	.0916	.6823	.8975
Observations	184	173	168
R^2	0.055	0.106	0.004

Panel B: Interest Cost

	CAR[0,3]		
	06/19/13	10/03/18	03/12/20
Low Int Cost	-0.500	1.805***	-2.614***
	(0.393)	(0.541)	(0.812)
Mid Int Cost	-0.472	3.314***	-0.432
	(0.532)	(0.545)	(0.802)
High Int Cost	-0.900**	3.522***	-1.707**
	(0.449)	(0.660)	(0.751)
Pr(H-L==0)	.502	.0451	.4133
Observations	439	474	474
R^2	0.013	0.142	0.033

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

Internet Appendix

A Foreign Currency Debt Maturity Dates and Exchange Rates

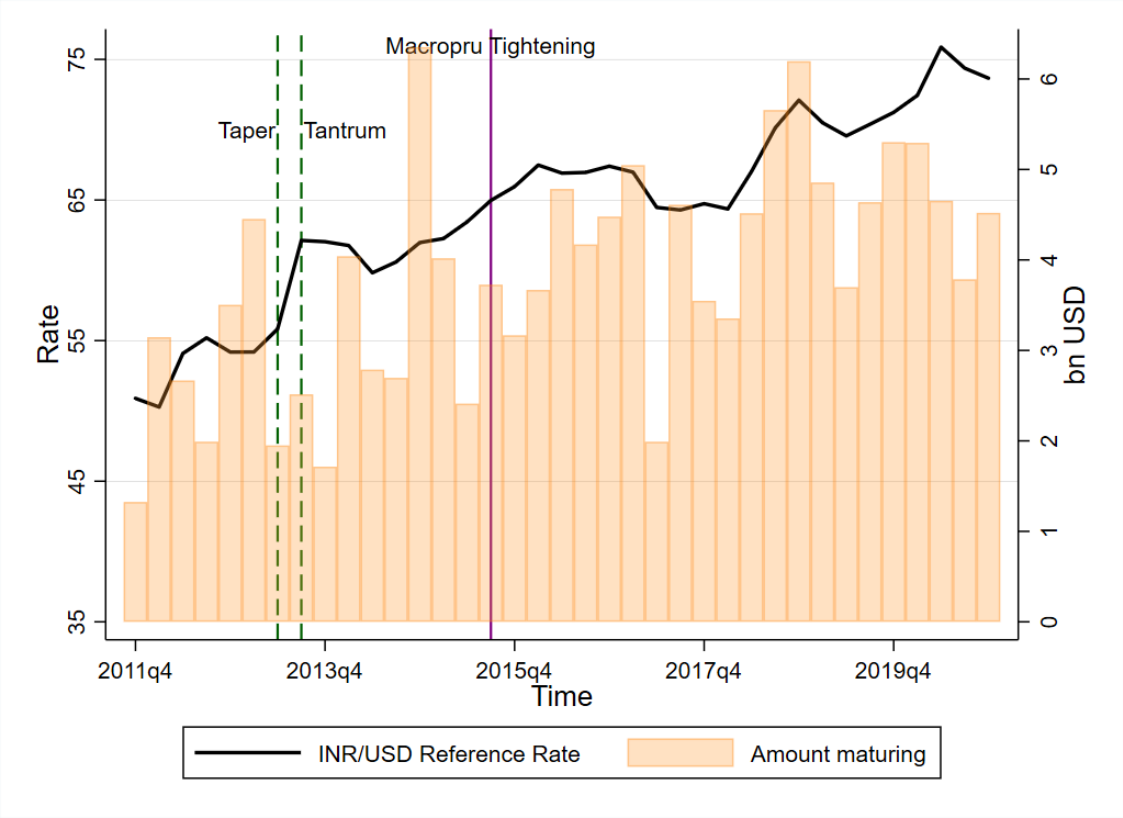


Figure A.1: **Foreign Currency Debt Maturity Dates and INR/USD Exchange Rate** The line shows the evolution of the INR/USD Reference Rate while the bars indicate the issuance volume of foreign currency debt due to mature in that quarter. The figure covers the period from the third quarter of 2011 (three years after the global financial crisis) to the fourth quarter of 2020.

Table A.1: **Foreign Currency Debt Maturity Dates and Exchange Rates**

This table shows results from an OLS regression used to predict exchange rates. All observations are at the monthly level. The dependent variable is the change in the log of the USD/INR reference rate multiplied by 100. The independent variable is the change in the log of foreign currency debt issuances due to mature in that month. The sample period is from September 2011 (three years after the global financial crisis) to September 2020. Newey-West standard errors with four lags are in brackets. Significance levels: *(p<0.10), **(p<0.05), *** (p<0.01)

	Δ Log (Exch Rate) ($\times$ 100)		
Δ Log (Amt. Maturing)	-0.419***		
	(0.156)		
Δ Log (Amt. Maturing issued Post-crisis)		-0.331*	
		(0.168)	
Δ Log (Amt. Maturing issued Post-taper)		-0.027***	
		(0.007)	
Δ Log (Amt. Maturing Issued Hi AIC)			-0.392**
			(0.157)
Δ Log (Amt. Maturing Issued Lo AIC)			-0.018
			(0.011)
Constant	-0.354**	-0.355**	-0.353**
	(0.175)	(0.176)	(0.176)
F-Stat	7.187	10.582	4.854
Obs.	109	109	109

B Rupee-Denominated Bonds and Foreign Investment in Domestic Bonds

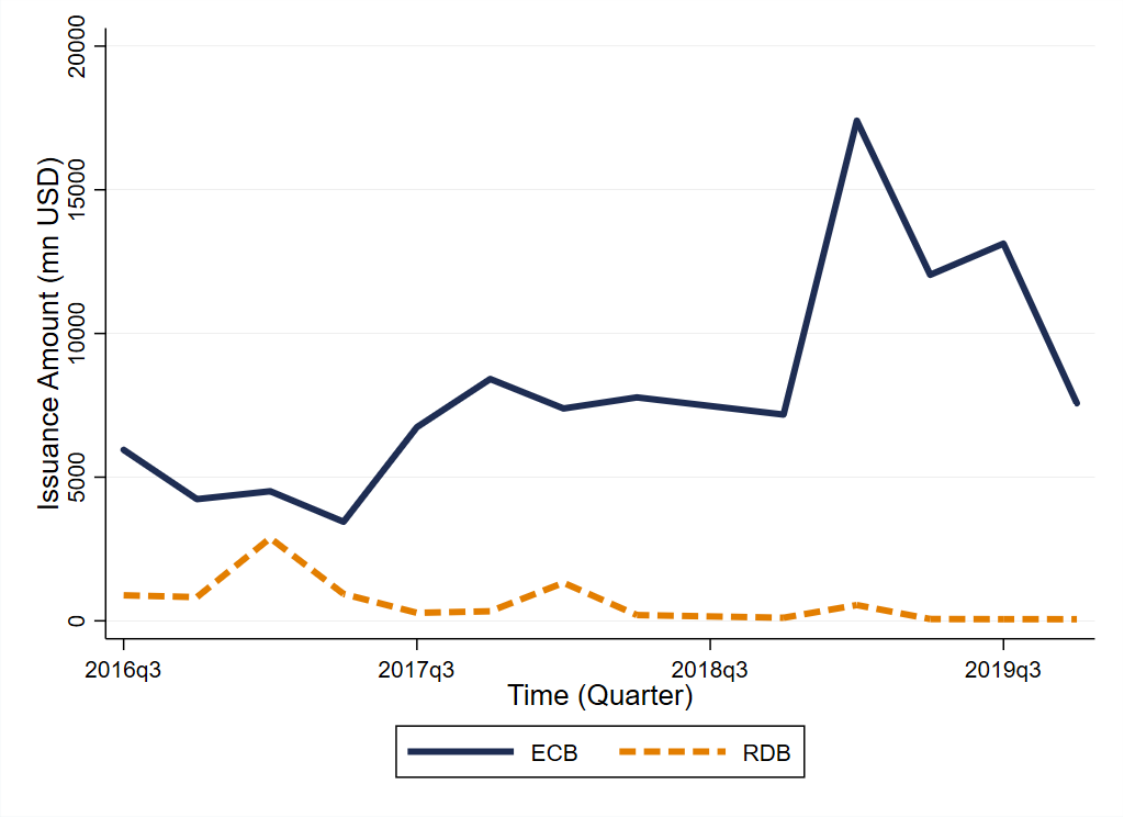
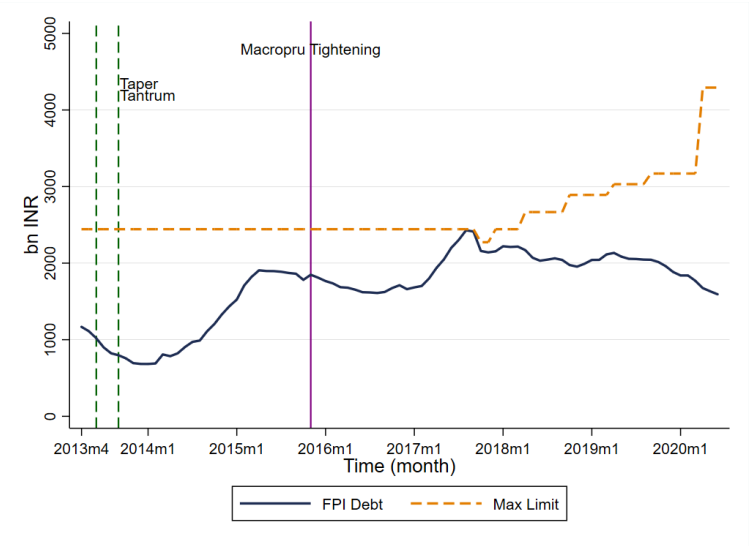


Figure B.1: **Foreign Currency Debt and Rupee-Denominated Bonds**
The figure shows the evolution of the issuance of foreign currency debt and rupee-denominated bonds from September 2016 to December 2020.

(a) Foreign Investment in Domestic Debt and Maximum Limits



(b) Net Foreign Investment Flows in Domestic Debt

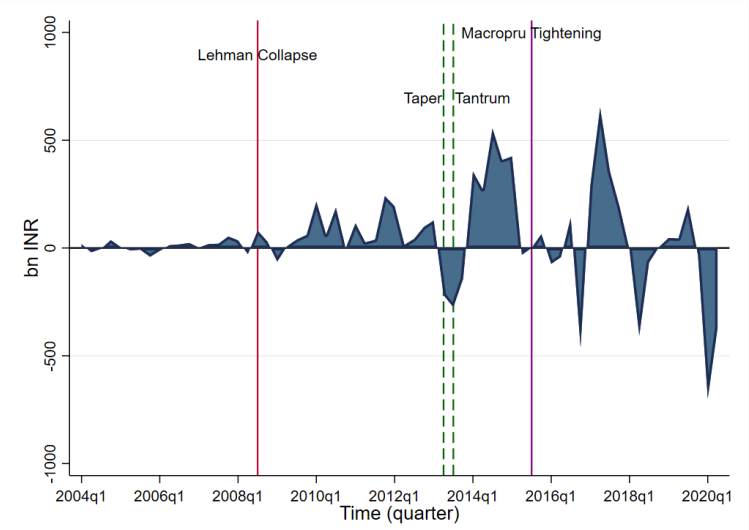


Figure B.2: **Foreign Investor Domestic Debt Holdings and Flows**
The figure depicts the evolution of the stock and flows of foreign investor positions in domestic corporate debt. Figure (a) depicts the stock of foreign investor holdings along with the maximum regulatory limits monthly from April 2013 to June 2020. Figure (b) depicts net foreign investment flows quarterly from January 2004 to June 2020.

C Macroprudential Policies in the Pre-crisis Period

Table C.1: **Carry Trade and Macroprudential Policies in the pre-crisis period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt between January 2004 and August 2008. All observations are at the firm-month level. The dependent variable in the first two columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next two columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. 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 AIC Spread (Pre-crisis)* is a dummy that takes the value 1 if the All-In-Cost Interest Rate spread was above its sample median for the pre-crisis period from Jan 2004 to Aug 2008. *CT*Hi AIC* is the value of *CT* interacted with *High AIC Spread (Pre-crisis)*. The INRUSD 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 exports to sales, and cash to assets ratio. 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)		Log(1+FC Borr)	
	(1)	(2)	(3)	(4)
CT [β_1]	-0.015	-0.071	-0.005	-0.028
	(0.293)	(0.298)	(0.114)	(0.113)
High AIC	0.408*	0.209	0.172*	0.081
Spread	(0.228)	(0.238)	(0.090)	(0.092)
CT*Hi AIC	-0.514	-0.446	-0.221	-0.182
Spread [β_2]	(0.374)	(0.391)	(0.147)	(0.148)
FX Return	0.015	0.013	0.005	0.004
	(0.026)	(0.027)	(0.010)	(0.010)
NIFTY return	-0.001	-0.003	-0.000	-0.001
	(0.006)	(0.006)	(0.002)	(0.002)
$Pr(\beta_1 + \beta_2 = 0)$	.0298	.0446	.0231	.0407
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes
Observations	27092	14486	27092	27092
PseudoR^2	0.039	0.003		
Adj.R^2			0.010	0.037

Table C.2: **Carry Trade, Macroprudential Policies and Interest Costs in the Pre-crisis Period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt between January 2004 and August 2008. All observations are at the firm-month level. The dependent variable in the first two columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next two columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. 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 AIC Spread (Pre-crisis)* is a dummy that takes the value 1 if the All-In-Cost Interest Rates spread was above its sample median for the pre-crisis period from January 2004 to August 2008. *Int Cost* is the ratio of total interest expense to debt outstanding. One-month lagged INRUSD and NIFTY market returns are included in all specifications. Firm-level controls include total assets, debt to asset ratio, ratio of exports to sales, and cash to assets ratio. 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)		Log(1+FC Borr)	
	(1)	(2)	(3)	(4)
CT	1.789***	2.395***	0.464***	0.684***
	(0.415)	(0.486)	(0.119)	(0.144)
Int Cost	0.043**	0.035	0.004*	0.005
	(0.017)	(0.025)	(0.003)	(0.003)
CT*Int Cost	-0.050*	-0.017	-0.004	-0.003
	(0.028)	(0.030)	(0.004)	(0.005)
Hi AIC*Int Cost		0.027		0.001
		(0.036)		(0.004)
CT*Hi AIC*Int Cost		-0.079		-0.004
		(0.061)		(0.007)
High AIC Spread		0.990**		0.372***
		(0.412)		(0.127)
CT*Hi AIC		-1.102*		-0.474**
		(0.668)		(0.188)
Controls	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
Observations	19290	19290	39809	39809
PseudoR^2	0.013	0.016		
Adj.R^2			0.032	0.033

Table C.3: **Carry Trade, Macroprudential Policies and Importers in the Pre-crisis Period**

This table shows results from logistic and OLS regressions used to predict the issuance of foreign currency debt between January 2004 and August 2008. All observations are at the firm-month level. The dependent variable in the first two columns takes the value 1 if a firm makes at least one issuance in the month, and 0 otherwise. In the next two columns, the dependent variable is the log of 1 plus the amount borrowed by a firm in a given month. 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 AIC Spread (Pre-crisis)* is a dummy that takes the value 1 if the All-In-Cost interest rate spread was above its sample median for the pre-crisis period from January 2004 to August 2008. *Imp/Raw Mat* is the fraction of raw materials imported by the firm. One-month lagged INRUSD and NIFTY market returns are included in all specifications. Firm-level controls include total assets, debt to asset ratio, ratio of exports to sales, and cash to assets ratio. 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)		Log(1+FC Borr)	
	(1)	(2)	(3)	(4)
CT	1.196***	2.182***	0.324***	0.597***
	(0.278)	(0.420)	(0.075)	(0.117)
Imp/RawMat	-0.002	-0.000	-0.000	-0.000
	(0.005)	(0.007)	(0.001)	(0.002)
High AIC Spread		0.876***		0.262***
		(0.306)		(0.092)
CT*Hi AIC		-1.323***		-0.371***
		(0.473)		(0.132)
CT*Imp/RawMat	0.009	0.002	0.003	0.001
	(0.005)	(0.010)	(0.002)	(0.004)
Hi AIC*Imp/RawMat		-0.003		-0.001
		(0.007)		(0.003)
CT*Hi AIC*Imp/RawMat		0.009		0.002
		(0.012)		(0.004)
Controls	Yes	Yes	Yes	Yes
Year FE and Firm FE	Yes	Yes	Yes	Yes
Observations	27794	27794	55609	55609
PseudoR^2	0.016	0.018		
Adj.R^2			0.033	0.033