Do Firms Believe in Interest Rate Parity?

Matthew R. McBrady
Bain Capital, LLC

Sandra Mortal
University of Missouri

Michael J. Schill
Darden Graduate School of Business Administration
University of Virginia

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Abstract

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Michael Schill is the corresponding author and can be reached at 434-924-4071 or schill@virginia.edu.

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Abstract

We test whether the currency denomination decisions of firms issuing debt are consistent with a belief in both covered and uncovered interest rate parity. For a broad sample of international corporate bonds denominated in six major currencies, we find strong and consistent evidence that firms alter the currency composition of their debt to respond to differences in covered and uncovered borrowing rates across currencies. We observe that emerging market and non-investment grade issuers are less likely to respond to differences in covered yields consistent with their limited access to currency swap markets. We conclude that although the gains that firms achieve through opportunistic currency denomination are economically significant, they may still be consistent with well-functioning markets.

1. Introduction

Interest rate parity is a bedrock assumption of international finance. It asserts that debt yields are equivalent across currencies when considering expected movements in exchange rate spot rates (uncovered parity) or prevailing forward exchange rates (covered parity). Given its importance to international finance, the academic literature on interest rate parity is justifiably vast. Nevertheless, although there is a rich understanding of the behavior of interest and exchange rates, there is surprisingly little understanding of how market participants respond to cross-currency variation in interest rates. In this paper, we examine the currency denomination decisions of firms issuing debt in international bond markets to test whether their behavior is consistent with a belief in the parity of covered and uncovered interest rates.

Shortly after the breakdown of the Bretton Woods system of fixed exchange rates, Frenkel and Levich (1975, 1977) established much of the theoretical and empirical support for covered interest parity in the short-term currency markets. In that context, covered interest arbitrage strategies are simple and relatively costless. Essentially they amount to lending in high interest currencies and borrowing in low interest currencies, exchanging the proceeds from the loan in the spot market, and selling the proceeds of the investment (plus interest) in the forward market. As a result of the limited risk and transaction costs over short-term horizons, covered interest parity holds to a first approximation in normal market conditions.

Covered interest parity for short-term interest rates, however, does not guarantee covered interest parity for longer-term bond yields. With larger frictions to arbitrage across currencies, the yields at which firms can issue bonds in different currencies need not be the same even after long-horizon currency risk is hedged with currency swaps (Clinton, 1988 and McBrady, 2003).[1] The standard assumption is that the magnitude of the

[1] In practice, firms hedge long-term foreign currency denominated debt with a collection of swap contracts. The first contract is a foreign currency interest rate swap contract where the borrower promises to exchange fixed rate interest payments in the foreign currency for floating rate interest payments in the foreign currency. The second contract is a basis swap contract where the borrower promises to exchange floating

deviation from interest rate parity should be bounded by the cost of executing and holding the round-trip arbitrage position. Deardorff (1979) argues that monitoring differences in covered interest yields and effectively enforcing long-term covered interest parity may be left to bond issuers conducting "one-way arbitrage" as they opportunistically denominate borrowing in low yield currencies. In this paper, we observe corporate borrowing behavior that is consistent with this proposition. Firms systematically issue bonds denominated in currencies with relatively lower covered yields and that those perceived borrowing opportunities subsequently disappear. This finding suggests that opportunistic issuance by firms may be a primary mechanism for driving covered interest yields toward parity.

For uncovered interest yields, the empirical evidence for short-horizon exchange rate behavior is overwhelmingly inconsistent with interest rate parity. In fact, the failure of short-horizon uncovered interest parity, the so-called "forward premium puzzle," is one of the most well documented phenomena in international finance (see, for example, Froot and Thaler, 1990). At longer horizons, relevant to corporate bond issuance, the evidence of interest rate parity is more mixed. Chinn and Meredith (2004), for example, present evidence consistent with interest rate parity for 5 and 10-year yields. We investigate whether firms systematically denominate bonds in currencies with relatively low nominal yields and/or those currencies that tend to depreciate.[2] Once again, we find strong

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interest payments in the foreign currency for floating interest payments in the domestic currency. The last contract is an interest rate swap contract in the domestic currency where the borrower promises to exchange floating interest payments in the domestic currency for fixed interest payments in the domestic currency. The aggregate effect of the collection of three swap contracts is to transform fixed rate interest payments in the foreign currency to fixed rate interest payments in the domestic currency for a particular maturity that matches that of the original debt contract. In effect the collection of swap contracts mimics the effect of a series of forward exchange rate contracts at maturities that match the swap contract terms. For a further discussion of how bond issuers use currency swaps to hedge foreign-currency bond issuance, see Fletcher and Taylor (1996) or McBrady and Schill (2007).

[2] Such interest rate and exchange rate gaming has long been a conjecture of corporate lending. A 1979 *Business Week* article provides a case in point. "After going heavily into Swiss franc debt in the 1960s, the multinationals saw the franc shoot up by 130% against the dollar between 1970 and 1978. A $100 million loan made in 1969 had turned into a $230 million liability nightmare nine years later. That sort of thing cost dozens of corporate treasurers their jobs. But if the Swiss franc now stabilizes against the dollar—as many foreign exchange analysts are predicting—not going into Swiss franc debt could also mean the loss of millions of dollars in unnecessary, extra costs for loans. Behind this career-making or career-breaking dilemma, of course, is the yawning interest rate differential that has opened up between U.S. dollar and Swiss franc borrowing. Imperial Chemical Industries Ltd. (ICI)…is currently borrowing 230 million Swiss francs in Zurich for 15 years at 3.5% interest. In the U.S., ICI would probably have to pay closer to 10%

support in the data that firms tend to choose low yield currencies when denominating bonds and that those differences in yields tend to subsequently disappear.

Overall, our analysis seeks to add to the large literature on interest rate parity and the more recent literature on opportunistic debt issuance. With regard to the former, it is most closely related to the early work by Frenkel and Levich (1975, 1977) and extensions of this work by Deardorff (1979) and Callier (1981). With regard to the latter, it is most closely related to McBrady and Schill (2007), who test for opportunistic currency choice across six currencies using a sample of government and government agency borrowers. They observe that these borrowers respond to differences in covered yield, nominal yield, and exchange rate appreciation. Earlier studies of debt issuance in a cross-currency context are largely anecdotal and based on studies that look at two currency comparisons using simple nominal interest rates (Johnson, 1988; Allayannis, Brown, and Klapper, 2003; Henderson, Jegadeesh, and Weisbach, 2006). Our work also augments previous work on opportunism across various other dimensions of firms' debt issuance decision.[3]

This paper offers three main contributions. First, following McBrady and Schill (2007), we investigate opportunistic debt issuance with a comprehensive sample of corporations (rather than sovereign governments and agencies), thus extending earlier results to a much broader corporate finance context. Our sample includes all foreign currency-denominated bonds issued by firms from 27 countries in each of the major international currencies of the 1993 to 2005 time period. Second, we investigate opportunistic issuance with a conditional logit regression set up that increases the power and precision of the inferences we are able to draw. Finally, we examine both the economic gains that firms achieve through their opportunistic issuance and the extent to which they appear to influence subsequent yields and exchange rates. In this way, we provide evidence

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for the same 15-year money—650 basis points more to borrow in U.S. dollars…but to take advantage of this enormous rate differential, the dollar must be stable against the Swiss franc" (Business Week, 1979).

[3] Friedman (1979) and Baker, Greenwood, and Wurgler (2003), for example, examine the choice between short-term and long-term debt. Faulkender (2005) examines the choice between fixed-rate and floating-rate debt. Chaplinsky and Ramchand (2001) examine the choice between public debt and Rule 144A debt. Kim and Stulz (1988) and Miller and Puthenpurackal (2002) consider opportunism across bond markets.

suggesting that firms, rather than more traditional long/short arbitrageurs, effectively enforce interest rate parity at longer-term horizons.

Overall, we find strong and consistent evidence that firms, like the sovereign and agency issuers documented in McBrady and Schill (2007), pick currencies in order to exploit apparent deviations from interest rate parity.[4] In any period of time, they are markedly more likely to issue in the currencies that offer relatively low covered and uncovered interest yields. There is some evidence that they also are more likely to issue bonds in currencies that have recently appreciated relative to the other currencies in the sample, consistent with the expectation that currencies are mean-reverting. Further analysis of the cross-section variation among issuers bolsters our conclusions. Emerging market and non-investment grade issuers are markedly less likely than other firms to pick currencies based on relatively low covered interest yields. In the former case, this follows from the absence of currency swaps for emerging market currencies. Unable to swap bond payments into their home currency, emerging market firms have little incentive to potentially swap their issue currency into any other. For non-investment grade firms, on the other hand, additional market frictions explain their relative inability to exploit lower covered interest yields. Currency swap counterparties (AA-rated international banks) assess credit charges for swaps entered into with less credit-worthy counterparties. These charges can be 15 to 20 basis points, effectively eliminating the potential gains available to higher credit-quality issuers.

For the full sample of issuers and time periods, we compare the average borrowing costs that are realized through firm decisions to denominate bonds in particular currencies with a "naïve" alternative currency denomination rule. For the full sample of issuers and time periods, the differences appear relatively minor and insignificant. The full sample, however, masks periods of relatively high and low issuance in each currency. During

[4] This evidence is consistent with what firms say they do. Graham and Harvey (2001) find that 44 percent of the firms in their survey cite lower borrowing costs as an important reason for issuing foreign currency obligations. Servaes and Tufano (2006) observe that "relative interest rates," "relative credit spreads," and "expected exchange rate movements" are among the most common reasons that firms cite in their study for issuing debt in a foreign currency. Geczy, Minton, and Schrand (2007) find that 42 percent of the firms they survey respond that they "Frequently" or "Sometimes" actively take positions in response to a market view on exchange rate or interest rate movements.

periods of relatively high issuance, firms achieve covered interest savings of 5 to 6 basis points. These gains, of similar magnitude to those documented in McBrady and Schill (2007), remain after firms hedge their currency risk with swaps. They offer significant interest cost savings, but are likely to be within the range of well-functioning markets. We suspect that the gains are too small to be attractive to round-trip arbitrage firms after taking into account the associated transaction costs and long-horizon holding costs, though sufficiently attractive to one-way arbitrageurs such as corporate borrowers.

Much larger gains are observed with regard to nominal yields and subsequent exchange rate depreciation. Firms achieve nominal interest savings of 50 to 80 basis points over borrowing in other currencies by issuing bonds in relatively low interest currencies in high-issuance months. Over the subsequent year, they also systematically benefit by issuing bonds in currencies that tend to depreciate 80 to 110 basis points more than the other currencies in the sample. While these gains are impressive in magnitude, it is important to note that they do not come without risk. Given the volatility of exchange rates, large gains provide necessary compensation for the retention of currency risk.

The rest of the paper is structured as follows. Section 2 describes the bond sample and our measures of borrowing cost. Section 3 presents the empirical tests. Finally, Section 4 offers concluding remarks.

2. Data

2.1 International corporate bond offerings

We construct a sample of international corporate bond offerings from the Thomson Financial SDC Platinum Global New Issues dataset over the period from 1993 to 2005. We obtain all non-convertible, fixed-coupon corporate bonds placed in foreign markets or denominated in a foreign currency. The designation of international bonds is accomplished by selecting bonds in the SDC dataset with the variable "Market area"

equal to "Euro" or "International." Bonds offered in the issuers' local currency are excluded from the sample. Public sector bond offerings (Primary SIC code 6111 or in the 9000s) and trusts (SIC code 619A or B) are eliminated. Bond offerings by financial institutions (SIC Code 6000s) are also eliminated. The dataset includes 5169 offerings with an aggregate current U.S. dollar-based total principal of $1.4 trillion.

Since we are looking for equilibrium choice behavior, we omit offerings in euros (including ECU) and euroland currencies (German marks, French francs, etc.) as these are transitional currencies over our sample period. Our concern is that over the transition period many euro-denominated debt offerings are simply "rebalancing transactions" of retiring old currency debt to replace with new currency debt.[5] In order to improve the power of our empirical tests, we restrict our sample to those offerings that are denominated in the six most common currencies, the U.S. dollar (USD), British pound (GBP), Japanese yen (JPY), Swiss franc (CHF), Australian dollar (AUD), and Canadian dollar (CAD). To ensure that firms maintain a legitimate choice across the sample currencies, we eliminate offerings from those home countries in which we find bonds denominated in less than three of the six sample currencies. The revised sample includes 2608 offerings with an aggregate current U.S. dollar-based total principal of $554 billion.

Table 1 summarizes the currency denomination distribution across country of origin of the corporate borrower. Panel A provides the distribution of the number of offerings by country and currency and Panel B provides the distribution of the U.S. dollar-based value of offerings by country and currency. We observe that firms tend to make use of the broad menu of currency choices in their denomination decision. We find that firms from some countries do not broadly choose from the menu of currencies. Borrowers from countries such as Brazil, Portugal, and Indonesia, for example, fail to collectively pass our sample screens. Some countries tend to have particular concentrations. South Korea, for example, tends to have a disproportionately large number of JPY denominated issues, consistent with expected operating cash flow hedging considerations. On a per offering

[5] The total number of bond offerings over the sample period for selected "euroland" currencies not included in the sample are 1451 for the euro, 154 for the German mark, 91 for the French franc, and 37 for the Italian lire.

basis, the bond offerings were on average largest from Italy ($573 million per offering) and smallest from Austria ($73 million per offering).

In Panel C of Table 1 we report the distribution of international debt by industry, country type, bond rating, and size of offering. Across industry, we define utilities as those bond offerings by firms with SIC code within the 4000s. G5 firms are defined as those from France, Germany, Japan, United States, and United Kingdom. Emerging market firms are defined as those from the following countries in our sample: Bermuda, Cayman Islands, China, Hong Kong, Malaysia, Mexico, Singapore, South Africa, and South Korea. The bond rating is that reported by SDC. We observe that utilities and firms from G5 countries represent an important segment of our sample. The offerings tend to be most commonly from BBB-rated firms and be issued in amounts between $100 and $500 million. However, small offerings are much more common for issues in CHF, AUD, and CAD.

In Panel D of Table 1 we report the share of annual amount issued (converted to USD) for each of the six sample currencies. We observe that bond offerings in CHF and CAD were particularly popular in the early 1990s. Bond offerings in AUD were particularly popular in the mid 1990s. Bond offerings in USD were particularly unpopular in the early 2000s while bond offerings in GBP were particularly popular. The time variation in share can be large: JPY share goes from 3% in 1998 to 47% in 2000 to 2% in 2002. Overall the data suggest that currency denomination demand is not static. Our objective is to test whether the increases in preferences of particular currencies correspond to periods when the various components of the costs of borrowing in a particular currency appeared relatively low.

2.2 Borrowing cost measures

We obtain monthly interest rate and exchange rate data to generate a panel of prevailing borrowing cost measures across the six sample currencies. To estimate the corporate

borrowing cost we use the 5-year Bloomberg Fair Market Yield indices for AA-rated Eurobonds in each sample currency. We choose the 5-year yield because the median bond maturity for our bond sample is 5 years. While Bloomberg Fair Market Yield indices do not represent the specific yield at which each of our corporate borrowers could issue a bond, they are designed to serve as pricing benchmarks and are widely consulted by fixed-income investment bankers. To maximize their applicability as pricing benchmarks in each respective market, the yield indices themselves are calculated daily from term structures constructed from a large sample of the most liquid bonds in each category (i.e. AA-rated euroyen bonds, for example). To proxy for foreign currency movements, we follow McBrady and Schill (2007) and use one-year prior realizations of the exchange rate from Datastream for each currency relative to the euro.

To measure covered yields, we obtain five-year interest rate swap rates for all currencies from Datastream and USD basis swap yields from Bloomberg. In the latter half of the 1990s, fixed-for-floating currency swaps evolved away from single instruments and toward two separate "plain vanilla" swaps: a simple interest rate swap packaged together with a foreign currency "basis" swap. The interest rate swap transforms fixed-rate cash flows in a given currency into LIBOR-based cash flows in the same currency. The currency basis swap then exchanges foreign LIBOR-based cash flows for US dollar LIBOR-based cash flows. To capture the dual effect, the covered spread is defined as the AA-rated eurobond yield less the total swap yield defined as the interest rate swap yield plus the basis swap yield for the respective currency.[6] Consistent with Clinton (1988) and

[6] There are some limitations on the availability of the full panel of data over the sample period. For the AA-rated Eurobond yield data, the CHF, AUD, and CAD series start in April 2000, December 1994, and July 1993 respectively. For the basis swap data, the JPY, GBP, CHF, AUD, and CAD series start in June 1997, January 1997, July 1998, March 1997, and February 2000. Because we need a balanced panel for our empirical tests we impute the values for the nominal yield and the covered yield. Over the sample period for all currencies other than the yen, basis swap rates rarely exceed +/- 15 basis points. We assume the missing basis swap yield to be the mean rate for those sample months with available data. Because the sample mean rate for JPY during LTCM crisis (August 1998 to August 1999) was extraordinarily low and thus unrepresentative, we exclude the rate for this period in calculating the mean to be used for the missing values. For the AA-rated Eurobond yield we use the sample currency mean credit premium over government benchmark yields and then apply that premium to the missing observations based on the prevailing benchmark yields by currency. For the benchmark yields, we use the 5-year government benchmark yield for each currency from Datastream.

McBrady (2003), we find some cross-sectional variation in covered yields across sample currencies.

For consistency, all yield values are log transformed and expressed in basis points. In constructing these proxies, our purpose is to isolate opportunistic borrowing behavior. Since we know that corporations also use foreign currency borrowing to hedge operating cash flow exposure (Allayannis et al., 2003; Kedia and Mozumdar, 2003; and Geczy, et al., 1997), we can improve the power of our tests by removing any systematic hedging effects. We use two variables to control for such systematic changes in cash flow in a particular currency: real GDP growth and nominal import growth. The GDP growth is measured as the log growth in real GDP in basis points for the currency's home country and import growth is measured as the log growth in nominal imports in basis points for the currency's home country. We use these two variables because we suspect that firms may collectively have more incentive to hedge cash flows in a particular currency if the respective economy for that currency receives a shock to overall economic growth in that economy or to growth in imports to that economy. The variables hopefully capture any systematic effects of variation in cash flow exposure in the currency on prevailing borrowing yields. To purge our borrowing cost proxies of any cash flow effects, we regress each borrowing cost measure on the contemporaneous estimate of GDP growth and import growth for the respective currency. We allow the coefficient estimates to vary by currency. We construct an adjusted borrowing cost measure by adding the residuals of the regression to the pre-adjusted sample mean of the measure. In this way the measure maintains the same mean and fundamental time-series structure while becoming independent of the cash flow effects.

We plot the series in Figure 1: nominal yield (Figure 1a), exchange rate movements (Figure 1b), and covered yield (Figure 1c). Figure 1d plots the basis swap rate, a component of the covered yield, showing with a flat line the imputed values in the early part of the sample period. Table 2 provides descriptive statistics of the borrowing cost variables. We observe that over the sample period, the nominal yield on the JPY debt is relatively low (161 bps) while that of the AUD (660 bps) and GBP (628 bps) is high. In

the year previous, we observe that the JPY appreciated the most, while the USD appreciated the least against the euro. Across the covered yields we observe some variation with the JPY and CHF spread over swaps at near zero while the other currencies range from 8 to 19 basis points on average. We observe strong serial correlation in the series and some cross-correlation, with the correlation coefficient between covered yield and nominal yield series at 0.30.

3. Empirical tests and results

3.1 Testing a model of currency choice

We hypothesize that the probability of issuing debt denominated in one of the six sample currencies is a function of the respective interest rate. To model the firm's currency denomination decision, we use a multinomial response model where the firm chooses to denominate the bond across the six currencies based on the prevailing yields on borrowing. To be specific, we use the McFadden (1973) conditional logit model. This model allows us to investigate how currency choice is affected by multiple currency attributes, such as the cost of borrowing in the different currencies. In our case, the bond issuer faces six currency choices, each with six potentially different costs.

In subsequent tests we use a mixed specification that uses features of both the conditional logit model and the related multinomial logit model. Both models allow for discrete choice across multiple alternatives. However, the conditional specification models that choice based on the characteristics of the alternatives, whereas the multinominal specification models the choice based on the characteristics of the decision maker. In the context of our analysis, the characteristics of the choice alternatives are the relative prevailing borrowing costs across currencies, while the characteristics of the decision maker are the characteristics of the firm.

We model currency choice as a function of nominal yields, exchange rate appreciation, covered yields, and indicator variables which capture the bond offering preferences for each currency. More formally, this choice is modeled as in Equation 1.

$$Prob(Y_i = j) = \frac{e^{\beta' x_{i,j}} * e^{\alpha' w_j}}{\sum_{j=1}^{J} e^{\beta' x_{i,j}} * e^{\alpha' w_j}} \quad (1)$$

The probability of issue *i* being denominated in currency *j* is a function *of* $x_{i,j}$, which is a vector containing the currency cost attributes for issue *i* and choice *j*, and β is a vector containing the respective coefficients. It is also a function of w_j, which contains a set of indicators for the currency being equal to *j* and α is a vector containing the respective coefficients. To avoid multicollinearity we omit the indicator for the USD, and thus, the dummy variable coefficients represent the probability of issuing in the given currency with respect to the USD.[7]

We provide the coefficient estimates of this model in Panel A of Table 3. For each specification we present two weighting methods. The first specification weights each observation equally (EW). The second specification weights each observation by the principal of the bond offering in USD (VW). McBrady and Schill (2007) aggregate borrowing decisions by quarter and evaluate borrowing costs at the beginning of the respective quarter. To further refine their analysis, we report borrowing costs on a monthly basis, yet to preserve the quarterly horizon of McBrady and Schill, we include monthly yields over the past rolling quarter as relevant independent variables. Specifically, we measure borrowing costs as of the beginning of the month, and include borrowing costs as of month t, t-1 and t-2. Since there is some delay between when a firm may observe a borrowing opportunity and the realization of that opportunity, we feel that including two monthly lags on the borrowing cost measure is appropriate, nevertheless by including contemporaneous and two lagged borrowing cost measures we

[7] In estimating our conditional logit model, we must effectively expand our dataset of firm borrowing decisions by the number of sample currencies. The dependent variable is modeled as a binary variable for each sample currency. Because we have six sample currencies, each observation in our sample is repeated six times with the binary dependent variable referring to the binary decision to denominate the bond in each of the sample currencies in turn.

are able to infer what lag structure firms find relevant. The coefficients on the currency dummies, α, which simply capture the same sample composition reported in Table 1 are not reported. The null hypothesis is that if prevailing interest rates across currencies does not influence the currency denomination of firm borrowing as implied by interest rate parity, the coefficients on the borrowing cost measures, β, should be zero.

Regressions 1 and 2 provide the estimates for the EW and VW specifications for the uncovered yields and exchange rate appreciations. Regressions 3 and 4 provide the estimates for the EW and VW specifications for the covered yields. Regressions 5 and 6 contain regression specifications with all borrowing cost variables together. We observe a striking pattern in the coefficient estimates. For nearly all the borrowing cost proxies, the coefficients on the contemporary and once lagged yields are not significantly different from zero. However for the twice lagged yields, the coefficients are negative and significant suggesting that the probability of a firm choosing a particular currency increases as the value of the borrowing cost measure at a two-month lag decreases. Such findings are inconsistent with firm belief in interest rate parity and evidence of opportunistic behavior on the part of firms where there is a two-month delay in executing the borrowing opportunity. The 1-year exchange rate appreciation coefficients are mostly insignificant, possibly because of the strong correlation across the three exchange rate variables that exists due to overlapping periods across these variables. Specifically, the exchange rate appreciation at time period *t* overlaps with that measured at time period *t-1* for 11 of the 12 months.

To simplify the regressions, we omit the concurrent and one month lag variables in specifications 7 and 8. When we include only the twice lagged exchange rate appreciation measure on the right-hand side of the regression, we find that the coefficient on this measure to be now positive and significant. This sign suggests that firms choose to issue debt in those currencies that have recently appreciated, which would be consistent with the belief by firm managers that exchange rates are mean reverting. The two-month lagged nominal yields, exchange rate appreciation, and covered yields appear to be relevant for firms in choosing their debt denomination. The regression results reject

the null hypothesis that bond issuers are indifferent to prevailing covered and uncovered yields when denominating international bonds. The results provide strong evidence that the support for opportunistic issuers identified by McBrady and Schill (2007) for a narrow subsample of firms is also found across the broader population of corporate firms. Results also report a novel finding that firms react to borrowing cost measures with a two month lag.

The conditional logit regressions, unlike OLS regressions, are non-linear, and thus the coefficients do not have economic interpretation. For that reason we report in Panel B of Table 3 marginal effects for regression 7. Specifically, we compute the change in the probability of issuing a specific currency resulting from a 100 basis point increase in the cost of issuing that specific currency (see Green (1997, p. 918) for details of these calculations). We also compute the model's estimated probabilities of issuing a particular currency and compare them to the actual probabilities from Panel A of Table 1, bottom row. It is encouraging to find that the estimated probabilities are very close to the actual currency shares.

We find that a 100 basis point increase in the USD nominal yield from its mean (while keeping all other variables at their means), reduces the probability of denominating debt in USD by 7 percentage points, (i.e., it reduces its probability from approximately 50% to 43%). By the same token, a 100 basis point increase in the USD covered yield, reduces the probability of denominating debt in USD by 14 percentage points. Thus, our results are not only statistically significant, they are also economically significant. The remaining marginal effects are substantially smaller, but the probabilities of denominating debt in these other currencies are also substantially smaller resulting sometimes in larger proportional effects. For example, for the CAD, the least popular currency in our sample, a 100 basis point increase in its nominal yield reduces the probability of denominating debt in the CAD by half a percentage point from 2% to 1.5% (a proportionally large decline in probability of 25% (0.5% / 2%)). Overall, the effect of cross-sectional variation in borrowing yield appear to influence both statistically and economically the likelihood of currency denomination of international bonds.

We recognize the importance of eliminating the possibility that the regressions are simply picking up the effects of cash flow hedging by firms exposed to exchange rate risk. We attempt to control for such systematic effects by purging the borrowing cost series for time-series variation in relative trade and economic growth. It is possible that our procedure for purging the borrowing cost series for systematic foreign exchange cash flow hedging effects does not completely remove such effects. Ideally we would like to be able to control for the cash flow positions by each firm in each of the 6 sample currencies. Such data is not available for our sample firms. Some firms report geographic segment revenue at an aggregated level, but that is insufficient for our purposes.

Faulkender (2005) models firm interest rate sensitivity by regressing 6-month LIBOR on quarterly cash flows (scaled by assets) and uses the regression coefficients to quantify the firm's interest rate exposure. We expect that an exchange rate version of this variable would be an attractive control variable for firm exchange rate sensitivity, as firms with sensitivity to a particular exchange rate may be more likely to hedge the sensitivity by issuing debt in that currency. We follow this procedure by estimating exchange rate sensitivity to quarterly revenue and operating profit data. We select these line items because they are above the line items in the income statement that are affected by exchange rate hedging. If we looked at the exchange rate sensitivity of firm net income or stock returns we would be unable to distinguish between those firms that have low sensitivity and those firms that have hedged away their exchange rate exposure (Jorion, 1990).

To estimate the exchange rate sensitivity, we regress the quarterly revenue and operating profit (Data items 2 and 21 in the quarterly Compustat file) scaled by total assets on the quarterly exchange rate appreciation relative to the euro for each sample currency in a rolling fashion over the past five years. Unfortunately, nearly 90% of the firms in our dataset do not report financial statements on a quarterly basis. We expect that estimates based on annual performance would be too imprecise to be of much statistical value. Despite the sample limitation, we proceed with our analysis using the roughly 10 percent

of the firms in the dataset that do report quarterly results based on an equity listing in the United States. This subset of firms is comprised of firms from Canada (38%), United States (37%), United Kingdom (7%), Norway (6%), Mexico (4%), and other countries (8%). The sensitivity coefficients are Winsorized at the 10th and 90th percentiles following Faulkender. These coefficients measure whether the firm sales or operating profits are historically sensitive to the exchange rate of any of the respective sample currencies.

We begin our test by re-estimating Regression 7 from Table 3 (not tabulated) with the smaller sample. We observe that the coefficient on the nominal yield is statistically significant (t-stat = -3.94), but the coefficients on the exchange rate appreciation and covered yield are no longer significant. With this regression as the baseline, we subsequently add the exchange rate sensitivity measures. Both the cash flow sensitivity measures generate positive and significant coefficients, suggesting that firms with a long position in the sample currency (positive sensitivity) are statistically more likely to issue debt in that currency (consistent with a hedging motive). Despite the significance of these sensitivity coefficients, the addition of these variables maintains virtually no effect on the borrowing cost coefficients. Based on the two approaches we use to control for exchange rate hedging motives, we conclude that the correlation between currency denomination and borrowing costs is not explained by hedging cash flow sensitivity.

3.2. The effect of firm characteristics

Although we observe opportunistic borrowing behavior for our overall corporate sample, we question whether all international borrowers tend to be similarly motivated by both covered and uncovered yield borrowing gains. In particular, we suspect that borrowers from emerging market economies and those with low bond ratings may display different preferences. For most emerging market countries, a swap contract market did not exist in the domestic currency over this sample period. Without the ability to swap back into the domestic currency, we suspect that firms from emerging market economies are likely to

be less sensitive to covered yield variations. For firms with non-investment-grade bond ratings we suspect that they are also likely to be less sensitive to covered yields since swap contracts with such firms will be executed at substantially greater costs. Such credit costs may very well be great enough to eliminate the gains from reductions in covered yields.

To accomplish this cross-sectional test, we include an indicator for the issue originating from a firm headquartered in an emerging market (Home=*EM*), and an indicator for the issue having non-investment grade rating (*Rating<BBB*). We interact these characteristics with choice attributes (the borrowing cost measures) and with each of the currency dummies. By allowing the interaction of both characteristics with the currency dummies we are allowing the model to maintain different probabilities for each subsample to issue in any particular currency. As mentioned we also allow the effects of currency cost on choice to vary with these two characteristics. In conditional logit models, characteristics are never added by themselves, as they would in more common models. This is because the characteristics are not a function of currency *j* and the term would drop out. Equation 2 contains the mathematical expression of the model for this specification.

$$Prob(Y_i = j) = \frac{e^{\beta'(x_{i,j} + em_i * x_{i,j} + b3_i * x_{i,j})} * e^{\alpha'(w_j + em_i * w_j + b3_i * w_j)}}{\sum_{j=1}^{J} e^{\beta'(x_{i,j} + em_i * x_{i,j} + b3_i * x_{i,j})} * e^{\alpha'(w_j + em_i * w_j + b3_i * w_j)}} \qquad (2)$$

We report the regression results in Table 4. For presentation purposes none of the currency dummies and respective interaction coefficients are reported in Table 4, as the coefficients on these variables effectively represent the sample distribution characteristics captured in Table 1 Panel C (the likelihood that a bond is denominated in any particular currency by subsample).

The coefficients on the borrowing cost measures continue to be significantly negative and those on the exchange rate appreciation continue to be significantly positive. For the emerging market firms, the coefficient on the covered yield interaction term is positive

and significant (specifications 1 and 2). This finding is consistent with the prediction that emerging market firms are less likely to respond to variations in covered yields. By contrast, the coefficient on the nominal yield interaction term is indistinguishable from zero, suggesting that emerging market firms are just as motivated as other firms to benefit from uncovered yield gains. Regarding exchange rate appreciation, only the interaction term on the value-weighted specification is significant, suggesting again that emerging market firms are motivated by uncovered yield gains despite their relative indifference to covered yield gains.

For the non-investment grade debt firms, the findings are similar to those of the emerging market firms: response rates are significantly less important for covered yields as evidenced by the positive coefficient on the interaction between covered yields and an indicator for the firm being non-investment grade (specifications 3 and 4). Since the baseline coefficient is negative one might question whether low-rated firms are active in responding to covered yields. The coefficient on the interaction between nominal yields and a non-investment grade indicator is indistinguishable from zero, and that between exchange rate appreciation and the non-investment grade indicator is significant for only the equally weighted specification, suggesting that non-investment grade borrowers are just as likely to pursue nominal yield savings as other borrowers. This is consistent with the notion that low-rated debt firms are relatively more likely to respond to variations in nominal yields which one might expect if the covered yield market is less open. These results continue to hold when we include all independent variables simultaneously (specifications 5 and 6). The results provide support for the prediction that emerging market firms and firms with low debt ratings are less likely to respond to covered yield variations, though just as likely to respond to nominal yield variations.

3.3 Economic gains to foreign currency borrowing

To better appreciate the economic gains associated with opportunistic issuance decisions we begin by computing the mean realized borrowing cost estimates for the sample

weighted equally across bond offerings (EW) and weighted by the value of the principal in each offering (VW). The realized nominal yield estimates (not tabulated) are 470 bps and 489 bps for the equal-weighted and value-weighted values, respectively. The realized covered yield estimates are 12 bps and 15 bps for the equal-weighted and value-weighted values, respectively. For the exchange rate series we adjust the variable from being defined as the past one-year appreciation rate to the forward one-year appreciation rate. The realized exchange rate appreciation estimates are -27 bps and -92 bps for the equal-weighted and value-weighted values, respectively.

To compute the mean gain across bond offerings, we must compare the reported realized costs to those of some naive benchmark. We follow the approach of McBrady and Schill (2007). As a reference for the equal-weighted figure we construct a benchmark that assumes that firms naively denominate their debt proportionally to the total number of issues in each of the six currencies (bottom row of Table 1, Panel A), namely 50% USD, 10% GBP, 15% JPY, 21% CHF, 3% AUD, and 2% CAD. Such naive weights generate mean equal-weighted borrowing cost estimates of 461 bps for the nominal yield, -25 bps for the exchange rate appreciation, and 12 bps for the covered yield when applied over the sample period.

We follow the same procedure using the principal value weights (bottom row of Table 1, Panel B) to generate a benchmark for value-weighted borrowing costs. Subtracting the realized values from the respective naive values provides an estimate of the mean gain over the naive cost attributed to the firm's choice of variation in the currency mix over the sample period. If firms choose to opportunistically issue in particular currencies over the sample period when the currencies are relatively less costly, the difference between the naïve value and the realized value will be positive.

As we can sense from these values the unconditional mean of borrowing cost savings is not great. However, from our earlier analyses we know that not all firms take equal advantage of variations in interest rates, for example, firms based in emerging markets and non-investment grade issues are less likely to pursue covered interest rate savings,

and thus an unconditional mean would not provide very relevant statistics. Further, we posit that issues effected during periods of excess issuance activity are more likely to be motivated by interest rate savings. To tease out the effects across the various sub-samples we run issue level regressions using the difference between the naive and the imputed borrowing costs as the dependent variables in three sets of regressions. The dependent variables represent the savings achieved through opportunistic issuance. The first set of regressions explains variations in nominal yield savings, the second variations in exchange rate appreciation savings and the final set variations in covered yield savings.

We include as independent variables an intercept and three dummy variables. The dummy variables are the emerging market indicator variable and the non-investment grade rating indicator from the previous section. We also construct an indicator variable equal to one when the share of all issuance volume (measured monthly in USD) in a given currency is particularly strong. We do this to be able to distinguish those periods when the borrowing gains are particularly attractive from those of normal borrowing costs. By looking at the levels of borrowing costs during periods of abnormal borrowing in a given currency we hope to be able to better gauge the representative gains associated with abnormal borrowing opportunities. Our approach follows a similar analysis by McBrady and Schill (2007). We identify the 15 months with the largest share of issuance in a particular currency over the sample period for each of the six sample currencies as heavy issuance months. To be specific, the heavy issue months are identified for each currency based on the share of total amount issued that is denominated in the particular currency for that month.

For each set of regressions we run equal- and value-weighted regressions. In equal-weighted regressions, each issue is given equal weight, and thus we use as the naïve benchmark the equal-weighted cost computed as described above. The coefficients for these regressions represent the equal-weighted mean differential for each of the sub-samples. In value-weighted regressions each issue is weighted by the principal amount issued in USD, and for these regressions we use as the naïve benchmark the value-weighted cost. The coefficients for these regressions represent the value-weighted mean

differential for each of the sub-samples. The intercept terms capture the global mean difference in borrowing cost savings, equally or value weighted depending on the specification, when the indicator variables are zero. A positive intercept suggests positive gains over the naïve currency denomination rule in non-heavy volume months, issues by investment grade firms and from non-emerging market countries.

We report these regression results in Table 5. We find that the average borrowing cost gains, captured by the intercept term, are near zero for most of the nominal yield and covered yield specifications. The intercept for the equal-weighted covered yield specification generates a significantly negative difference of 1.4 basis points. The average gains for the exchange rate movements are 29 and 28 basis points for the equal-weighted and value-weighted specifications, respectively. This result is consistent with McBrady and Schill (2007) who also find that currency denomination systematically anticipates one-year ahead exchange rate movements.

Of potentially more interest are the coefficients on the heavy issue volume indicator variable. We find the coefficient on this variable to be large and significant in all six specifications. The equal-weighted and value-weighted coefficients are respectively 53 and 81 basis points for the nominal yield gains, 79 and 110 for the exchange rate gains, and 5 and 6 basis points for the covered yield gains. The test results clearly suggest that the periods of heavy issuance in a particular currency are associated with periods of borrowing cost gains. We suspect that such gains might not be large enough to motivate a round-trip arbitrageur to take and hold a two-way position for five years, but are large enough to motivate a firm that already needs the debt capital to prefer currencies that provide slight savings.

Lastly, the coefficients on the emerging market dummy and the non-investment grade rating dummy suggest that the gains are not symmetric across firms. Emerging market firms tend to achieve substantially less covered yield gains. The coefficient on emerging market dummy with covered yields is a significant -4 basis points for both specifications. Non-investment grade rated firms tend to obtain less opportunistic gains across all

measures. The coefficient on the non-investment grade rating indicator variable is strongly negative for all measures and all specifications. In general the values suggest that poorly rated firms realize borrowing costs that are inferior to the naïve benchmark.

3.4 Borrowing Cost Gains in Event Time

Lastly, we investigate the time-series variation of the borrowing cost gains measures in event time. We plot the mean abnormal borrowing cost gains in event time where *Month 0* is the month of the bond offering. We measure the cost savings across each sample currency from 12 monthly lags through 12 monthly leads relative to the month of the offer. We plot for each event month the value-weighted mean, weighted by the principal of the bond offering. For the exchange rate we alter the series somewhat so as to capture the abnormal appreciation of the currency prior to *Month 0* and the abnormal depreciation of the currency subsequent to *Month 0*. Specifically this amount is measured as the exchange rate for *Month 0* less the exchange rate at each of the event window months. If the yen to euro exchange rate moved from 100 at *Month -12* to 80 at *Month 0* to 100 at *Month +12*, the yen has appreciated prior to the offering and depreciated subsequent to the offering. Such currency movements reduce the euro-based borrowing cost to the issuing firm by its choice to issue at *Month 0*. Based on this example, the revised exchange rate series for the yen would be -20% at *Month -12*, 0% at *Month 0* and -20% at *Month +12*. The humped-shaped pattern of the plot correctly indicates that the bond was issued at the peak of the exchange rate movement.

In the plots, all of the three borrowing series are standardized by subtracting the sample currency mean and dividing by the standard deviation such that the currencies are treated equally. The plot is provided in Figure 2. The various panels are the nominal yields (Panel A), exchange rate appreciation (Panel B), and covered yields (Panel C). Plots for both the full sample and only those issued during heavy currency volume months are provided.

For all three series, we observe that the borrowing gains tend to peak some months prior to the offering to about the time of offering. For the nominal yield, the peak for both the full sample and the heavy volume period offerings occurs several months prior to Month 0. This is also the case for the exchange rate effect for both samples of bond offerings. We also observe that there is a striking decline in the borrowing gains following Month 0. This decline is particularly sharp for those bonds offered during the heavy volume months. The findings are similar to those of McBrady and Schill (2007) for government and agency bond issuance and Pasquariello, Yuan, and Zhu (2006) for ADRs and exchange rates.

The time-series evidence is consistent with the notion that firm currency-denomination decisions represent one-way arbitrage opportunities for these firms. Since the firm must borrow anyway, choosing a particular currency provides a way to lower the cost of capital on an "as needed" basis while not incurring the round-trip costs associated with classic interest-rate arbitrage. It may be that corporations are, in fact, the marginal market participant that moves yields toward parity.

4. Conclusion

We examine managers' underlying beliefs about opportunities for borrowing gains from uncovered and covered interest rate parity deviations. For firms issuing international bonds, we propose that managers choose across a menu of potential currencies to identify borrowing bargains based on differences in uncovered or covered interest yields. We examine the correlation between aggregate bond denomination choice and estimates of uncovered and covered borrowing costs across a broad set of currencies from 1993 to 2005 to explore firm behavior.

Overall, we find strong evidence that managers respond to measures of covered and uncovered borrowing costs. Their aggregate issuance decisions are consistent with the belief that covered and uncovered interest parity does not hold at some horizons. Our

results for covered yields are less strong for firms from emerging markets and firms with non-investment grade bond ratings consistent with their more limited access to currency swap markets. Overall, the gains that firms achieve are economically significant but consistent with well-functioning markets. We find that bond yields and exchange rates systematically move toward parity following periods of relatively high issuance. This suggests international bond issuers may be effectively the marginal traders who enforce interest rate parity at long horizons.

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Table 1
Summary of international corporate bond offering sample

The table shows the distribution of home country, currency, and borrower characteristics for the 1993 to 2005 sample of international corporate bond offerings. The table reports the total number of bond offerings (Panel A), the total principal amount offered in billions of current U.S. dollars (Panels B), the distribution of borrower characteristics (Panel C), and the year of offering (Panel D). The country of origin denotes the ultimate domicile nation of the issuer as defined by SDC.

Panel A. Total number of bond offerings by country of origin

	Sample currency						
Country of origin	USD	GBP	JPY	CHF	AUD	CAD	TOTAL
Australia	40	1	7	3	0	0	51
Austria	1	0	4	25	0	0	30
Belgium	6	4	7	2	0	0	19
Bermuda	28	3	1	0	0	0	32
Canada	267	6	9	2	0	0	284
Cayman Islands	5	0	4	3	0	0	12
China	6	0	1	1	0	0	8
Denmark	7	0	14	5	1	0	27
Finland	4	1	3	0	0	0	8
France	84	73	61	78	10	13	319
Germany	82	36	53	42	11	3	227
Hong Kong	22	0	5	1	1	0	29
Italy	12	7	7	0	0	0	26
Japan	193	14	0	305	0	3	515
Malaysia	18	2	11	1	0	0	32
Mexico	113	3	1	2	0	1	120
Netherlands	53	6	4	10	2	0	75
New Zealand	18	4	7	2	0	0	31
Norway	32	5	6	18	0	0	61
Singapore	17	0	3	0	1	0	21
South Africa	3	2	3	1	0	0	9
South Korea	52	2	37	3	0	0	94
Spain	15	1	7	3	0	0	26
Sweden	14	3	8	8	2	1	36
Switzerland	47	6	2	0	6	1	62
United Kingdom	163	0	53	8	11	1	236
United States	0	71	64	31	24	28	218
Total	1,302	250	382	554	69	51	2,608
Mkt. share	49.9%	9.6%	14.6%	21.2%	2.6%	2.0%	

Table 1 (Continued)
Summary of international corporate bond offering sample

Panel B. Total principal amount by country of origin.

	Sample currency						
Country of origin	USD	GBP	JPY	CHF	AUD	CAD	TOTAL
Australia	10,225	316	491	579	0	0	11,611
Austria	200	0	347	1,671	0	0	2,218
Belgium	853	1,064	642	84	0	0	2,643
Bermuda	13,187	756	90	0	0	0	14,033
Canada	73,439	1,396	805	273	0	0	75,912
Cayman Islands	581	0	246	207	0	0	1,034
China	1,725	0	145	112	0	0	1,982
Denmark	957	0	923	417	69	0	2,365
Finland	1,112	359	174	0	0	0	1,645
France	18,979	18,369	8,314	12,571	709	1,323	60,265
Germany	15,954	12,777	9,706	5,092	668	221	44,418
Hong Kong	7,099	0	760	45	220	0	8,124
Italy	9,730	4,278	914	0	0	0	14,921
Japan	39,847	4,582	0	18,338	0	683	63,450
Malaysia	8,658	967	1,777	9	0	0	11,410
Mexico	31,479	766	205	230	0	77	32,757
Netherlands	17,733	2,307	2,044	1,862	125	0	24,071
New Zealand	3,202	908	334	171	0	0	4,616
Norway	8,012	1,110	198	2,040	0	0	11,360
Singapore	6,268	0	19	0	82	0	6,369
South Africa	1,020	379	535	18	0	0	1,952
South Korea	11,410	326	5,750	171	0	0	17,656
Spain	4,230	600	1,116	309	0	0	6,255
Sweden	3,397	778	1,500	584	145	68	6,472
Switzerland	13,250	1,167	1,421	0	539	226	16,602
United Kingdom	53,684	0	7,254	1,277	1,266	62	63,542
United States	0	19,770	16,208	3,947	3,634	2,839	46,398
Total	356,231	72,974	61,915	50,006	7,456	5,499	554,081
Mkt. share	64.3%	13.2%	11.2%	9.0%	1.3%	1.0%	

Table 1 (Continued)
Summary of international corporate bond offering sample

Panel C. Total principal amount by sub sample

	Sample currency						
	USD	GBP	JPY	CHF	AUD	CAD	TOTAL
Industry							
Utilities	125,785	38,239	23,230	18,491	1,500	1,629	208,873
Other industries	230,446	34,734	38,685	31,515	5,957	3,870	345,207
Country type							
G5	128,464	55,497	41,481	41,225	6,277	5,129	278,073
Other developed	160,108	15,039	11,244	8,197	878	294	195,759
Emerging markets	67,659	2,437	9,190	585	301	77	80,249
Bond rating							
AAA	33,601	11,322	3,513	10,202	3,339	3,839	65,815
AA	42,403	16,149	17,041	16,514	1,561	1,003	94,670
A	64,320	22,180	27,542	6,324	2,315	199	122,879
BBB	110,318	16,035	4,706	333	71	77	131,540
Non investment grade	73,147	3,120	534	178	0	0	76,979
Non rated	32,444	4,168	8,580	16,456	169	381	62,198
Size of offering							
$0 to $100m	9,437	2,249	11,735	15,616	2,941	2,541	44,519
$100 to $250m	81,212	18,028	16,579	27,281	2,807	2,225	148,133
$250 to $500m	120,955	29,791	18,221	6,504	1,708	733	177,912
$500 to $1000m	100,641	16,076	10,272	606	0	0	127,594
>$1000m	43,986	6,829	5,108	0	0	0	55,924

Table 1 (Continued)
Summary of international corporate bond offering sample

Panel D. Total share of principal amount by year

	Sample currency					
	USD	GBP	JPY	CHF	AUD	CAD
1993	0.685	0.041	0.032	0.206	0.003	0.034
1994	0.609	0.028	0.132	0.176	0.006	0.049
1995	0.681	0.034	0.090	0.172	0.006	0.017
1996	0.605	0.022	0.200	0.149	0.016	0.007
1997	0.721	0.080	0.104	0.086	0.007	0.002
1998	0.832	0.083	0.028	0.052	0.002	0.002
1999	0.715	0.110	0.072	0.070	0.031	0.003
2000	0.342	0.134	0.467	0.046	0.010	0.001
2001	0.527	0.266	0.135	0.064	0.008	0.000
2002	0.576	0.342	0.024	0.045	0.011	0.001
2003	0.717	0.170	0.047	0.042	0.020	0.004
2004	0.710	0.191	0.041	0.032	0.012	0.014
2005	0.715	0.126	0.020	0.093	0.041	0.005

Table 2
Summary statistics of borrowing cost measures

The table reports the means and correlation coefficients across the panel of currencies and the borrowing cost variables. All values are in log basis points. The sample period is from 1993 to 2005. The nominal yield is the log-basis point 5-year AA-rated average yield from Bloomberg for the respective currency. The exchange rate appreciation is the one-year past appreciation rate in the exchange rate spot rates (quoted as currency i/euro) in log basis points. The covered yield is the log-basis point difference in the 5-year AA-rated average yield from Bloomberg and the 5-year swap yield from Datastream plus the average basis swap yield from Bloomberg for the respective currency. All borrowing cost measures are measured at the beginning of the month.

	Nominal yield	Exchange rate appreciation	Covered yield
Currency months	156	156	156
Sample time-series means by currency			
USD	560.22	25.27	18.67
GBP	627.64	57.18	16.27
JPY	161.12	130.99	2.61
CHF	322.14	119.94	1.57
AUD	660.14	56.40	8.19
CAD	582.32	25.94	8.37
Sample autocorrelation coefficient			
1st order	0.989	0.911	0.736
2nd order	0.977	0.817	0.664
Sample cross-correlation coefficients			
Nominal yield	1.0000	0.0874	0.3011
Exchange rate appreciation		1.0000	-0.0611
Covered yield			1.0000

Table 3

Conditional logit regressions

Conditional logit regressions of currency choice on currency attributes (nominal yields, exchange-rate appreciation, and covered yields) and currency dummies, where USD is the omitted dummy. Panel A tabulates regression coefficients, and Panel B tabulates elasticities. The sample period is from 1993 to 2005. The currency attributes are defined in Table 2. Time period *t* is defined as the beginning of the offer month. The observations in the regressions are either equal weighted (EW) or value weighted (VW) where value is defined as the total principal in USD of the bond. The coefficients on the currency dummies are not reported, and statistical inference is based on robust standard errors. Elasticities are based on coefficients from regression (7) and represent the change in the probability of issuing in a certain currency if its cost increases by 100 basis points. The number of observations is 2608. The symbols *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	EW	VW	EW	VW	EW	VW	EW	VW
Nominal yield (t)	-0.0009	-0.0023			-0.0010	-0.0021		
Nominal yield (t-1)	0.0007	0.0021			0.0003	0.0017		
Nominal yield (t-2)	-0.0026**	-0.0047***			-0.0022**	-0.0045***	-0.0028***	-0.0047***
Ex-rate app. (t)	0.0000	0.0001			0.0000	0.0001		
Ex-rate app. (t-1)	-0.0001	0.0000			-0.0000	0.0000		
Ex-rate app. (t-2)	0.0002*	0.0002			0.0001	0.0001	0.0001***	0.0002***
Cov. Yield (t)			0.0005	-0.0041	0.0001	-0.0040		
Cov. Yield (t-1)			0.0040	0.0056	0.0031	0.0040		
Cov. Yield (t-2)			-0.0084***	-0.0085*	-0.0080***	-0.0071	-0.0057***	-0.0063***
Pseudo-Rsqr	0.2478	0.3879	0.2433	0.3756	0.2489	0.3889	0.2487	0.3881

Table 3 (Continued)

Conditional logit regressions

Panel B

	USD	BPD	JPY	CHE	AUD	CAD
Nominal yield (t-2)	-7.00	-2.50	-3.53	-4.68	-0.74	-0.51
Ex-rate app. (t-2)	0.24	0.09	0.12	0.16	0.03	0.02
Cov. yield (t-2)	-14.31	-5.12	-7.22	-9.55	-1.51	-1.05
Est. Prob.	49.51	9.92	14.80	21.17	2.71	1.86
Actual Prob.	49.90	9.60	14.60	21.20	2.60	2.00

Table 4
Conditional logit regression with issuer characteristic interactions

Conditional logit regressions of currency choice on currency attributes (nominal yields, exchange-rate appreciation, and covered yields, all measured at the beginning of the month two months prior to the offering month) currency dummies (where USD is the omitted dummy), and a number of interactions. The sample period is from 1993 to 2005. The currency attributes are defined in Table 2. The observations in the regressions are either equal weighted (EW) or value weighted (VW) where value is defined as the total principal in USD of the bond. D(Rating<BBB) is an indicator variable for the bond rating being below BBB. D(Home=EM) is an indicator variable for the bond issuer originating from an emerging market. The coefficients on the currency dummies and currency dummies interacted with D(Rating<BBB) and D(Home=EM) are not reported. Statistical inference is based on robust standard errors. The number of observations is 2608. The symbols *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

	(1) EW	(2) VW	(3) EW	(4) VW	(5) EW	(6) VW
Nominal yield (t-2)	-0.0031***	-0.0049***	-0.0031***	-0.0050***	-0.0030***	-0.0050***
Ex-rate app. (t-2)	0.0001***	0.0003***	0.0001***	0.0003***	0.0001***	0.0003***
Cov. yield (t-2)	-0.0061***	-0.0076***	-0.0079***	-0.0088***	-0.0083***	-0.0095***
Nom. yield x D(Home=EM)	0.0007	0.0025			0.0008	0.0025
Ex-rate app. x D(Home=EM)	-0.0002	-0.0004**			-0.0002	-0.0004**
Cov. yield x D(Home=EM)	0.0317***	0.0245***			0.0311***	0.0244***
Nom. yield x D(Rating<BBB)			-0.0023	-0.0015	-0.0026	-0.0018
Ex-rate app. x D(Rating<BBB)			-0.0005***	-0.0004	-0.0005***	-0.0003
Cov. yield x D(Rating<BBB)			0.0254**	0.0347**	0.0238**	0.0353**
Pseudo-Rsq	0.2969	0.4297	0.2957	0.4288	0.2981	0.4305

Table 5
Abnormal borrowing costs

The table reports pooled OLS regressions representing cross-sectional variations in mean results to see if firm denomination decisions differ from two naive denomination rules weighted by number (EW) and USD amount of offerings (VW). The sample period is from 1993 to 2005. The dependent variables are defined as the difference between the naïve borrowing cost and the realized borrowing cost. We present results for equal-weighted OLS regressions when the naïve benchmark is the equal-weighted cost, and value-weighted OLS regressions when the naïve benchmark is the value-weighted cost. The coefficients capture the borrowing gains achieved by deviating from the respective generic borrowing strategy. The nominal yield is the log-basis point 5-year AA-rated average yield from Bloomberg for the respective currency. The exchange rate appreciation is the one-year ahead appreciation rate in the exchange rate spot rates (quoted as currency i/euro) in log basis points. The covered yield is the log-basis point difference in the 5-year AA-rated average yield from Bloomberg and the 5-year swap yield from Datastream plus the average basis swap yield from Bloomberg for the respective currency. D(Heavy issue volume) is an indicator variable that equals 1 if the month in which the offering was made was one of the 15 busiest months in the sample period for that currency, where business of the month is defined by the share of total sample bond offerings denominated in the particular currency. Robust t-statistics are reported in parentheses. The number of observations is 2608. The symbols *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

	Naïve borrowing cost less realized borrowing cost					
Dependent variable	Nominal yield		Ex. rate appreciation		Covered yield	
	EW	VW	EW	VW	EW	VW
Intercept	6.39	-0.38	29.14**	27.89**	-1.41***	0.15
	(1.61)	(0.09)	(1.98)	(2.17)	(3.76)	(0.51)
D(Heavy issue vol.)	53.30***	81.38***	78.95***	109.60***	5.01***	6.42***
	(5.25)	(4.98)	(2.63)	(3.01)	(8.53)	(8.02)
D(Home=EM)	4.11	0.98	54.63*	30.25	-4.22***	-3.83***
	(0.41)	(0.11)	(1.79)	(1.07)	(6.60)	(6.31)
D(Rating<BBB)	-103.60***	-64.40***	-79.23***	-47.09**	-5.13***	-3.76***
	(17.27)	(11.95)	(2.88)	(2.00)	(9.54)	(7.99)
R-sqr	0.0516	0.0641	0.0053	0.0104	0.0640	0.0991

Figure 1. Borrowing cost variables over sample period. This figure plots the monthly borrowing cost measures over the 1993 to 2005 sample period. The units are log basis points. The various panels include the nominal yields (Panel A), exchange rate appreciation (Panel B), and covered yields (Panel C). Panel D plots a component of the covered yield, the basis swap rate. Due to lack of reported rates over the full time series, the imputed values are plotted as flat lines for a portion of Panel D.

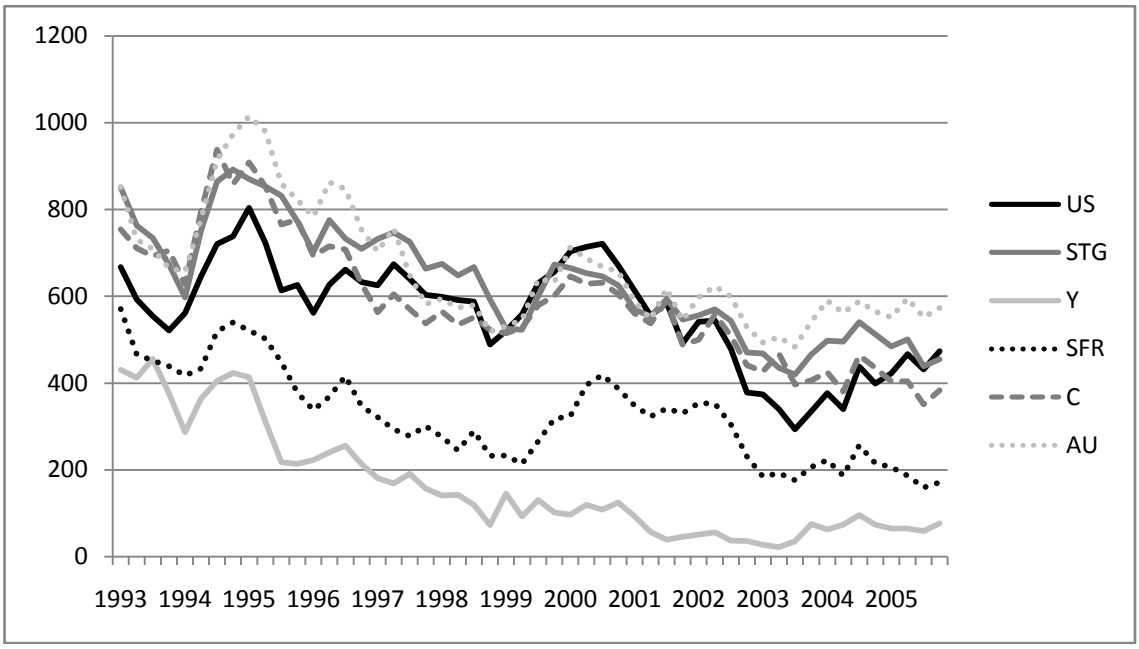

Figure 1a. Nominal yield

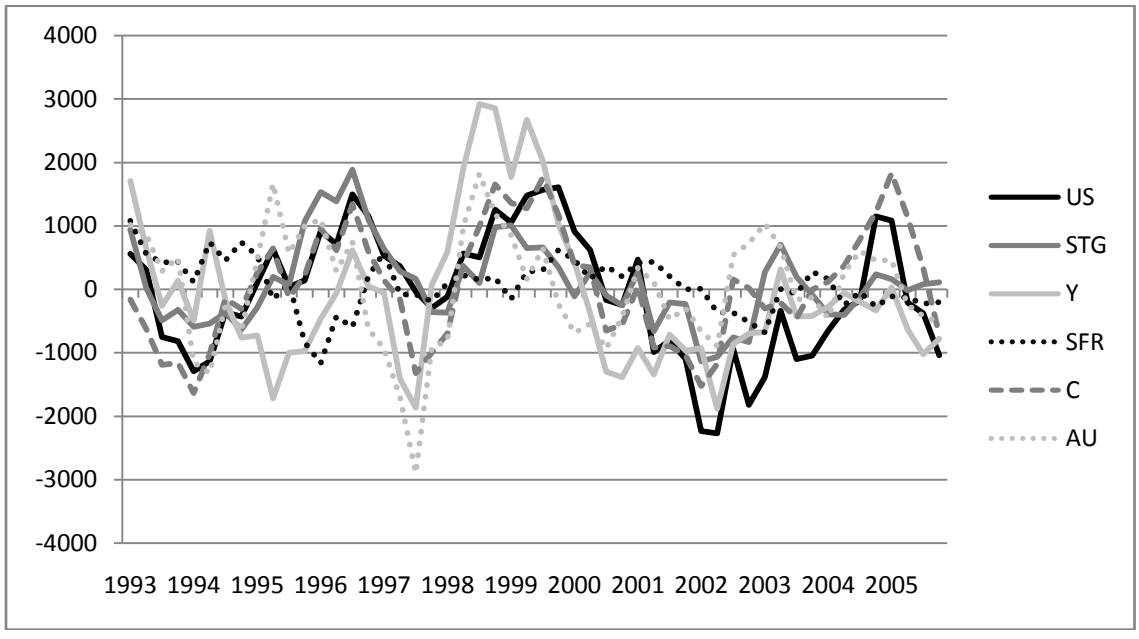

Figure 1b. Exchange rate appreciation

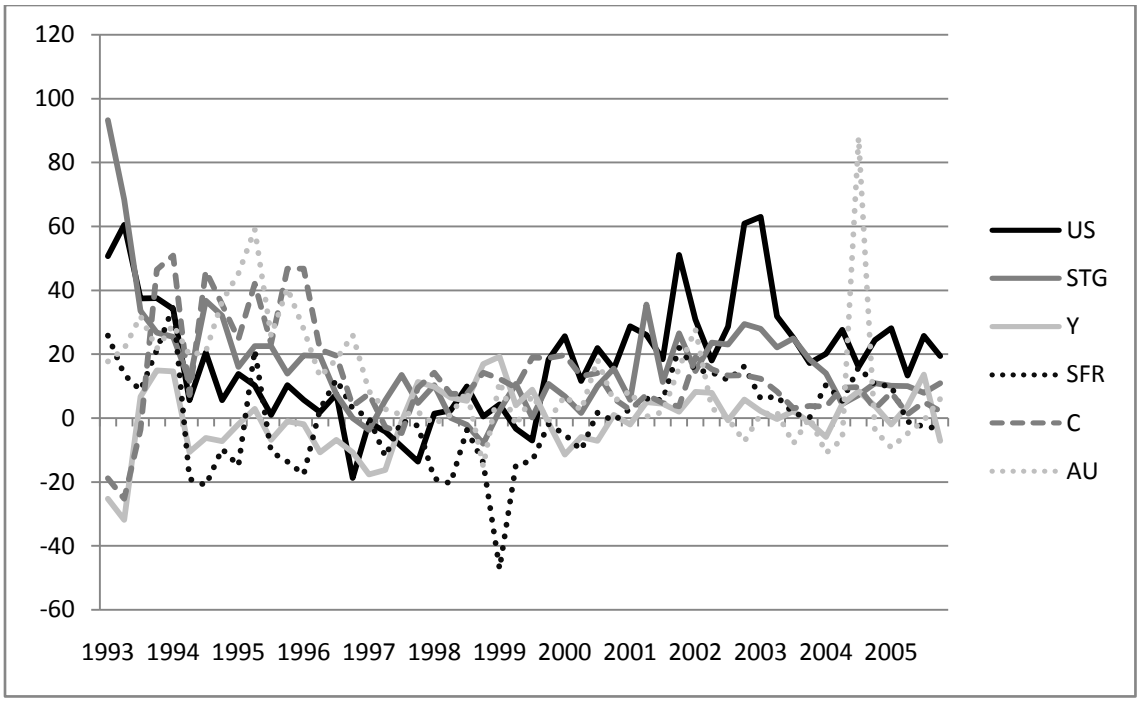

Figure 1c. Covered yield

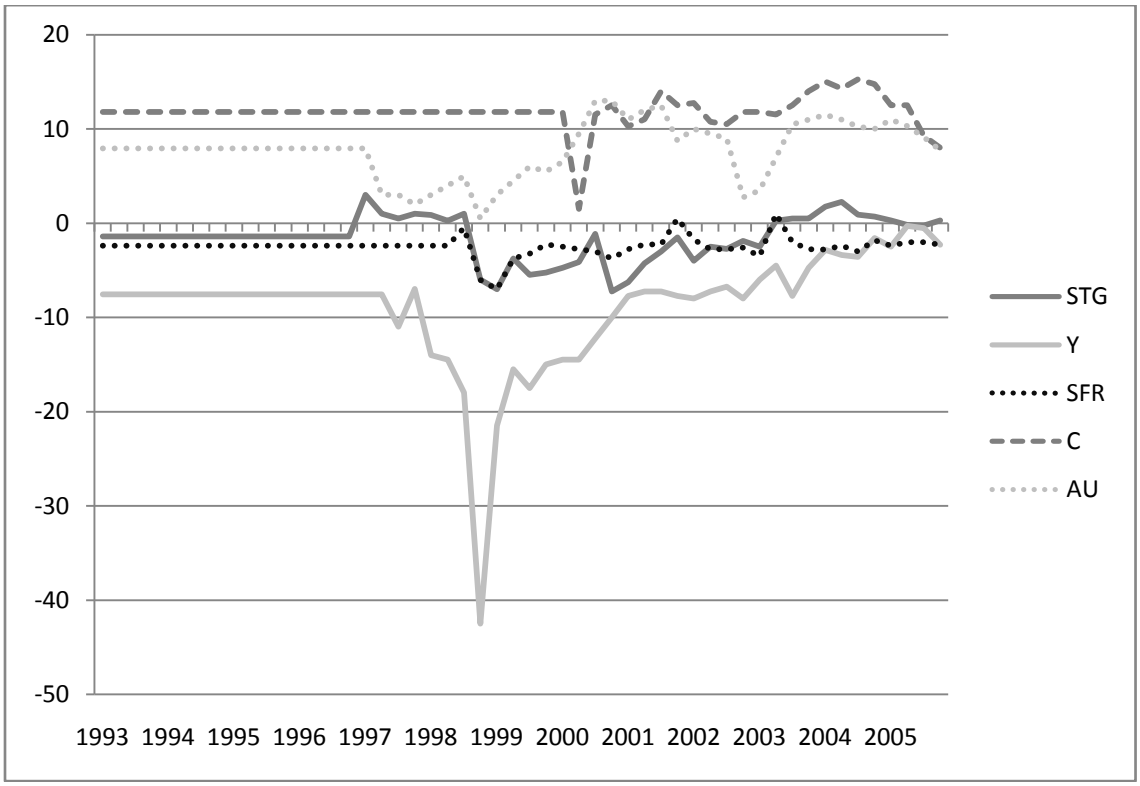

Figure 1d. Basis swap rate

Figure 2. Abnormal borrowing gains in event time. This figure plots the mean abnormal borrowing cost gains in event time where Month 0 is the month of the bond offering. Plots for both the full sample of bond offerings and only those issued during high currency share months are provided. High currency share months are defined as the 15 busiest months in the sample period for that currency, where business of the month is defined by the share of total sample bond offerings denominated in the particular currency. Observations are value weighted by the principal of the bond offering in USD. All series are standardized by subtracting the sample currency mean and dividing by the sample currency standard deviation. The various panels are the nominal yields (Panel A), exchange rate movements (Panel B), and covered yields (Panel C). The exchange rate variable measures the standardized amount of exchange rate gain achieved by offering the bond in month 0. This is measured by calculating the relative amount of exchange rate appreciation before the bond offering and the relative amount of exchange rate depreciation after the bond offering. Specifically this amount is measured as the exchange rate for month 0 less the exchange rate at each of the event window months.

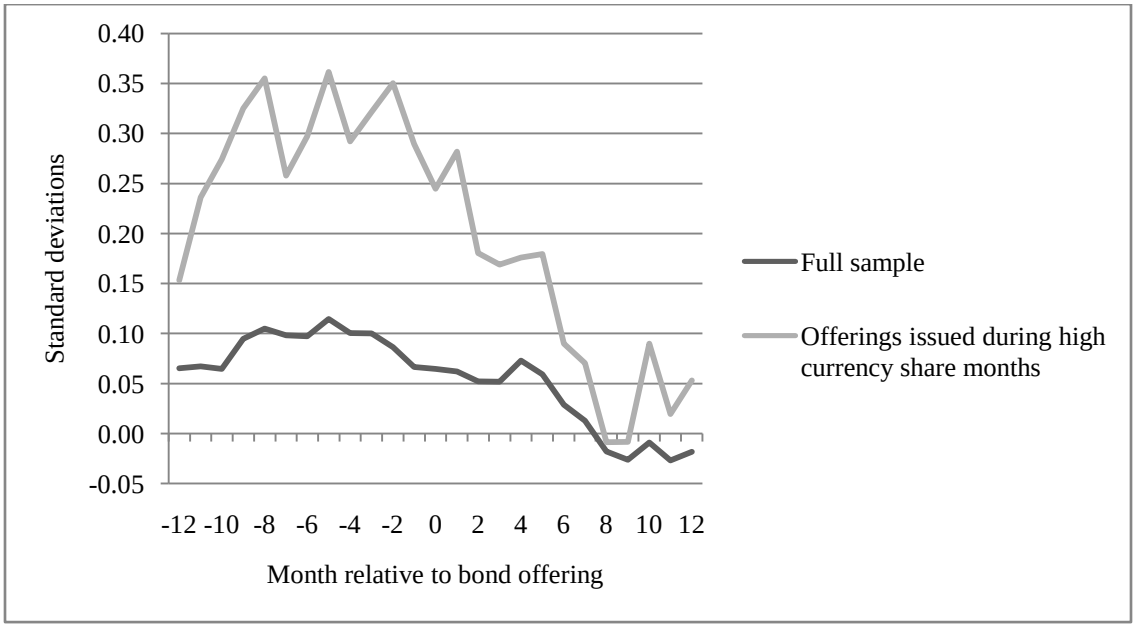

Figure 2a. Nominal yield

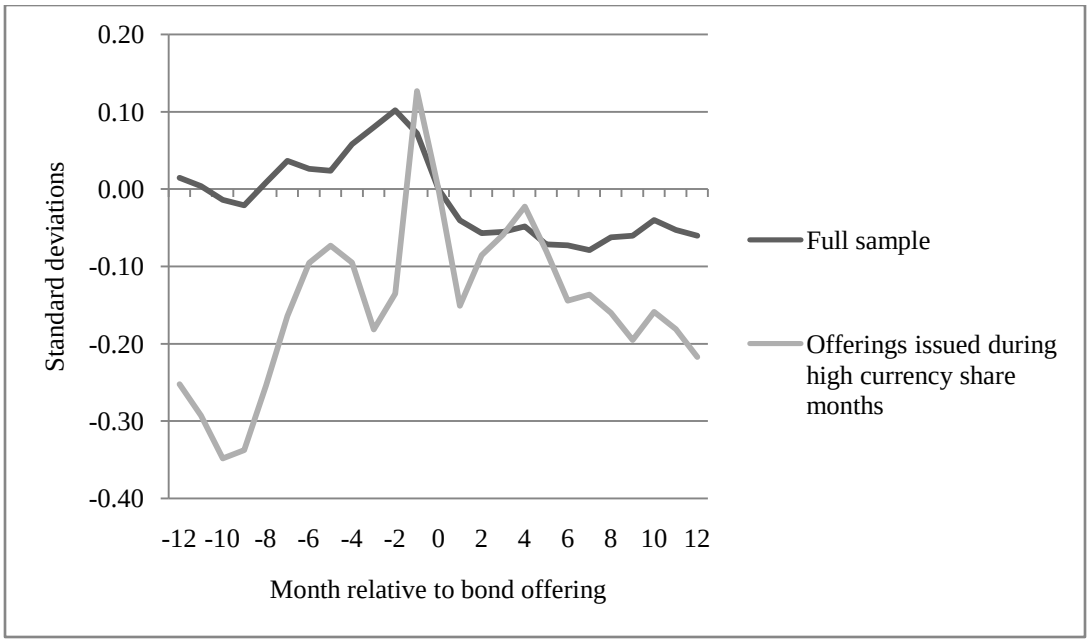

Figure 2b. Exchange rate

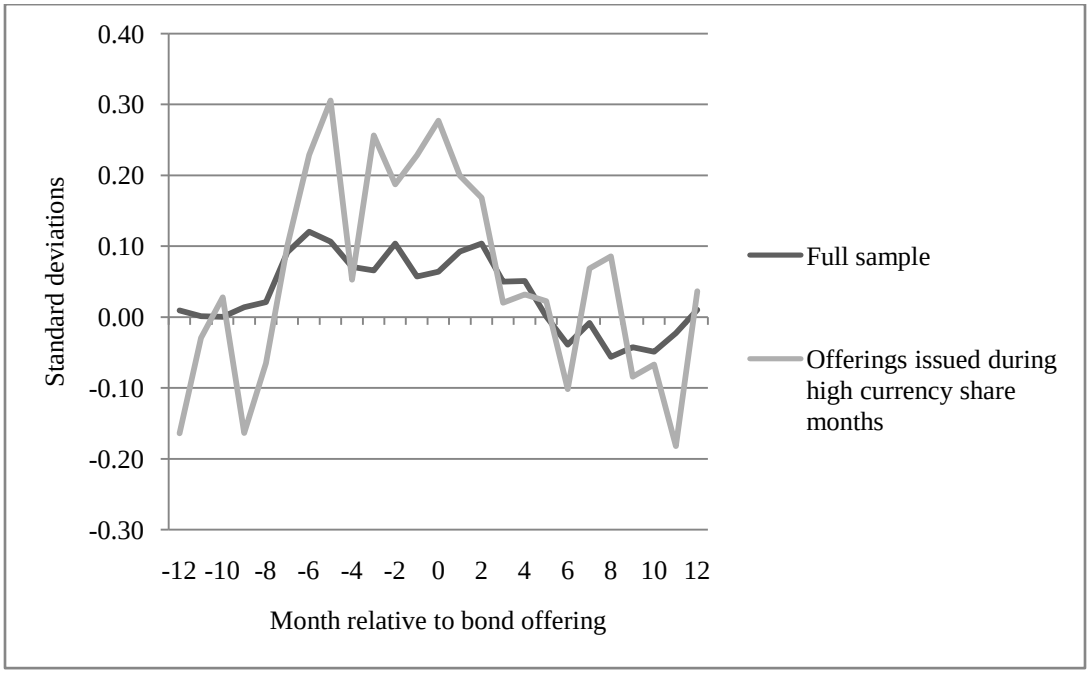

Figure 2c. Covered yield