

**WHAT IS THE ROLE OF BOOKBUILDING IN BOND ALLOCATION?  
EVIDENCE FROM BRAZIL**

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# WHAT IS THE ROLE OF BOOKBUILDING IN BOND ALLOCATION? EVIDENCE FROM BRAZIL

## ABSTRACT

*This study examines two different aspects of bookbuilding process of issuing corporate bond on an emerging market. Specifically: (a) underwriter's discretionary power and (b) bidder's efficiency. Using a unique sample of 40 bookbuilding processes for Brazilian corporate bonds of non-financial companies between January 2001 and July 2006, we document that there is no empirical evidence that the underwriter uses his discretionary power, as other studies of equity offerings have confirmed. In this work, the difference between pro rata allocation and actual allocation (award receive by bidder) is calculated for each bid. The difference is null for 96.6% of the sample, only 19 of 557 bids have difference between these two manners. From these 19 bids, only 4 bids present absolute difference (pro rata minus actual allocation) larger than 1 corporate bond.*

*Bidder and issuer's characteristics seem to impact investors' efficiency on competitive auctions. For instance, we find empirical evidence that step bids reduce bidder's likelihood of success, contrary to early studies that argue that multiple bids are optimal.*

*Mutual funds present superior performance on bidding strategy among bidders. If the bidder were a mutual fund, its chance of success would increase 60%. This advantage is related to particular features of the Brazilian corporate bond market that allowed mutual fund to develop an expertise on the bookbuilding process. They are responsible for around 75% of demand for corporate bonds and participate frequently in bookbuilding processes. Furthermore, the total number of bidders that participate in bookbuilding process is small and all of them are domestic. Besides, there is no restriction to international investors.*

## **1. INTRODUCTION**

This study examines different aspects of the bookbuilding process of issuing corporate bonds on emerging market by focusing on: the underwriter's discretionary power and the bidder's efficiency. Although there are considerable works regarding discretionary power on equity Initial Public Offering (IPO), similar studies are rare on corporate bond offering. Most of the research is concerned about pricing, seasoning process and rating of corporate bonds. Consequently, there is no much effort on the specific theme of issuing process problems.

In most emerging markets, the corporate bond market is much larger than equity market. For example, in Brazil, debt offers are around three times equity offers in 2006. In general, in emerging markets, corporate bonds are one of few alternatives to raise resources for long term financing.

This paper contributes to the corporate bond literature in interesting ways. First, by examining the investor's bids and actual allocation made by the underwriter, we verify whether the underwriter has the same approach as that of the equity underwriter in which some investors are benefited in their allocation according to information disclosure. The traditional equity literature, as in **Benveniste and Spindt (1989)**, argues that investment banks have to compensate informed investors to reveal information. One reason to use bookbuilding on equity IPOs is to collect information about demand for each share price level. **Cornelli and Goldreich (2001)** confirm the theory by finding that the underwriter awards more shares to bidders who provide information in their bids. This paper investigates empirically, for the first time, the compensation theory for the corporate bond market.

Second, this work analyzes the bidder's efficiency on competitive auction in order to identify what the bidders and issuers' characteristics are that may contribute to bidders' success in achieving their purpose of obtaining all demand attended. There are few studies regarding this aspect. **Scott and Wolf (1974)** argue that bidder should use step bid to obtain her optimal strategy of bidding. Most empirical work about bid strategy uses databases composed of auctions of Brazilian government treasury bonds. This work contributes to the literature in two ways: (a) analyzes, for the first time, the determinants of bidder success on bidding on bookbuilding and (b) uses databases consisting of corporate bonds for empirical evidence.

Using a unique sample of 40 books<sup>1</sup> for corporate bonds issues of non-financial companies between January 2001 and July 2006, we document that the underwriter does not use his discretionary power to beneficiate some bidder, as happens on equity offerings, since investment banks really use a pro-rata basis to allocate bonds among investors.

Furthermore, the bidder's characteristics influence investor performance on bookbuilding. If the bidder is a mutual fund, its chances of obtaining 100% of efficiency increase, but if the investor uses step bid, his probability of success is reduced. Not only investor but also issuer characteristics affect bidder's efficiency. For example, if a corporate bond is considered as low or medium risk level, it becomes easier for the bidder to realize all bids attended.

This work is structured in 6 sections. Section 2 provides a background in debt market. Section 3 briefly reviews the literature, including the hypotheses to be tested. Section 4 reviews the dataset and provides basis statistics. Section 5 describes the empirical analyses and discusses the major results. Section 6 concludes.

## **2. THE BRAZILIAN CORPORATE BOND MARKET**

### **2.1 Overview**

The Brazilian capital market has experienced an evolution since the inflation rate was controlled in 1994. After the latest crisis in 2002-2003 related to Mr. Lula da Silva's election, an optimistic economic environment allowed the market to establish a new record in 2005. About US\$19 billion in corporate bonds offerings and US\$ 4.5 billion worth of equity offerings were issued. As happened in other emerging countries, one possible explanation to substantially increased debt offer volume is related to falling interest rates. See on figure 1, total debt and equity offerings from 1996 to 2006.

Even though the debt market is much larger than the equity market, the Brazilian debt market is too small if it is compared with the US. The market value of bonds issued by non-financial corporate business in the US was about \$2,947 billion at the end of 2004. According to the *Sistema Nacional*

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<sup>1</sup> Book is a sheet that investment banks use to consolidate all bids received from bidders, define the final interest rate

*de Debêntures* (“SND”), until July 2006, the current Brazilian corporate debt outstanding was approximately US\$40 billion.

### **INSERT FIGURE 1: BRAZILIAN EQUITY AND CORPORATE BOND OFFERS – 1996-2006**

Although the total proceeds from debt offerings are rising, the secondary market is not following this trend. Most of trades on the secondary market are related to the exercising of options of repurchase agreements offered by leasing companies. One cause of this problem can be related to the fact that major buyers of corporate bonds are not interested in trading these securities, but hold to maturity. This happens in the Chilean debt market where pension funds are the main buyers. As for the Brazilian market, this phenomenon can be associated with mutual funds. Poor secondary markets are not exclusive to the Brazilian market, since most emerging countries, like Mexico, Argentina, Russia and Turkey, have the same problem.

### **INSERT FIGURE 2: BRAZILIAN SECONDARY MARKET – 1995 TO 2006**

Most Brazilian corporate bonds have floating interest rates that are based on the DI rate <sup>2</sup>(Depósito Interfinanceiro) and the IGP-M rate<sup>3</sup> (Índice Geral de Preço de Mercado). This characteristic of using floating rates is similar to the Euro zone countries and other emerging markets. The DI rate is an interest rate used in the interbank deposit market and is based on the SELIC<sup>4</sup> interest rate (Sistema Especial de Liquidação e Custódia). There are two distinct ways to express the DI rate as interest rate for corporate bonds: (i) DI rate plus an annual fixed coupon, for example, DI + 2.5%; (ii) Percent of DI rate, like 109% of DI, in this case the coupon is 9% of DI rate.

Usually, pension funds use the IGP-M as a benchmark for fund performance. Therefore, they prefer issues with the IGP-M rate as interest rate. On the other hand, the issuers usually prefer to use the DI rate as the interest rate of corporate bonds, because their capital structure is based on this rate and their stockholders use the DI rate as one possible benchmark for performance.

The Brazilian corporate bond market presents peculiar feature: the major buyers of corporate bonds are mutual funds. And most of their customers, especially retail ones, prefer to invest in mutual

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and allocate the bonds among bidders.

<sup>2</sup> DI Rate is equivalent to LIBOR rate

<sup>3</sup> IGP-M rate is equivalent to Consumer Price Index

funds that present the DI index as benchmark. Consequently, mutual funds need to buy securities linked to DI index. Two basic options remain treasury bonds and corporate bonds. In general, the corporate bond interest rate is higher than Brazilian treasury bills, because it is riskier.

Analyzing the 10 top mutual funds administrators<sup>5</sup>, eight of them belong to large financial groups that include commercial banks. These mutual funds represent about 70% of the mutual fund industry. Based on discussions with investment bankers and on a confidential survey performed by a major debt underwriter, our survey indicates that the top 3 underwriters (bookrunners), which represent about 50% of all corporate bond underwriting market, belong to the same financial group of the top 3 mutual funds managers (who correspond to around 45% of total assets of the mutual fund industry). Therefore, there is a possible agency problem: the major sellers (underwriters) belong to the same financial group of key buyers (mutual funds).

The Brazilian market is similar to others in emerging countries. The issuer can use the inflation rate index as a benchmark, very common in Latin American countries during the 1980's. **Anderson (1999)** analyzes inflation and contract cost in the Brazilian debt market. During recent years, bond's maturity has been longer reaching up to 12 years. Although some middle-size firms have access to the debt market, it is still expensive to underwrite a corporate bond, not only due to the investment bank fees but also to comply with the debt public company requirements to provide information to the bondholders.

Although there is no legal restriction to place corporate debts to foreign investors, only local investors participate in the bookbuilding process. Foreign investors prefer Brazilian sovereign bonds, not only because they present an interesting return, but also they are less risky and more liquid than corporate bonds. In February 2006, the Brazilian government created another incentive to sovereign bonds, which become more attractive to international investors. The Law 11.312 allows foreign investors to invest on sovereign bonds with no withholding taxes. Despite all these incentives to invest on sovereign bonds, some foreign investors started to show interest on corporate bonds from emerging markets.

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<sup>4</sup> SELIC rate is equivalent to Fed Fund Rate

<sup>5</sup> Ranking obtained from ANBID ( Associação Nacional dos Bancos de Investimentos). <http://www.anbid.com.br>

## 2.2 Legislation and Regulation

The issuing of corporate bonds is ruled by Law 4.606 of 1976, modified by Laws 9.457 of 1997 and 10.303 of 2001. They define general rules to underwrite such as tenor, face value, amortization, interest rate index, convertibility, types, offer value limit, and register. There are four types of corporate bonds: (1) fixed collateral, (2) floating collateral, (3) unsecured and (4) subordinated. The main difference among them is related to their priority over company's assets. In fixed collateral, the issuer gives the bondholder privileges over a specific free asset (of course, an asset that is not collateral to any other debt). The floating collateral corporate bond is a privilege over the company's free assets. With unsecured bonds, there is no privilege. The bondholder has the same priority of other debtholder without collateral. In subordinated bond cases, the only priority is over the shareholder.

In 2003 the CVM<sup>6</sup> (Comissão de Valores Mobiliários) published the CVM 400 Instruction, with the rules and procedures of debt issuance, including rules for bookbuilding. This resolution settles: (i) formal responsibilities to both underwriter and issuer during the offering process; (ii) defined standard procedures to be followed by investment bank during the underwriting process, including prospectus's content, overallotment options and especially regarding what public information should be disclosed along the offer process, and (iii) allowed shelter registration. The shelter registration is based on SEC rule 415 that settled procedures to shelter registration in the US debt market. **Kidwell et al. (1984)** find that this rule benefits issuers, because they could cut some basis points of their final bond's interest rate, regardless of their rating.

## 2.3 Procedures to underwrite a Corporate Bond

The debt IPO process or seasoned process of new corporate bond is similar to equity offerings. The issuer mandates an investment bank to be the underwriter, in general, this position is called "coordinator" or "bookrunner". The bookrunner is responsible for the final allocation of the securities (corporate bonds) among investors. The average time for public companies to issue a corporate bond is around three months. The first step of underwriting is to verify if the issuer meets the requirements from CVM. First of all, the issuer must be registered as public company at the CVM in order to underwrite a corporate bond. The offering itself must be also registered at the

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<sup>6</sup> CVM is equivalent to US SEC

CVM, otherwise the issuer is not allowed to sell bonds in the primary and organized secondary markets. Bond indenture and transcripts of board or general shareholders meeting concerning the offering must be registered at Commercial Registrar. In case the issuer chooses a fixed collateral bond, it is necessary to be constituted. The underwriter has to determine if the issue value respects limit imposed by law 6.404. For fixed collateral bonds, the limit is up to 80% of the value of the collateralized assets and for floating collateral bond up to 70% of company assets minus the book value of fixed collateral debts. In case of unsecured bonds, the limit is up to 100% of company's book equity. However, there is no previous limit for subordinated bonds.

Investment banks can register the corporate bond in two different places, (a) at the SND that is a registration, custodial and settlement system for corporate bonds created in 1988 and maintained by a partnership between ANDIMA<sup>7</sup> (Associação Nacional dos Bancos de Investimento) and CETIP (Câmara de Custódia e Liquidação), or (b) BovespaFix, an integrated framework for trading, settlement and safekeeping of corporate bonds created in 2001 by BOVESPA<sup>8</sup> (Bolsa de Valores de São Paulo).

The underwriter analyzes the cash flow, balance sheet and perception of the firm among the investors. During this process, the underwriter designates an investment agency, like Standard & Poor's, Moody's and Fitch to evaluate and rate the bond. The rating has a key role in the process of pricing the new bond. Many authors study the relationship between the rating and spread of corporate bonds. The first to analyze this is **Weinstein (1978)**, who studies the security price reaction to change in issuer rating. **Ederington et al. (1987)** analyze the relationship between interest rate and rating and finds positive connection between rating and bond price. In **2003, John, Lynch and Puri** used multiple regressions to determine the important variables that influence the corporate bond spread in the U.S. In particular, they analyzed the influence of the collateral on spread.

**Kliger and Sarig (2000)** argue that rating information is very valuable because the issuer can disclose inside information to investment agencies, who assign ratings that reflect this information without fully disclosing the specific underlying details to the public at large.

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<sup>7</sup> Andima is national association of investment banks. <http://www.andima.com.br>

<sup>8</sup> Bovespa is Sao Paulo Stock Exchange



The investment agencies in Brazil use a particular table of rating, applicable only for Brazilian corporate bonds. This table uses the same nomenclature of the international standard (AAA, AA, BBB, etc) with a symbol like “bra” or “br” (reference to the Brazilian market). It is important to understand that it is possible to have a Brazilian corporate bond with rating considered investment grade (Standard&Poor’s br.AAA) by the Brazilian rating table but for U.S market is treated as junk bond.

When the underwriter receives the rate and finishes the analysis of them, it is determined if it would be a firm commitment contract or best-effort basis, and the bond’s indicative interest rate. This decision about firm commitment and best-effort basis is analyzed by **Benveniste and Spindt (1989)**. The underwriter can form a syndicate calling other investment banks to participate in the debt offering. The main objective of forming a syndicate is to improve the distribution power, i.e., more investment bankers trying to sell the securities among the investors. These members of the syndicate not necessary participate of the decision of allocation, however, they have access to the final book. This aspect of the process is a little be different from equity offering, which only the bookrunner and co-bookrunner have access to the final book.

Usually in the Brazilian market, issuers decide to make a competitive sale using bookbuilding process. However, there is another alternative, the negotiated sales. According to **Ederington (1976)**, in periods of relatively low uncertainty, the issuer receives a slightly lower bid yield if she chooses competitive rather than negotiated sales. **Sorensen (1979)** compares interest costs of corporate bonds sold by competitive bid with comparable bonds sold by negotiation. This result demonstrates that interest costs for negotiated sales are significantly greater than competitive sales ones, ceteris paribus. He also finds that the interest rate falls as the number of bids received by issuer increases.

In the next step, the underwriter goes on a road trip among investors to build the book of bids. On the road show, the investment bank introduces the company and gives the conditions and characteristics of the bond, including its rating. After that, investors send their bid directly to the bookrunner who analyzes the bids and decides which interest rate will be adopted for all offering and how the allocation of the bonds will be among the investors in the case of oversubscription (demand larger than supply). There are two kinds of bids: the limit bid, in which the investor determinates the number of bonds for the one determined interest rate, and the step bid, in which the investor decides how many bonds he desires for different level of interest rates.

### **3. LITERATURE REVIEW AND HYPOTHESIS**

In this section is the literature review and hypothesis of the two distinct aspects of the bookbuilding process cited in the introduction. First cited is discretionary power used by underwriter to allocate bonds among investors. Second is a brief review of the background of bidding strategy. The last section contains a general review of works regarding corporate bond in the Brazilian market.

#### **3.1 Discretionary Power on Bookbuilding**

During the 80's, many authors studied theory models to explain the underpricing problem on equity issues. **Rock (1986)** proposes a model based on asymmetry of information among investors on fixed price auction. In this kind of auction, the stock price is revealed and the underwriter uses pro rata basis to allocate stock among bidders. Consequently, according to Rock, a well-informed bidder would be more aggressive on underpriced issues and less on overpriced issues. Therefore, a poorly informed investor would receive more shares on overpriced and less on underpriced issues. This phenomenon is called Winner's Curse. In order to avoid this adverse selection problem, **Rock (1986)** argues that the underwriter has to determine the stock price at less than fair value.

In the 90's, bookbuilding dominated the US market and started to be used on European markets. Thenceforth, many authors began to study the discretionary model (bookbuilding), using Rock's references to asymmetric information and adverse selection. **Benveniste and Spindt (1989)** propose a bookbuilding model that permits the underwriter to obtain information from well-informed bidders. This information allows investment banks to measure real demand for the issue and to price more accurately based on the bids sent by bidders.

The success of bookbuilding process is based on two major facts: (a) composition of regular investors group and (b) special allocation (benefits) to bidders who reveal information. Investors have incentive to reveal information to underwriters by sending bids if they receive more shares (privileges) of hot issues, i.e., issues that they believe that would generate higher return to them. On the other hand, underwriters would request investor's participation on cold issues<sup>9</sup>, under penalty of no longer participating in other offerings.

**Cornelli and Goldreich (2001)**, confirm **Benveniste and Spindt's (1989)** main hypothesis of special award to bidders who divulge information to the underwriter. They show that investors who use step bids send large bids, are domestic and regularly receive more stocks.

Based on the equity literature of bookbuilding, the underwriter has to compensate well-informed bidders who disclose information on bond issuing process.

***Hypothesis H1:** Underwriter allocates more bonds to bidder who reveals more information thru bids.*

In order to observe if the underwriter uses his discretionary power when allocating the issues among the investors, the difference between the pro rata allocation and actual allocation is calculated. Consequently, we would estimate for each investor the pro rata allocation and compare it with the actual allocation that represents how many bonds he received.

### **3.2 Bidding Strategy**

As cited before, bookbuilding is the principal method used by the underwriter to price and distribute bonds among investors. Actually, it dominates debt market distribution in Brazil and the United States. This method is classified as the competitive auction model. Consequently, it is necessary to review auctions in the literature.

**Vickrey (1961)** studied auctions theory models, in particular, competitive and discriminating auctions. Before citing his results, it is interesting to define and explain these two basic auction models, commonly used in treasury bills auctions. In the competitive auction, bidders send bids containing quantity and bond price<sup>10</sup>. The underwriter sums the bids received from the lowest interest rate (highest price) to the highest (lowest price), until obtaining the volume necessary to fill the offering. The last bid that entered in sum settles the final interest rate or market clearing price for all bonds. In this case, the bidder faces uncertainty about acceptance and price, as the entire offering is distributed at final interest rate. The bidder has incentives to reveal her true reservation price, because she cannot determine what the final bond price will be.

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<sup>9</sup> Cold issues are issues that are less attractive to investors.

<sup>10</sup> In US debt market, corporate bond are priced based on coupon, in Brazilian market bidders price it based on its interest rate.

In the discriminating auction, each successful bidder pays the actual price bid, i.e., she pays the price expressed in her own bid, rather than a single price common to all bidders, as occurred in the competitive auction. In this type of auction, the bidder faces uncertainty about acceptance, but not about the bond's price, since the price paid is equal to the bid sent.

**Vickrey (1961)** argues that competitive auction will result in a Pareto-optimal allocation of resources in several environments, but points out that under the bidder's risk-neutrality, the discriminating auction may be equivalent. He also conjectures that under risk aversion, the discriminating auction may dominate.

Following **Vickrey (1961)**, **Holt (1980)**, in the context of bidding for a single and indivisible unit, shows that expected revenues to the seller, in the case of corporate bond lower interest rate, are identical under the two type of auctions when bidders are risk neutral. The discriminating auction results in higher expected revenues, when bidders are risk adverse. **Harris and Raviv (1981)** obtain similar results of **Vickrey (1961)** and **Holt (1980)**.

After a brief review about auction models, it is important to review two important papers concerning bidding strategy. **Smith (1966)** develops a model of bidding behavior in bill auctions, based on theory of bidding under uncertainty. He assumes that bidders desire to maximize expected utility, where the expectation is over a subjective probability density function for the lowest accepted bid. He chooses a single bid price (limit bid) to attempt to maximize a single-period expected utility function.

Years later, **Scott and Wolf (1979)** criticize the Smith model of maximizing bidding decisions. The main argument is subject to three points: (1) since organizations with multiple owners submit most bids, the assumption of single objective function requires justification; (2) dealers can bid on Treasury bills once a week, so their problem is a multi-period one; (3) bidders can bid different amounts at distinct prices, so single (limit) bid is inconsistent. They set some conditions that justify the use of single, one-period utility function. However, they demonstrate that, in general, multiple price bids (step bid) in Treasury bill auctions are optimal and more efficient for bidders. In Brazil, **Silva (2003)** investigates the strategies of the bidder in Brazilian treasury auctions using aggregate and bidder level data. He finds that in competitive auctions bidders tend to present higher number of bids (using step bid).

***Hypothesis H2: Bidder that uses step bid is more efficiency than ones who use limit bid.***

In order to measure bidder's efficiency, a proxy is created called **Allocation Ratio**. It is the ratio of total bonds awarded and bid by each investor. The maximum value the allocation ratio can assume is one, when the number of bonds awarded by investor is equal to bid. It maintains that the bidder obtain 100% of success on her bidding strategy, considering that the main objective of the bidder is to achieve a quantity of bonds at a determined price established by herself.

There are some bidder's characteristics that may affect bid performance. Based on the particular facts of the Brazilian debt market, where major underwriters and buyers belong to the same financial market, it is interesting to create a variable to control for this aspect.

In the literature, there are many authors that study bid strategy but they focus on other aspects. For example, **Gordy (1999)** finds evidences that the bidder uses the step bid on Portuguese treasury bill auctions not only to maximize their utility, but also to protect from the Winner's Curse. He shows that the number of bids per bidder and the dispersion among a bidder's bids increases with the volatility of market rates and with the expected number of well-informed bidders.

Although it is not possible to analyze the relationship between bidding strategy and profitability<sup>11</sup> on the Brazilian debt market, because there is no representative secondary market, it is important to cite some authors who study this topic. **Umlauf (1993)** examines auctions of Mexican treasury Bills from 1986 to 1991, and observes a positive significant relationship between bidder's profitability and level of competition in Mexican auctions. **Scalia (1997)** studies the Italian treasury bond market in 1995-1996 and finds that level of competition and information dispersal are negatively correlated to bidder's profitability. **Hamao and Jegadeesh (1998)** analyze auctions of 10-year Japanese Government Bonds from April 1989 to November 1995 and find that neither competition nor uncertainty significantly affects auction profits.

### **3.3 Brazilian Review**

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<sup>11</sup> Profitability comes from spread obtained from buying on primary market (offering) and selling on secondary market to investors who failed to obtain bonds on primary market.

**Anderson (1999)** studies Brazilian indentures, which are agreements commonly used in corporate bonds. He finds corporate bonds are characterized by: (i) features that mitigate inflation risk for investors; (ii) contingent-maturity mechanics that provide period opportunities for exit or renegotiation; (iii) paucity of covenants that restrict the debtor's investment, financing, and dividend decisions; and (iv) self-enforcement mechanisms that avoid reliance on inefficient institutions.

**Saito and Sheng (2006)** study whether rating would be sufficient to capture interest rate's cost of contractual differences among non-standard bonds contracts. **Mellone et al. (2002)** consider rating as a scalar variable and find evidence that rating determined the final bond's interest rate when it has DI as interest rate index, but they could not find the same evidence for IGP-M indexed bonds. They do not confirm that issuer characteristics such as maturity and guarantee influence the final interest rate. **Leal and Carvalhal (2006)** provide a better understanding of the current situation of the Brazilian debt market and make suggestions to promote its development.

### 3.4 Variables Description

The first group of variables is related to bidder characteristics. The first characteristic is the type of investor, that is, whether the bidder is a mutual fund, a pension fund, a bank or private bank. It was created a dummy variable, for each kind of investor: (i) **mutual fund**, (ii) **pension fund**, (iii) **bank** and (iv) **private bank**. Moreover, it matters if the investor belongs directly or indirectly to any of syndicate's members, based on the possible agency problem in the Brazilian debt market, where major underwriters (sellers) and bidders (buyers) belong to the same financial group. Hence, a dummy variable called **syndicate** is created, which is one if the investor has any relationship with any member of a syndicate, and is otherwise zero. The last dummy, called **bid**, is created, which assumes a value of one if the bidder uses step bids.

The second group of variables is related to issuer's characteristics. For interest rate indexes, three dummies are generated to identify the three kinds of interest rates: (i) Percent of DI rate (**%DI**); (ii) DI rate plus annual fixed rate (**DI+spread**) and (iii) IGP-M rate (**IGP-M**).

The bond's rating can be considered as a proxy of measure of risk, and three different risk levels are considered: (i) High Risk (**high**); (ii) Medium Risk (**medium**) and Low Risk (**low**).

In the appendix I, there is an equivalence table for the ratings of three major investment agencies: Moody's, Standard & Poor's ("S&P") and Fitch. The three distinct risk levels are considered investment grade in the Brazilian market. The proxies of risk level are to control the analysis.

A variable, called **overdemand ratio**, is developed to measure the ratio of total demand and total supply of the offering. The total demand is the sum of all bids sent to the underwriter and total supply is the sum of all bonds received by investors.

$$overdemand\_ratio = \frac{total\_demand}{total\_supply}$$

Another dummy variable is created to control the effect of being a debt-IPO (**debt IPO**). If the issuer is underwriting for the first time, the investor does not have a track record. Therefore, there is more uncertainty and asymmetry of information between issuer and bidder. For that reason, it becomes more difficult for an investor to settle on a bid strategy to obtain success. And finally, the last variable to be used on econometric analysis is the **Herfindahl** index, to capture competitiveness of bookbuilding. The Herfindahl index is a common measure of the size of firms in relationship to the industry and an indicator of amount of competition among them. The Herfindahl index is defined as the sum of squares of market shares (firm's participation on the industry) of each individual firm. It can range from 1 (monopolistic situation) to 0 (high competition among players). In case of bookbuilding, the industry can be considered the total supply, firms are the investors and market share is the ratio of actual allocation and total supply.

$$H = \sum_{i=1}^n S_i^2$$

$$S = \frac{bidder\_award}{total\_supply}$$

Where, H is the Herfindahl index,  $S_i$  is ratio of bidder's award and total supply (market share) of the investor  $i$  and  $n$  is the number of investors. On the table I, there are expected signals for each variable.

### **Insert Table I – Independent Variables**

#### **4. DATA AND DESCRIPTIVE STATISTICS**

The dataset includes 40 offers (18 Debt-IPO and 22 seasoned offerings) of Brazilian non-financial companies issues from January 2001 to July 2006. The dataset was provided by one of the major

Brazilian players of corporate bonds, as explained before, it is not implied that this investment bank was the bookrunner in all offers. The average issue size is R\$ 398 million and the tenor is 5.44 years. These values change according to the interest rate index. For example, the IGP-M average size falls to R\$ 337 million and tenor rises to 7.44 years. Bonds with % DI as interest rate index present strong demand; 17 of 18 offers have demand larger than supply. The same phenomenon does not happen with IGP-M's bonds, only 5 of 9 offers present demand larger than supply. Most of the bonds are considered low and medium risk, only 4 issues (10% of total) are assigned as high risk.

In general, when the issuer assigned a firm commitment contract, only 11 issues of 40 use the best efforts. The mean size of syndicate formed is 5.63 underwriters, the issues with DI +spread as interest rate index have 6.69 underwriters and issues with % DI as interest rate index have 4.72 underwriters.

Mutual funds have the most investor activity on bookbuilding. On average, they send 10.13 bids per offering. Pension funds are second with 4.68 bids per offering. In the case of IGP-M issues, they both have similar number of bids submitted (7.56 and 7.44 bids). Private banks have a marginal participation in all offerings. See Table II

### **Insert Table II – Descriptive Statistics of Corporate Bond Offers**

The table III shows the average interest rate according to rating and interest rate index. The interest rates presented on this table are merely indicative and not representative, because the DI and IGP-M rates have varied a lot since 2001, this fact can bias the average. For example, on the table, IGP-M issues present lower interest rate for medium risk than for low risk, 11.26% and 11.63%, respectively. At a first glance, this result might be considered strange because this implies that asset with lower risk has higher return. However, this result is explained by falling down tendency of IGP-M rate, the medium risk issues were offered recently (2004) when IGP-M rate was much lower than 3 years ago (2001).

### **Insert Table III – Interest Rate by Rating**

As expected, mutual funds have a relevant participation in total demand and award. They demand about 81% in % DI issues, 70% in DI + spread issues and 55% IGP-M issues. Pension funds have a strong demand participation in IGP-M issues, about 31%. Banks have more demand participation in DI + spread issues.



Similar participation occurs on total awards. Mutual funds have bought about 88 % of total bonds offered on % DI issues and 67% on DI + spread issues. Pension funds have obtained 28% of total bonds offered on IGP-M issues. Private banking participation in total demand and awards is not significant, less than 0.1%. Analyzing all offers, it can be inferred that mutual funds are the major players on corporate bond offers. They demand about 75% of all offers. Banks are the second player with 15% of demand market share, followed by pension funds with 10%. See Table IV.

#### **Insert Table IV – Investor Participation in Total Demand and Award**

Mutual funds investors use more step bids; about 38% of their bids are step bids. For banks, step bids represent only 18% of total bids, regardless of the interest rate index. Pension funds present an interesting behavior: on issues with DI index, step bids respond for only about 15% of its bids. However, this participation almost duplicates (31%) when a pension fund is bidding on IGP-M issues. See table V

#### **Insert Table V – Bid Type and Investor**

### **5. EMPIRICAL ANALYSIS**

In this section, there are two main objectives: (i) to compare the pro rata allocation and actual allocation and (ii) to identify allocation ratio determinants.

#### **5.1 Actual x Pro Rata Allocation**

In the first objective, we use a sample composed only of competitive offerings, which present demand larger than supply. On non-competitive offerings, demand is equal or less than supply. Of course, in these cases, pro rata and actual allocation are equal. Consequently, the sample contains 557 bids from 27 bookbuilding processes. Pro rata allocation is estimated using the pro-rata basis for each bid and is then compared to actual allocation. The actual allocation is the award received by investor. We make a hypothesis test using the t-statistic to test the difference between actual and pro rata allocation. The hypothesis can not be rejected. The results are displayed on the Table VI.

#### **Insert Table VI – Hypothesis Test**

The mean difference between actual and pro rata allocation is -0.0036 and maximum absolute difference is 3. According to t-statistic, there is 73.92% of probability of the difference to be zero and standard deviation is 0.2544 and median is zero. From 557 observations only 19, the different

between actual and pro rata allocation are not zero. In 15 of these 19 observations, the absolute different was 1. See Table VII.

### **Insert Table VII – Absolute Difference**

Based on the results presented on tables VI and VII, the H1 hypothesis that underwriter rewards investors who revealed information cannot be confirmed. In the debt issuing process, allocation decision follows the pro-rata basis and there is no investor who is favored by the underwriter. The main cause of difference from actual and pro rata allocation might be related to rounding problem. The pro-rata basis can generate a not integer number of bonds to allocate to investors. Hence the underwriter has to round up or down this number. In sum, the H1 cannot be confirmed, because there is not statistical support to apply theory of Benveniste and Spindt (1989) on the issuing of corporate bonds.

## **5.2 Allocation Ratio**

In order to analyze the determinants of bidder success on bookbuilding, the allocation ratio is used as variable dependent. It is considered as a dummy: 1 if the investor's demand is 100% attended, otherwise 0.

In the first part, we perform univariate analysis for each possible determinant mentioned early in the text (see table I) and control variables. In the second part, multivariate regressions using the Logit model are made to analyze the combination of two or more dependent variables. In both analyses, we use a data set composed by 727 bids from 40 offerings of Brazilian corporate bonds issues of non-financial companies from January 2001 to July 2006. In the third part, we perform a robustness test using a data set composed of 27 offerings (557 bids) that present demand larger than supply.

### **5.2.1 Univariate Analysis**

Table VIII reports estimates of regression in which the dependent variable is allocation ratio and independent variables include issuer and bidder's characteristics and control variables. The bid type is statistically significant and negative. This implies that the usage of step bid decreases the probability of achieving 100% of bid demand.

All dummies of interest rate indexes are statistically significant. The IGP-M and DI + spread is positive and % DI is negative. On one hand, if the issuer uses IGP-M or DI + spread as interest rate index, it becomes easier for the investor to obtain all demand attended. On the other hand, if issuer uses %DI, it becomes more difficult for the bidder to gain 100% of bid demand.

All risk level variables are statistically significant. High and medium are positively and low is negatively correlated to allocation ratio. These results imply that bidder has more difficulty obtaining success on offering with low risk, and less difficulty when issues are considered riskier.

Even though, we consider the type of investor a strong candidate to explain the allocation ratio success, no variable shows to be statistically significant. The same fact happened to Debt IPO variable, which is also not statistically significant.

As expected, overdemand ratio is statistically significant and negatively correlated to Allocation Ratio. When the overdemand ratio is larger, investors have less chance of accomplishing the allocation ratio equal to one. The control variables' size and Herfindahl are statistically significant, negatively and positively correlated to allocation ratio, respectively.

### **Insert Table VIII – Allocation ratio Univariate Analysis**

#### ***5.2.2 Multivariate Analysis***

Independent variables were divided in three major groups: bidder and issuer's characteristics and control variables. The bidder group is composed by bid, investor dummies (mutual funds, pension funds and banks) and syndicate. We do not include private banking investors because they are not relevant in the dataset. The issuer group is constituted of interest rate index dummies (% DI and IGP-M), risk dummies (medium and low) and debt IPO dummy. We choose to exclude the high risk variable from analysis because there are few issues with this risk level.

The control variable group is formed by size, maturity, overdemand ratio and Herfindahl index. We identify a possible endogeneity between overdemand ratio and the issuer's characteristics variables. A priori, overdemand ratio is measured using two variables, total demand and total supply (size of offering). The supply is defined by the issuer prior to the bookbuilding process, although, underwriter can use the green shoe and overallotment to raise the offering's size. These alternatives are limited by law and, consequently, supply is limited and can be easily estimated.

The other variable, demand, can not be estimated, because it depends on the bidder's appetite for the corporate bond. Bidder's demand will vary according to the issuer's characteristics; some bidders are attracted by bonds with IGP-M as interest rate index, like pension funds. As cited before, for example, mutual funds have strong demand for long maturity DI bonds. Based on these arguments, it is not possible to make regression using overdemand ratio and issuer's characteristics as independent variable simultaneously, without isolating endogeneity among them. In order to avoid this endogeneity problem, we perform, in the first stage, ordinary least squares ("OLS"), using as dependent variable overdemand ratio observed and, as independent variables: % DI, IGPM, medium, low, debt IPO, size and maturity. Using the coefficients obtained in this regression, we estimate new overdemand ratio for all bids. All independent variables are extremely significant and only IGP-M and size variables have negative signals. The others are positively correlated to overdemand ratio. Table IX displays results from the first stage.

On the second stage, we use the Logit model, using allocation ratio as dependent variable and the three groups of variables described above, as dependent variable. It is important to note that the overdemand ratio used on this regression is the overdemand ratio estimated based on the first stage. Table X contains the results of the Logit model. This two-stage procedure is analogous to Aggarwal et al. (2002), where they have similar problem of endogeneity among variables. In their case, they want to verify if there is an endogeneity between institutional allocation and stock return on equity IPO.

### **Insert Table IX –First Stage – Overdemand Ratio**

The regressions (models) are organized in four panels. All regressions include one investor variable and bid, combined with control variables: maturity, overdemand ratio (estimated on the first stage), size and Herfindahl index. The main objective is to combine these variables with interest rate indexes, bond risk level, syndicate and debt IPO. The bid dummy is statistically significant at 1% and negative in all regressions. This finding indicates that the use of step bid does not contribute to full success. The **hypothesis H2**, which the bidder who uses step bid is more efficient than one who uses limit bids cannot be confirmed. One possible explanation for this empirical result is the fact that the underwriter does not reward the bidder for revealed information. Consequently, the use of step bids that represents valuable information for the underwriter on equity IPO is not seen as private information disclosed by the bidder on corporate bonds offerings.

On panel A, we analyze the combination of the three different kinds of investor with bid type and interest rate indexes. The objective is to verify if the interest rate index influences bidding strategy efficiency. We verify that the only significant variable is mutual funds and it is positively related to allocation ratio. None of the interest rate index variables are statistically significant, and the same happened to pension and bank variables. It implies that the interest rate index is not a determinant of success on bookbuilding.

On panel B, we analyze the influence of risk level on allocation ratio. As can be seen, no investor variables are considered significant at 1% or 5%. However, mutual fund presents significance very close to 5%. Both risk variables, medium and low, are statistically significant and positively related to allocation ratio. Low's coefficient is larger than medium, and it can be inferred that bidders have better efficiency on bidding when the offered bonds are less risky.

On panel C, mutual funds continue statistically significant and positive. On the other hand, pensions and banks are not significant. Debt IPO is not statistically significant for each type of investor, and this result indicates that the fact of being a debt IPO does not influence bidder performance. It implies that asymmetric information between issuer and bidder, when issuer is offering corporate bond for the first time, is not relevant.

On the last panel, we analyze the influence of bidders belonging to the same financial group of any member of the syndicate. The main objective of this panel is to verify if some bidder has some competitive advantage upon others, based on peculiar features of the Brazilian debt market. In all three regressions, syndicate variable is not statistically significant. This fact implies that mutual funds related to the same financial group of syndicate's members do not have better performance on bidding. Consequently, a priori, it is not a source of market inefficiency.

### **Insert Table X – Allocation Ratio Multivariate Analysis**

As expected, in all regressions, overdemand ratio is statistically significant and negatively related to allocation ratio. This result indicates that offers, which present demand larger than supply, are more difficult to obtain success on bidding. The Herfindahl index is also statistically significant for all regressions, but it has positive signal, indicating that if there is concentration of bidders on bookbuilding, i.e, few competitors with large bids, it becomes easier to bidder obtain full

allocation. Maturity variable is not statistically significant for all models, and implies that maturity is not a determinant of bidding success.

### *5.2.3 Sub Sample Analysis*

In this section, we perform a robustness test to check if the results obtained on the previous section remain coherent using a select dataset composed only by competitive offerings from January 2001 to July 2006, which present demand larger than supply. Consequently, we excluded from database bids from non competitive offerings, in which demand is equal or less than supply, because on these offerings there is no competition among investors and allocation ratio is 1 for all bidders. So the new dataset is composed of 557 bids from 27 competitive offerings. Usually, robustness test is performed substituting the independent variables used to confirm the hypothesis, but in this case, there are no others variables that can be used to replace the original ones. The econometric procedure is the same of prior section and the results are displayed on table XI.

In the case of bid-type variable, there is no surprise: it remains statistically significant and negatively related to allocation ratio for all panels. This implies that bid type is one determinant of allocation ratio. Furthermore, these results corroborate the fact that the hypothesis **H2** can not be confirmed.

Mutual fund variable becomes strongly significant in all panels and their signal continues to be positively related to allocation ratio. It can be inferred that mutual funds present superior performance among investors. There are some particular aspects of the Brazilian corporate bond and mutual fund markets that seem to help to explain this superior performance. First, only local bidders participate on bookbuilding, and international investors do not have incentives to buy corporate bonds, based on the fact that they do not pay taxes on sovereign bonds. This feature reduces the total number of bidders on each bookbuilding process. Second, mutual funds are the major player on corporate bond market, and represent around 75% of total demand. Third, the mutual fund industry is severely concentrated. Five top mutual funds represent around 60% of the entire industry, therefore there is a small group of mutual funds that have great bargain power. In sum, mutual funds are the major players that frequently compete on a concentrated market (corporate bond market). This frequency allows mutual funds to develop an expertise of bidding on

bookbuilding, because the rules of the game do not change, the number of players is limited, and there are no new bidders entering and some investors have bargain power.

### **Insert Table XI – Sub Sample Analysis**

For instance, as happens to bid type and mutual funds, the low variables are still statistically significant and maintain their original signal. The only difference on issuer's variables is related to medium variable, when it becomes not significant at 5% on models 4 and 6 of panel B. But its signals remain positive.

Size variable becomes statistically significant for all models and its signal continues to be negative. Maturity remains not significant and overdemand significant and negatively correlated to allocation ratio. The major change occurred with Herfindahl index, and it becomes not significant for all models.

## **6. CONCLUSION**

We examine two aspects regarding bookbuilding of Brazilian corporate bonds from January 2001 to July 2006. First, we examine the difference between estimated pro rata allocation, using pro-rata basis, and actual allocation was calculated for each bidder, in order to verify if underwriter benefits some bidder for revealed information. The difference is null for 96.6% of the sample, where only 19 of 557 bids have difference between these two allocations. Based on the t-statistic, no empirical evidence was found for use of discretionary power by the underwriter to allocate bonds among investors, therefore none is benefited by underwriter for disclosed information. This result is interesting because the procedure to underwrite corporate bonds and equities is very similar, however underwriter's behavior and allocation methodology is quite different. On corporate bond offerings, in theory, investors do not have incentives to reveal information because they would not receive reward by the underwriter. Consequently, one question remains: what is the object of using bookbuilding to underwrite bonds only to measure demand and to price accurately?

Many authors argue that the bidder should use step bids on competitive auctions of treasury bills because it is considered optimal bidding strategy. This work documents that step bid reduce the bidder's chances of achieving success bidding on bookbuilding. Among investors, mutual funds present superior performance on bidding strategy, and this advantage is related to particular features of the Brazilian corporate bond market that allowed them to develop an expertise on

bookbuilding processes. Mutual funds are responsible for around 75% of total demand and participate frequently in the bookbuilding processes. Furthermore, the total number of bidders that participate in bookbuilding is small and restricted.

Not only bidder's characteristics may influence bidding efficiency, but also the issuer's characteristics. There is a positive relationship between risk levels and bidding success, and corporate bonds considered as low and medium risk level increase investor's chances of full success. As expected, corporate bonds with large overdemand ratio represent hard work to bidders, in order to gain full allocation on their bids.

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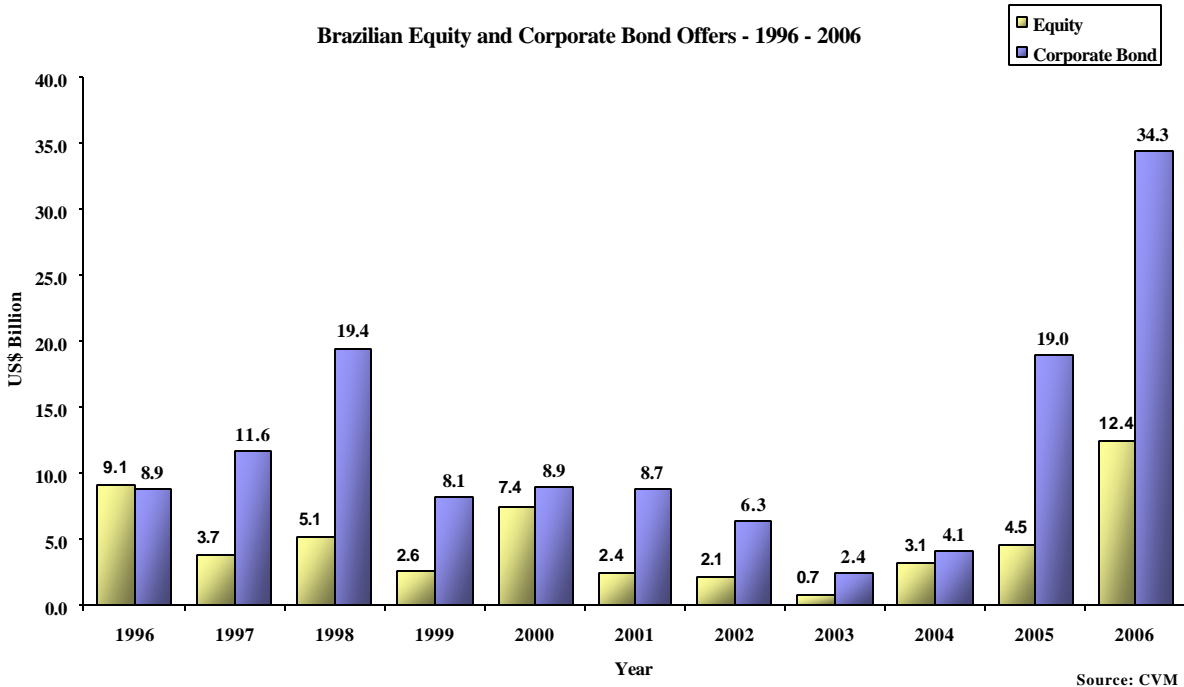
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### APPENDIX I – RATING EQUIVALENCE

	<b>S&amp;P</b>	<b>Moody's</b>	<b>Fitch</b>		
<b>Highest credit quality</b>	AAA	Aaa	AAA	} Low Risk	
	AA+	Aa1	AA+		
<b>Very High credit quality</b>	AA	Aa2	AA		
	AA-	Aa3	AA-		
<b>High credit quality</b>	A+	A1	A+		} Medium Risk
	A	A2	A		
	A-	A3	A-		
<b>Good credit quality</b>	BBB+	Baa1	BBB+	} High Risk	
	BBB	Baa2	BBB		
	BBB-	Baa3	BBB-		

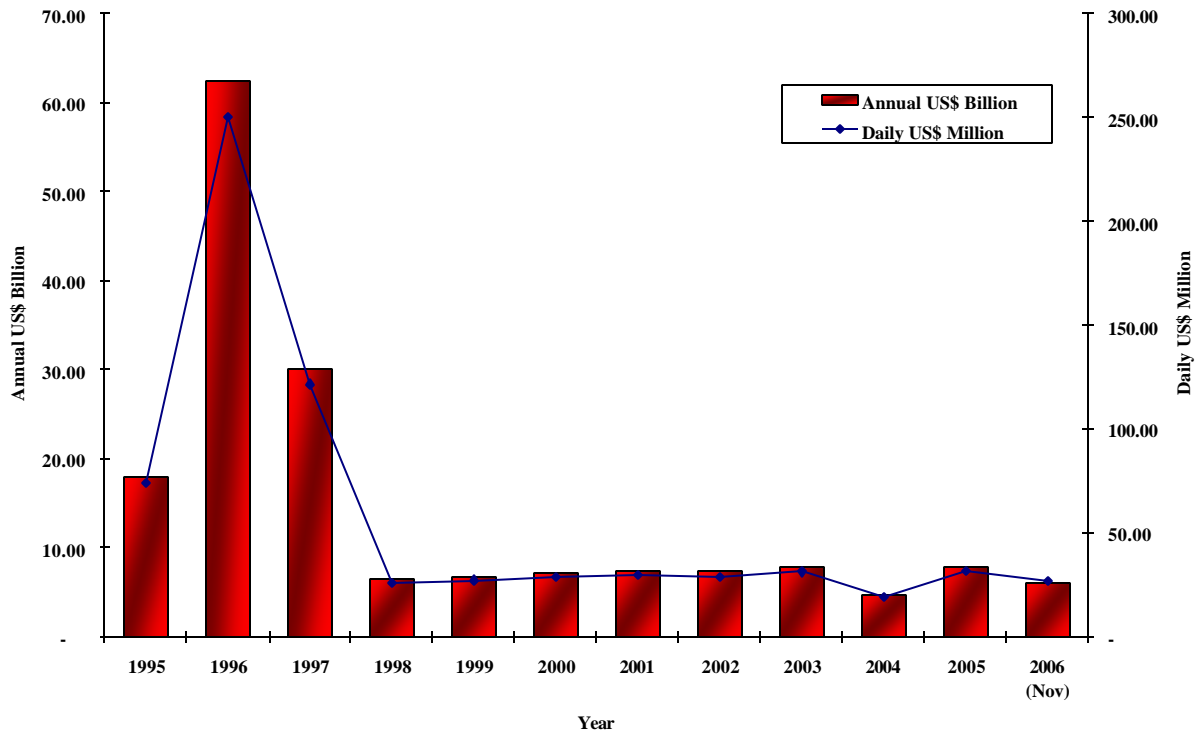
Source: Banco Santander

**FIGURE 1: BRAZILIAN EQUITY AND CORPORATE BOND OFFERS – 1996-2006**



**FIGURE 2: BRAZILIAN SECONDARY MARKET – 1995 TO 2006**

### Brazilian Secondary Market - 1995 to 2006



Source: Sistema Nacional de Debentures

### Table I – Independent Variables

This table cites the name of independent variables to be used in the empirical analysis, as well their briefly description, their expected signal related to the dependent variable **allocation ratio** and justification for this signal.

Variable Name	Description	Expected Signal	Justification
		<b>Allocation Ratio</b>	
Bid	Dummy: 1 - Step Bid	+	Optimal bid
Mutual Fund	Dummy: 1 - Mutual Fund Bidder	+	Well informed bidder
Pension Fund	Dummy: 1 - Pension Fund Bidder	+	Well informed bidder
Bank	Dummy: 1 - Bank Bidder	?	
Private	Dummy: 1 - Private Bank Bidder	-	Not an assiduous bidder
% DI	Dummy: 1 - % DI as Interest Rate Index	?	
DI + spread	Dummy: 1 - DI + spread as Interest Rate Index	?	
IGP-M	Dummy: 1 - IGP-M as Interest Rate Index	?	
Syndicate	Dummy: 1 - If investor is syndicate's member	+	Agency Problem
Debt IPO	Dummy: 1 - Debt IPO	-	Uncertainty and AI
Herfindahl	Herfindahl index	+	More Competition
Overdemand Ratio	Ratio of total demand and total award of each issuing	-	More Competition

Obs.: AI means asymmetric information

### Table II – Descriptive Statistics of Corporate Bond Offers

This table reports descriptive statistics of 40 Brazilian Corporate Bonds issues of non-financial companies from January 2001 to July 2006. The dataset of corporate bonds is divided in three groups according to its interest rate index: %DI, DI + spread and IGP-M. In each group, it is calculated the: number of offers, number of Debt IPO offers, number of overdemand offers

(offer that presents demand larger than supply), number of high risk, medium risk and low risk offers, average size of issue (R\$MM), average tenor (years), number of firm commitment and best-efforts offers, average size of syndicate, average number of bid sent by each type of investor (Mutual Fund, Bank, Pension Fund and Private Bank) and total number of step bid and limit bid sent by investor.

		<b>% DI</b>	<b>DI + Spread</b>	<b>IGP-M</b>	<b>Total</b>
<b>Number of Issues</b>	N	18	13	9	40
<b>Debt IPO</b>	Number debt IPO offers	9	6	3	18
<b>Overdemand</b>	Number of overdemand offers	17	5	5	27
<b>Risk Level</b>					
	High	0	4	0	4
	Medium	8	5	5	18
	Low	10	4	4	18
<b>Size</b>					
	Average Size of Issue (R\$ MM)	404	431	337	398
	Ln (Size)	6.00	6.07	5.82	5.99
<b>Tenor</b>	Average Tenor (years)	5.08	4.54	7.44	5.44
<b>Distribution Contract</b>					
	Firm Commitment	11	10	8	29
	Best-Efforts	7	3	1	11
<b>Syndicate</b>	Size of Syndicate	4.72	6.69	5.89	5.63
<b>Number of bids by (average)</b>					
	Mutual Fund	11.78	9.62	7.56	10.13
	Pension Fund	4.06	3.62	7.44	4.68
	Bank	3.44	2.00	1.56	2.55
	Private Bank	0.89	0.31	1.22	0.78
<b>Type of Bid</b>					
	Step Bid	112	52	50	214
	Limit Bid	251	150	112	513
	Total Bids	363	202	162	727

**Table III – Interest Rate by Rating**

This table reports the average interest rate of 40 Brazilian Corporate Bonds issues of non-financial companies from January 2001 to July 2006 according to their interest rate index (%DI, DI + spread and IGP-M) and risk level (high, medium and low). For example, in the first column are displayed the average interest rate of corporate bonds that uses % DI as interest rate index for each risk level.

<b>Interest Rate Index</b>				
		<b>% DI</b>	<b>DI + spread</b>	<b>IGP-M</b>
<b>Risk Level</b>	Low	104.57%	1.03%	11.63%
	Medium	105.26%	1.27%	11.26%
	High	n/a	1.66%	n/a

**Table IV – Investor Participation in Total Demand and Award**

In this table the 40 Brazilian Corporate Bonds issues of non-financial companies from January 2001 to July 2006 are arranged according to their interest rate (%DI, DI + spread and IGP-M). In each group, the participation of each type of investor (Mutual Fund, Bank and Pension Fund) on total demand and total award are calculated.

		<b>Interest Rate Index</b>											
		% DI			DI + spread			IGP-M			All Offerings		
		Mutual Fund	Bank	Pension Fund	Mutual Fund	Bank	Pension Fund	Mutual Fund	Bank	Pension Fund	Mutual Fund	Bank	Pension Fund
<b>Demand</b>	Participation												
	Average	81%	14%	5%	70%	17%	12%	55%	14%	31%	75%	15%	10%
	Max	97%	47%	16%	98%	62%	31%	78%	67%	58%	98%	67%	58%
	Min	37%	1%	0%	18%	0%	1%	0%	0%	22%	0%	0%	0%
	Median	88%	10%	4%	83%	8%	8%	63%	4%	28%	81%	8%	8%
<b>Award</b>	Participation												
	Average	88%	8%	4%	67%	20%	12%	54%	18%	28%	74%	14%	12%
	Max	100%	53%	15%	93%	62%	31%	75%	67%	58%	100%	67%	58%
	Min	24%	0%	0%	17%	0%	0%	0%	0%	19%	0%	0%	0%
	Median	93%	4%	2%	84%	6%	10%	67%	7%	31%	82%	5%	7%

**Table V – Bid Type and Investor**

In this table the 40 Brazilian Corporate Bonds issues of non-financial companies from January 2001 to July 2006 are arranged according to their interest rate (%DI, DI + spread and IGP-M). In each group, it is counted the number of step bid and limit bid sent by each type of investor (Mutual Fund, Bank and Pension Fund).

		<b>Bid Type</b>											
		% DI			DI + spread			IGP-M			All Offerings		
		Mutual Fund	Bank	Pension Fund	Mutual Fund	Bank	Pension Fund	Mutual Fund	Bank	Pension Fund	Mutual Fund	Bank	Pension Fund
Number of	Step Bid	90	11	9	41	4	7	24	3	20	155	18	36
	Limit Bid	122	51	64	84	22	40	44	11	47	250	84	151
	Total	212	62	73	125	26	47	68	14	67	405	102	187
% Participation													
	Step Bid	42%	18%	12%	33%	15%	15%	35%	21%	30%	38%	18%	19%
	Limit Bid	58%	82%	88%	67%	85%	85%	65%	79%	70%	62%	82%	81%

### Table VI – Hypothesis Test

This table reports the result of hypothesis test using the t-statistic to test the difference between actual and pro rata allocation. The dataset is composed by 27 Brazilian Corporate Bonds issues of non-financial companies from January 2001 to July 2006 that presented overdemand (demand larger than supply).

H0: Actual Allocation - Pro Rata Allocation =0	
<b>Mean</b>	-0.0036
<b>Median</b>	0
<b>Max</b>	3
<b>Min</b>	-2
<b>Stdev</b>	0.2544
<b>N</b>	557
<b>t-statistic</b>	-0.3330
<b>Probability</b>	73.92%

### Table VII – Absolute Difference

In this table is calculated the absolute difference between actual and pro rata allocation for each bid of the dataset that it is composed by 27 Brazilian Corporate Bonds of non-financial companies issues from January 2001 to July 2006 that presented overdemand (demand larger than supply).

<b>?=  Actual - Pro Rata Allocation  </b>	<b>Number of Bids</b>	<b>% of total</b>
<b>?=0</b>	538	96.59%
<b>?=1</b>	15	2.69%
<b>?=2</b>	3	0.54%
<b>?=3</b>	1	0.18%
<b>Total</b>	<b>557</b>	<b>100.00%</b>





**Table IX –First Stage – Overdemand Ratio**

The table reports results of the first stage regression to isolate the endogeneity of issuer's characteristics variables from overdemand ratio. An OLS model was used to identify the determinants of overdemand ratio. Independent variables are: % DI and IGPM (dummies variables for interest rate index), medium and low (dummies for risk level), size (natural logarithm of total proceeds (R\$ million) and maturity (years). The dataset is composed by 40 Brazilian Corporate Bonds issues from January 2001 to July 2006. \*,\*\* indicate significant difference at 5% and 1% using t-test two tailed. t- statistic based on White (1980) heteroskedasticity –consistent standard errors on parentheses.

Dependent Variable: Overdemand ratio	
	<b>Model 1</b>
<b>% DI</b>	0.99** (13.29)
<b>IGP-M</b>	-0.56** (-7.69)
<b>Medium</b>	0.47** (5.97)
<b>Low</b>	1.31** (8.85)
<b>Debt IPO</b>	0.24** (3.47)
<b>Size</b>	-0.4** (-5.77)
<b>Maturity</b>	0.05** (3.48)
<b>Constant</b>	7.28** (5.55)
<b>Adjusted R<sup>2</sup></b>	45.39%
<b>N</b>	727



