

## **An investigation of the partial adjustment effect of Brazilian IPOs**

### **Abstract**

Bookbuilding process reduces information asymmetry and underpricing in IPOs. When the underwriter perceives high demand, he or she adjusts upward the offer price, but not the full fair price. This partial adjustment creates positive first day return, which is used to compensate informed investors for revealing truthful information during the pre deal period. The underwriter can also compensate informed investors by increasing their allocation through overallocation and greenshoe option. We use Hanley (1993) methodology for testing partial adjustment in Brazilian IPOs issued between 2004 and 2009. We investigate deeper the effect of greenshoe option in price adjustment and underpricing.

### **1. Introduction**

The Brazilian Security Exchange Commission (CVM – *Comissão de Valores Mobiliários*) regulated the use of bookbuilding in December 2003 (Saito and Pereira 2006). Since then, most IPOs issued in Brazil have used this process. Bookbuilding allows underwriters to assess market demand before defining the final parameters of the initial public offering. The underwriter establishes a price range for the issue (minimum and maximum prices) in the preliminary prospectus. After that, the investment bank invites qualified investors to make non-binding buying offers. Each buying offer contains the desired number of shares for different price levels. At the end of this process, the *lead* underwriter estimates a demand curve for the offer, revises and establishes the final offer price in the definitive prospectus.

Qualified investors have superior information in relation to other investors in the market, because of their ability to obtain and analyze information or because they are used to participate recurrently in IPOs and have strong relationships to investment banks. According to Benveniste and Spindt (1989), the underwriter has to compensate the well informed investor in order to receive truthful information during the bookbuilding process. When the underwriter observes high demand for an issue, he or she adjusts the price upward, but not the full market value. This partial adjustment will create high initial return in the first trading day, which compensates qualified investors of revealing truthful information. Hanley (1993) and Bradley and Jordan (2002) find evidences of partial adjustment phenomenon in the USA stock market.

This article investigates the existence of the partial adjustment phenomenon in Brazil. We replicate the methodology in Hanley (1993) for Brazil. We extend the analysis for investigating more deeply greenshoe option.

We analyze IPOs issued between 2004 and 2009. In this period one hundred and thirty-four companies issued new shares (initial or subsequent offers), totaling a volume of more than R\$ 203.6 billion, approximately 1.34% of Brazilian GDP accumulated in the same period (BM&F Bovespa, 2010). Even with the financial crisis in 2008, we can regard this five-year period as the most prosperous for the Brazilian capital market to date.

We find evidences that underwriters compensate informed investors mainly with overallocation, but our results indicate the existence of some partial adjustment in Brazil when we include in the analysis the greenshoe option. The remaining of the article contains the following sections: Literature Review, Database and Descriptive Statistics, Regression models and results and Conclusion.

## **2. Literature Review**

Reilly and Hatfield (1969), Stickney (1970), McDonald and Fisher (1972), and Logue (1973) find evidence that initial public offerings in the United States have, on average, positive returns on the first trading day, which is known as underpricing. But if the process of an IPO were efficient, one would expect that the first day return be zero. If the issuing company has a clear expectation that its offer will have a positive return on the first trading day, it is rational to expect that the lead underwriter raise the offering price so it could capture that increase in value.

Ibbotson (1975) analyzes IPOs issued between 1960 and 1969 on the New York Stock Exchange and finds a positive mean initial return of 11.4%. He attributes his findings to downward bias in the offering.

Beatty and Ritter (1986) analyze the relationship between underpricing and underwriters' market share. According to their article, it is a dilemma for the underwriter to establish an offering price at a level that pleases qualified investors and the issuing company, putting their reputational capital at risk. The market for new issues has a complex net of conflicting interests among participants. When making their decisions, qualified investors, investment banks and issuing companies have to weigh-up short and long-term gains, risk (depending on the level of uncertainty the new shares) and reward, their relationship networks and their reputational capital. In addition to this network of interests, there is also an issue of information asymmetry.

According to Beatty and Ritter (1986) and Titman and Trueman (1986) prestigious underwriters reduces information asymmetry, and therefore the underpricing. Barry, Muscarella, Peavy and Vetsuypens (1990) find evidence that venture capital backed IPOs are less underpriced than non-venture capital backed IPOs, because of the certification effect of venture capital funds.

Rock (1986) divides investors in two kinds: (i) qualified investors, with perfect information about the value of shares to be offered and (ii), ordinary investors (with imperfect information about them). According to his model the firm has to price its shares at a discount to attract uninformed investors and ensure the offer placement.

Levis (1990) tests Rock's model (1986) in the London Stock Exchange and finds evidences that underpricing is related to the existence of uninformed investors. According to the author, the greater the number of uninformed investors, the greater the dispersion of bids and, therefore, the greater the chance that the value of the shares at the end of the offer will be a long-way off the fair price.

Baron (1982) develops a theoretical model in which the issuing pricing is a function of market demand and the sales effort of the underwriter. The underwriter is better informed about the market demand than his client, the issuing company, but his distribution effort is not observable by the company. To address this moral hazard problem, the optimal contract sets the offering price below its real value, defined as the equilibrium price in the offer when the investment bank makes its best possible effort (GRINBLATT and HWANG, 1989). Therefore, the underpricing can also be seen as a bargaining chip between the issuing firm and the investment bank. The company would accept a discount on the fair value of its capital to promote the investment bank and ensure the placement of its bid.

Ritter (1984) relates underpricing with speculative waves and market euphoria. According to the author, in a period of 15 months from January 1980 to March 1981, the average return on the first day of trading was +48.4% (well above the periods analyzed until then). Unlike existing explanations for the phenomenon of underpricing, the author argues that, apparently, the main reason for this phenomenon was the wave of offers of natural resource companies. These companies' risk was unknown to the market, and therefore the issuing price reflected depreciation greater than usual to ensure the share's placement on the market. The article has often been referenced since, in phenomena such as the Internet bubble of 2001, another characteristic period of a hot market with strong underpricing. Loughran and Ritter (2002) and Lowry and Schwert (2002) find evidence of positive autocorrelation among initial returns.

Leal (2004) finds a mean initial return of 34% for IPOs issued in the Brazilian market between 1974 and 1994. In 2003 CVM (Comissão de Valores Mobiliários - Brazilian Securities and Exchange Commission) regulated the use of bookbuilding in IPOs. Since then, most IPOs in Brazil use this process. Bookbuilding is an efficient way of minimizing underpricing, since investors reveals their preferences in price and volume, and reduces the information asymmetry (SAITO and PEREIRA, 2006). We can observe the drop in the initial returns of IPOs after the bookbuilding adoption in Silva and Famá (2011). The authors find a mean underpricing of 4.8% in Brazilian IPOs issued between 2004 and 2007.

Benvenistes and Spindt (1989) model the IPO process as an auction in which participants are asymmetrically informed investors. In order to obtain truthfull pre-deal information from well informed investors, the underwriter needs to

compensate them in a way that it is more interesting to reveal truthful information than false information. The allocation of shares is proportional to the non-bidding indication of interest, revealed during the bookbuilding process. When demand is high, the underwriter adjusts the offer price upward and the informed investor who revealed truthful information receives a higher allocation in a high-demanded IPO than the investors that revealed false information. If there is over-allotment, the underwriter can also issue more shares in the aftermarket to cover the short position by exercising the *greenshoe* option, creating the possibility of extra remuneration to the well-informed investor that reveals good information. But if shares are rationed, even with the over-allotment, the underwriter will adjust the issue price only partially, not incorporating all information he gathered pre-deal. This partial adjustment phenomenon will produce underpricing and over-allotment with new shares issued in the aftermarket. The first-day return is an extra way of compensating well-informed investors from revealing good information and not being able to buy all shares he wanted.

Hanley (1993) defines and tests the partial adjustment phenomenon. According to the author, at the end of the bookbuilding process the underwriter reviews the offering price, readjusting the offer with only part of the perceived demand. Thus, the underwriter facilitates the placement of shares (and the additional lots – the *greenshoe*) which, as well as representing relatively less work for him, also increases his remuneration (investment banks are usually also paid for additional lots). Additionally, by passing on only part of the perceived demand, the investment bank ends up boosting the underpricing, because investors who could not participate in the offer will buy the shares directly on the stock exchange secondary market, thus raising the stock price. She finds evidence that IPOs with upward revision have higher underpricing, and concludes that pre-deal information predicts initial return. Bradley and Jordan (2002) also find evidence of partial adjustment phenomenon in the USA stock market.

Hanley (1993) also investigates the long-term performance. She finds that all groups of IPOs: with price below the range in the preliminary prospectus, within the range and above the range perform worst than the NASDAQ Index. We observe in her results that there is a greater percentage of IPOs with offer price below the range that perform better than NASDAQ, and that this percentage decreases for IPOs within the range and decreases even more for IPOs above the range, but the difference among groups is not significant.

Pinheiro and Carvalho (2011) investigate the price stabilization effect in the short-run returns of Brazilian IPOs. For doing so, the underwriter distributes more shares than the originally contracted. This over-allotment is possible by selling shares short. According to the authors, there are three ways that allow the underwriter to cover its short position: (i) by acquiring shares in the secondary market at the market price during the stabilization period, (ii) by exercising the *greenshoe* option and buying shares at the launching price, or (iii) by doing both. The over-allotment and ASC (aftermarket short covering) allows the underwriter to manipulate price in the secondary market without incurring in financial loss.

There are two possible reasons for the overallotment: (i) to mitigate high volatility caused by *flippers* and (ii) to maintain the price artificially high during the stabilization period and compensate informed investors for revealing their information. The underpricing and price stabilization are mechanisms that serve to this purpose. Price stabilization reduces the underpricing, but allows the underwriter to buy back overpriced shares. The authors find evidence that the two reasons apply for the Brazilian market, and that ASC reduces underpricing.

Based on Pinheiro and Carvalho (2011) findings, we investigate more deeply than Hanley (1993) the relationship between the existence of the greenshoe option in the prospectus and price revision during the bookbuilding process. We expect price revision to be positively correlated to greenshoe option. The underwriter should include this option in deals he or she expects high demand. We also investigate if the exercise of greenshoe option in the aftermarket is explained by upward price revision. Greenshoe options allow underwriter to allocate extra shares to informed investors in high demanded deals without creating much underpricing.

### **3. Databases and Descriptive Statistics**

#### **3.1. Database**

We collected information on all the IPOs that took place on the BM&F Bovespa between January 1, 2004 and December 31, 2009 in Bloomberg. We start our collection period in 2004 because there were hardly any offerings in previous years, and CVM regulated the bookbuilding process in 2003.

We included in our sample re-IPOs, that is, subsequent offerings of companies that had very little liquidity previously, as for instance TAM in 2005.

We excluded of our sample Renar Maçãs in 2005, Le Lis Blanc and Nutriplant in 2008 because they were valued below R\$300,000,000.00, and were therefore much smaller than the other observations.

Our final sample contains 115 IPOs, Table 1 shows the offerings in chronological order.

We validated the preliminary and definitive data of offerings with information in the preliminary prospectuses, final prospectuses and notices of termination. In case of inconsistency, we used the information available in the latest official document, i.e., in the following order: notice of termination, followed by the final prospectus and, finally, the preliminary prospectus. It is important to notice that CVM requires companies and their investment banks to publish only the final prospectus. Despite being good corporate governance practice, not all firms in the sample disclosed their preliminary prospectuses and notices of termination.

## 3.2. Descriptive Statistics

### 3.2.1 Partial Adjustment

To analyze the partial adjustment phenomenon, Hanley (1993) grouped the IPOs into three groups: offerings with final prices below the offer range disclosed in the preliminary prospectus, offerings with final price within the offer range and offerings with final price above the offer range. The revision in the first group implies that there is bad information revealed in the pre-issue market, in the second group there is no information revealed and in the third group good information revealed.

We normalize the offer price revision with the following method. We consider that the maximum price in the offer range equals 1 and that the minimum price in the offer range equals zero. Then we adjusted the final price according to the range adjustments scale. Figure 1 presents normalized offer price revision in chronological order. The values range from 1.5 (which represents a distance above the range equivalent to half the extension of it) and  $-1.25$  (below the range to a distance equivalent to one and a quarter times the length of it). There is an apparent concentration of observations in the maximum and minimum limits of the range. Although we do not identify any significant pattern, we can observe that the first half of the observations appears to be, on average, a little closer to the upper limit of the range, while the second half appears to be, also on average, a little closer to the minimum price of the range. However, there are no *a priori* signs that seasonality or more or less active periods influence the underwriter to review the price in any expected way.

To facilitate the analysis, we have order the observations according to their relative positions (offering price in relation to the offer range in the preliminary prospectus). Figure 2 shows such ordering. We can observe that the offerings tend to be revised in an apparently symmetrical fashion. That is, if we compare the observations above 0.5 (the midpoint of the range, regarded as the expected offer price in the preliminary prospectus) with the observations below the same line, we will get similar curves, with a clear pattern of issues exactly on the maximum and minimum limits, as well as a series of observations at the midpoint of the band and below the range at a distance equal to the extent of it.

Hanley (1993) and other studies that examine the pre-market offer price revision separate the sample into three groups: final offer price below the offer range, final offer price within the offer range and final offer price above the offer range. However, as we can observe in Figure 3, there are few offerings with final price above the range and below the range. The vast majority of our sample has launched prices within the range. If we keep the same classification as the international literature, we will classify in the same category offers with final price in the upper range limit and in the lower range limit, and these offers clearly have different directions regarding the interpretation of the demand by the underwriter. In this study, unlike other studies in the literature, we group the offerings into (i) final offer price below the range or at the minimum value, (ii) final offer price within the range (excluding the limit values) and (iii) final offer price above the range

or at the maximum value. For the sake of simplicity, the three subgroups are referred throughout the study as below, within and above the range. This distinction is important because it significantly alters the research results. We interpret that offerings with offer final price above or at the upward range limit signal a pre-market perception of high demand; offerings with offer final price below or at the downward range limit signal a perception of low demand. Therefore it makes sense to classify differently offerings launched in the upward range than offers in the downward range.

Table 1 presents descriptive statistics along with the means difference test for each variable and between each subgroup. The group “below the range”, “within the range” and “above the range” have 44, 42 and 29 observations respectively. Despite being the smallest group, the offerings with an offering price at the maximum value or above the offer range represent 25.22% of the sample.

We calculate the width in Brazilian Reais of the valuation range as  $P_H - P_L$ , where  $P_H$  is the highest price in the offer range and  $P_L$  is the lowest price. We observe that although the width median is the same (R\$ 4.00), the mean differs significantly. The reason for that is because some offers were made at prices far above average, creating this distortion. The IPOs of BrasilAgro (2006), MMX (2006), InvestTur (2007), Brazil Brokers (2007), MPX (2007) and OGX (2008) were launched with share prices of around R\$ 1,000.00. If we exclude these offerings, the mean of the offer range width is R\$ 4.63 for the total sample, R\$ 4.69 for the subgroup “below the band”, R\$ 4.66 for the subgroup “within the band” and R\$ 4.49 for the subgroup “above the band”. That is, there is apparently no significant difference between groups. The range width is a *proxy* for the level of offering uncertainty. When the underwriters are less confident about the company's value, or about the market demand for the issue, they tend to make assessments that are “broader”, with more distant “pessimistic” and “optimistic” scenarios. Therefore, as well as analyzing the range width in terms of Reais (absolute terms), we also analyze the range width in percentage terms. We calculate the percent width as  $(P_H - P_L) / P_L$  and use this variable in the regressions, in order to control the level of pre-bookbuilding uncertainty.

The offerings “above the range” have smaller range width mean and median than the other groups, but the difference in relation to the two other groups are not significant.

We calculate the expected offering price as  $(P_H + P_L) / 2$ . Offers “below the range” have higher mean expected prices than those “within” or “above the range”. However, the difference is not significant and the medians are approximately the same for the three groups. This trend is reversed in the final offer price, published in the final prospectus for each offering. This time, there is indication that offerings “above the range” have offer prices that are higher than the other two subgroups, in terms of the median. Still, once again the means were not significantly different.

We observe that more than half of all IPOs have greenshoe option in the prospectus, and the percentage of issues with this feature increases with the relative position in the range. In the group below the range there are 52.3% IPOs with greenshoe, in the group inside the range there are 71.4% and in the group above the range 79.3%.

The *pre-greenshoe* volume offered differs significantly between the subgroups, both in terms of means and medians. Despite the fact that the difference between the offers “within the range” and the other two sub-groups is not significant, the difference between the offers “above” and “below the range” is. Offers “above the range” capture considerably more than offers “below the range”, (nearly triple in terms of means and twice in terms of medians).

We also note that the offers above the range have a mean market capitalization significantly higher than the offers below the range, which indicates a greater appetite of the market for offerings from the largest companies.

Table 2 presents the descriptive statistics about price revision during the bookbuilding process. We build the data comparing information in the preliminary prospectuses with the final prospectuses.

We calculate price revision as  $(P_O - P_E)/P_E$ , where  $P_O$  is the final offer price disclosed in the definitive prospect and  $P_E$  is the expected offer price in the preliminary prospect (the mid price between the highest price ( $P_H$ ) and the lowest price ( $P_L$ ) in the valuation range). We observe that price revision is apparently symmetrical among groups. It is negative in the first subgroup and positive in the third, but in terms of the mean and median, the revisions distance ( $P_O - P_E$ ) of the two groups are similar in magnitude. Price revision in “within the range” group is around zero.

The same occurs with the revisions regarding the limits of the offer range, calculated as  $(P_O - P_L)/P_L$  for “below the range” and  $(P_O - P_H)/P_H$  for “above the range”. This indicates that the market follows a common pattern in defining the offer range (note, in Table 1, that the range width is about R\$ 4.00 for all the subgroups), and in reviewing the offering price.

We estimate the change in the number of shares offered as  $(N_O - N_E)/N_E$ , where  $N_O$  is the number of shares offered in the IPO and  $N_E$  is the number of shares disclosed in the preliminary prospectus. Although we identify changes in only 15.65% in the sample, this adjustment represents significant difference in the total final volume offered. We observe that offerings in the “above the range” group have a greater propensity to have positive shifts in the number of shares issued than offers “below the range” (24.14% of this group). The underwriter, as well as adjusting the price according to the demand, also – or even instead of adjusting the price – adjusts the number of shares. Note that the price adjustment and quantity of stock offered adjustments fit the idea of supply and demand model, in which there is *ex ante* uncertainty about demand.

We calculate the difference in Brazilian Reais of expected volume to final volume offered as  $V_O - V_E$ , where  $V_O$  is the number of shares offered multiplied by final offer price and  $V_E$  is the expected number of shares in the offering according to the preliminary prospect multiplied by the expected offer price in the preliminary prospect. We also calculate



the ratios  $V_O/V_E$ ,  $V_O/V_L$  and  $V_O/V_H$ , where  $V_L$  is the anticipated number of shares in the preliminary prospect multiplied by the lower price in the offer range, and  $V_H$  multiplied by the upper price in the offer range. Ratios are different among group, increasing from “below the range”, “within the range” and “above the range” groups.

Pinheiro and Carvalho (2011) explain that some IPOs contain the possibility of hot issue. This option allows the underwriter to increase the number of shares originally declared to a limit of 20% during the pre deal period. This option must be declared in the prospect and the decision of the additional issue is taken by the issuing company and the underwriter before the IPO launching. The greenshoe option allows the underwriter to issue additionally up to 15% new shares in the aftermarket. Therefore, the underwriter has the possibility of adjusting partially not only the price, but also the number of shares in the pre-deal.

Table 3 contains an analysis of first day return and additional shares issues after the launching day in the sample and subsamples.

We calculate the initial return as  $(P_1 - P_0)/P_0$ , where  $P_1$  is the closing price in the first trading day,  $P_0$  is the launching price. We also calculate the abnormal return in the first day, subtracting from the initial return the Ibovespa return. We can see that the initial return is, on average, positive, both in absolute and abnormal terms. A higher percentage of offerings with launching price “above the range” has positive first-day return (65.52%) compared to the offerings “within the range” and “below the range” (both approximately 54%). But the initial return corresponds approximately to 1% of the launching value in all three subgroups, and there are no significant differences among the three subgroups.

We do difference mean tests for percentage change in number of shares offered and difference in reais of expected volume to final volume offer (both information also presented in Table 2) for the three subgroups. We calculate the difference in Brazilian Reais of final offer volume to volume after the greenshoe option as  $V_F - V_O$ , where  $V_F$  equals the final number of shares after greenshoe multiplied by the final offer price and  $V_O$  is the number of shares offered in the launching day multiplied by the launching price. We can observe that the group “above the range” has significantly higher change of number of shares, greenshoe exercised ratio and difference in offer volume to postgreenshoe volume than the other two groups (“within the range” and “below the range”).

We observe a higher percentage of IPOs with underpricing in the “above the range” group compared to “inside the range” and “below the range”. The first day return is also higher for the “above the range” group, but the mean is not statistically different from the other two groups. Bids “above the range” have higher number of shares adjustments than the other two groups, but the mean is not statistically different than the other two groups. When we analyze the exercise of greenshoe option, we observe that the above the range has a higher ratio of new shares issued in the aftermarket than the other two groups, and the difference is statistically significant. Our descriptive analysis support the idea that underwriter

makes overallocation of high demanded deals, creating the possibility to compensate investors for revealing information, but it does not provide strong evidence of partial adjustment in prices as Hanley (1993).

In order to understand the long-term returns of bids, we estimate cumulative abnormal returns after issuance. We calculate daily abnormal return as the difference between the daily stock return and the daily Ibovespa return, and accumulate them as time goes by. Table 4 presents the “*cumulative abnormal returns*” or “*CAR*” in different horizons and for the three groups.

We find that the CAR in 128 trading days up to 510 days are negative in the three groups. At 255 trading days, the offerings “below the range” have a significantly lower performance than the offerings “above the range”. However, at 510 trading days, the returns of the subgroups “below” and “above the range” are almost equal in terms of absolute return and, in the case of cumulative abnormal returns, the scenario is reversed, and offerings “below the range” have a return that is less negative than the offerings “above the range”, although there is not any statistically significant difference.

The percentage of offerings with a positive performance is higher for the group “below the range” for all the time periods analyzed (22, 128, 255 and 510 days after the launch). This positive percentage difference increases as the period distances from the launching day. Our results are similar to the findings of Hanley (1993).

#### **4. Econometric Tests**

We run OLS regressions to validate our findings in the descriptive analysis.

In order to analyze the effect of bookbuilding information in initial return and the exercise of greenshoe option in the aftermarket we include the following variables in the regression in addition to the ones we described in the descriptive analysis:

- (i) Ibovespa % change between submission and offer date: we used the Ibovespa return in the waiting period as a measure of how hot the market is. We expect a positive correlation of this variable to initial return.
- (ii) Credit Suisse or UBS Pactual lead underwriter dummy: a dummy variable that equals one if the lead underwriter is Credit Suisse or UBS Pactual and zero otherwise. These two investment banks were the lead underwriter in the vast majority of IPOs in our sample, and we used this dummy as a proxy for underwriter reputation. We expect this variable to have a negative relation to underprice.
- (iii) Crisis Dummy— a dummy variable that equals one if the IPO was issued after August 2008 or zero otherwise. We expect that this dummy is negative correlated to underpricing, because the crisis should decrease investors optimism and the willingness to pay more for IPOs.
- (iv) Valuation range width x Ibovespa % change: this interaction variable represents risky IPOs issued in hot markets.

(v) Greenshoe option – dummy with value 1 if there is greenshoe option in the prospectus.

Table 5 contains the results of the regressions. In models (1) and (2) we test how initial return is related to pre-deal information. In model (3) we test how the exercise of greenshoe option in the aftermarket is related to pre-deal information. Models (4) and (5) relates the information in the preliminary prospectus to the final prospectus and help us to better analyze some results we find in model (1), (2) and (3).

In Model (1) we note that abnormal initial return is positively related to Ibovespa return in the waiting period. The results also show a positive and significant effect of price range width on the initial return. Note that the interaction variable of range width and Ibovespa change is also significant, but with a negative sign. The marginal effect of the length of the valuation range is

$$\frac{\partial(\text{initial\_return})}{\partial(\text{range\_width})} = 0.026 - 0.17 \times R_{\text{Ibovespa}}$$

Where  $R_{\text{Ibovespa}}$  is the Ibovespa return or percentage change during the waiting period. Since  $R_{\text{Ibovespa}} \in [-0.076, 0.077]$ , we have that  $\frac{\partial(\text{initial\_return})}{\partial(\text{range\_width})} \in [0.013, 0.039]$ . Therefore, the price range width has a positive effect on the abnormal initial return. In other words, we find evidence that risk causes underpricing. This is in accordance to the theories that establish a positive relationship between these two variables, as in Ritter (1984). But the negative sign implies that the underpricing for riskier IPOs is smaller in times of hot markets. At first it seems a surprising result, since we would expect higher uncertainty in periods of hot market. However, since we are already controlling for uncertainty, it may corroborate the idea in Rock (1986) of risk averse underwriters that lower the launching price to attract uninformed investors. In periods of high demand, or hot markets, a ‘not too low’ price may be enough to attract investors. Consequently, underpricing is smaller in hot markets. Note that in Model (2), in which we do not control for the interaction between risk and hot market, the price range width is not significant in explaining underpricing.

We also observe in Model (1) a positive and significant relation between the existence of greenshoe option in the prospectus and underpricing.

In Model (3) we find that the exercise of greenshoe option in the aftermarket is positively related with price revision during the bookbuilding (percentage change from final offering price to expected offering price) and significantly negative related to range width, as expected. Interestingly, the interaction variable between IPO risk and hot market is also significant, but with a positive sign. This implies that riskier IPOs issued in hot market have a higher ratio of greenshoe option exercised in the aftermarket. We interpret the results in Model (1) and (3) as an evidence that there is a lot of

interaction between initial return and greenshoe option. This evidence is pretty much in accordance to Pinheiro and Carvalho (2011), which concludes that aftermarket short coverage reduces underpricing.

Finally, in Model (4) and (5) we find a significant and positive relation between the existence of greenshoe option and upward price revision and percentage change in the number of shares during the bookbuilding process. Our results support the idea in Benveniste and Spindt (1989), according to which underwriters compensate informed investors through overallocation, but when demand is so high that there is shares rationing even with the overallocation, underwriters adjust the price only partially to the perceived demand, creating positive initial return.

## 8. Conclusion

The objective of this study is to investigate the existence of the partial adjustment phenomenon in the Brazilian market.

We find evidences that underpricing and short coverage in the aftermarket have great interaction. Our results indicate some evidence of partial adjustment, but our findings are not as strong and straight forward as in Hanley (1993). Our evidences indicate that underwriters prefer to compensate informed investors in Brazil with overallocation, reducing underpricing. But if shares are rationed even with overallocation, they adjust the price only partially, creating underpricing. This interpretation is in accordance to Benveniste and Spidndt (1989), where underwriter compensates informed investor with overallocation and underpricing.

The existence of greenshoe option is also related with higher underpricing, if we control for a variable that interacts risk and hot market in the waiting period. When there a is hot market, the underwriter tends to adjust upward the price of riskier IPOs, reducing the underpricing, but this increases the exercise of the greenshoe option in the aftermarket. These findings highlight the need of considering overallocation and aftermarket short coverage when one investigates underpricing and partial adjustment phenomenon in Brazil.

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Figure 1- Relative position of the offering price in chronological order

The 115 public initial offerings of the sample had their respective valuation ranges normalized, in a way that the maximum price was 1 and the minimum price was 0. Afterwards, the definitive offering price was also normalized and is represented in the graphic. The order is chronological.

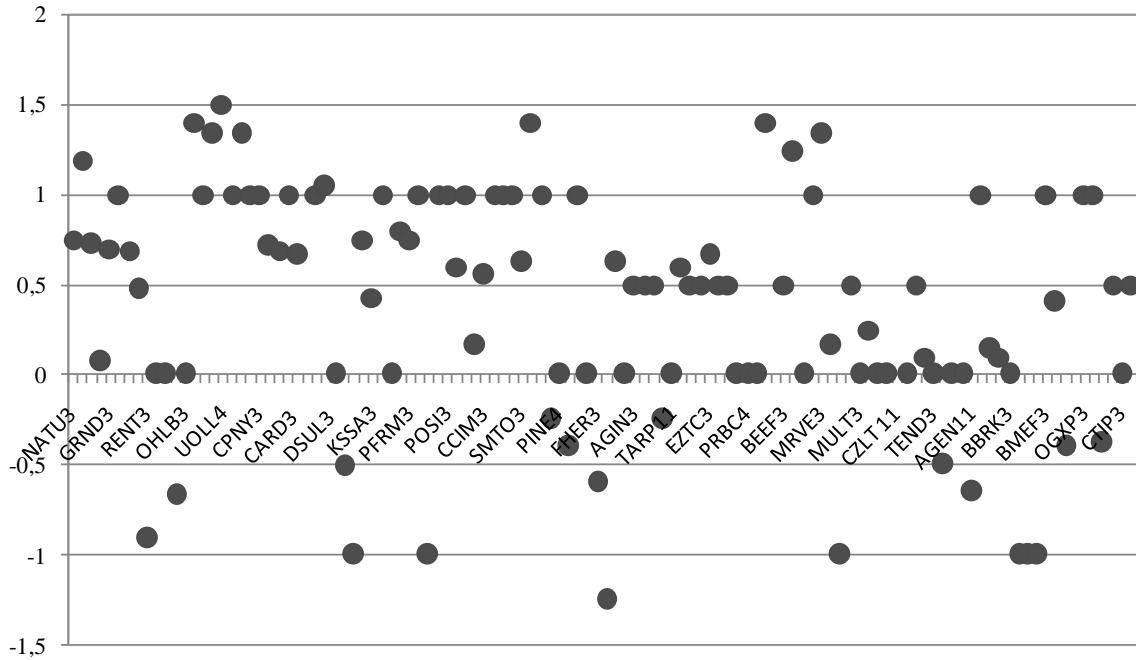


Figure 2 – Relative position of the offerings ordered according to the position

The 115 initial public offerings of the sample had their valuation ranges relativized in a way that, the maximum price was assumed to be 1 and the minimum price 0. Afterwards, the definitive offering price was also relativized and is represented in the graphic. The order is a function of the relative position of the definitive offering price after it was relativized.

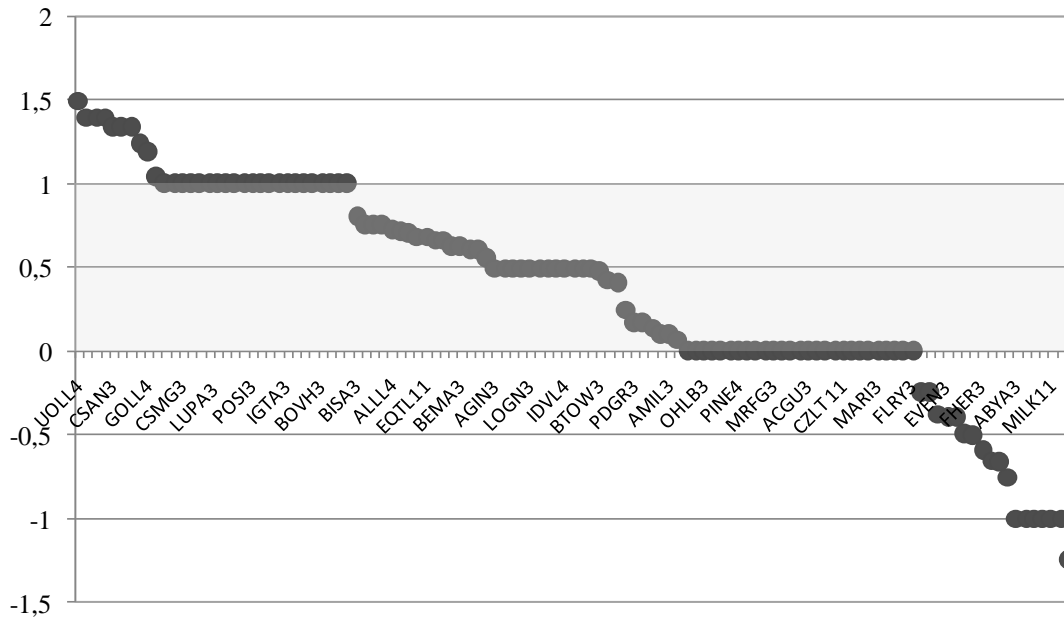


Table 1 - Statistics of the initial public offerings of the sample

Descriptive statistics of the final offer price and volume in relation to the pre-bookbuilding offer range and predicted volume in the preliminary prospectus. We extracted the data from the Bloomberg terminal on September, 25th, 2010. Below the means, the medians are presented in brackets. On the right, the means difference test with probability p-value and the degree of freedom in brackets. “\*\*\*” represents a statistically significant degree below 1 %..

	All IPOs	IPOs with final offering price below or at the minimum value of the offer range	IPO with final offering price within offer range (excluding limits)	IPOs with final offering price above or at the maximum value of the offer range	Means difference test		
		(1)	(2)	(3)	(1) - (2)	(1) - (3)	
Data from Preliminary Prospectus	Number of issues	115	44	42	29		
	Percent of sample		38,26%	36,52%	25,22%		
	Offer range width in Brazilian Reais	R\$ 13,52 [R\$ 4,00]	R\$ 18,62 [R\$ 4,00]	R\$ 8,74 [R\$ 4,00]	R\$ 12,89 [R\$ 4,00]	(0,383) [84]	(0,703) [71]
	Offer range width in percentage terms	26,68% [26,94%]	26,13% [28,17%]	28,07% [28,99%]	25,52% [25,00%]	(0,323) [84]	(0,776) [71]
	Net revenue in preceding year	R\$ 1.037,64 M [R\$ 363,60 M]	R\$ 927,42 M [R\$ 343,85 M]	R\$ 1.405,49 M [R\$ 334,10 M]	R\$ 664,34 M [R\$ 398,40 M]	(0,481) [81]	(0,340) [68]
	Expected offering price	R\$ 73,66 [R\$ 18,50]	R\$ 115,07 [R\$ 20,25]	R\$ 43,54 [R\$ 17,25]	R\$ 54,45 [R\$ 19,50]	(0,177) [84]	(0,339) [71]
	Percent of sample with greenshoe option	66,1%	52,3%	71,4%	79,3%		
Data from Definitive Prospectus	Final offering price	R\$ 69,83 [R\$ 18,00]	R\$ 100,43 [R\$ 17,00]	R\$ 43,16 [R\$ 17,50]	R\$ 62,02 [R\$ 23,00]	(0,232) [84]	(0,517) [71]
	Offered Volume R\$ Million (pre-greenshoe)	R\$ 898,38 M [R\$ 525,20 M]	R\$ 540,20 M [R\$ 477,27 M]	R\$ 864,96 M [R\$ 510,43 M]	R\$ 1.490,21 M [R\$ 723,07 M]	(0,249) [84]	(0,002)*** [71]
	Market Capitalization at IPO	R\$ 3.505,47 M [R\$ 1572,54 M]	R\$ 1.569,24 M [R\$ 1338,67 M]	R\$ 3.684,77 M [R\$ 1499,12 M]	R\$ 6.183,53 M [R\$ 2174,65 M]	(0,212) [84]	(0,002)*** [71]



Table 2- Offering adjustments between the preliminary and final prospectuses

Descriptive statistics of the percentage difference between the offering prices and offered volumes in relation to what is predicted in the preliminary prospectus. We extracted data from the Bloomberg terminal on September 25th, 2010. Below the means, the medians are in brackets.

	All IPOs	IPOs with final offering price below or at the minimum value of the valuation range	IPO with final offering price within valuation range (excluding limits)	IPOs with final offering price above or at the maximum value of the valuation range
		(1)	(2)	(3)
Mean percentage difference from expected offering price to final offering price	-2,14% [0,00%]	-18,34% [-14,52%]	0,20% [0,00%]	19,07% [12,82%]
Mean percentage difference from minimum or maximum range values and the final offer price		-19,35% [-18,34%]		18,97% [8,00%]
Mean percentage change in the number of shares offered	14,85% [20,00%]	20,00% [20,00%]	13,77% [13,05%]	13,89% [20,00%]
Percentage of IPOs with positive change in number of shares	15,65%	6,82%	19,05%	24,14%
Average difference in Reais of expected volume to final volume offered	R\$ 23,44 M [R\$ 0,00 M]	-R\$ 122,98 M -[R\$ 92,33 M]	R\$ 10,98 M [R\$ 9,11 M]	R\$ 263,65 M [R\$ 102,00 M]
Average ratio of offered volume in relation to minimum volume expected	1,00 [1,00]	0,83 [0,86]	1,03 [1,02]	1,23 [1,15]
Average ratio of offered volume in relation to expected volume	1,135077461	0,933630756	1,174303578	1,383910498
Average ratio of offered volume in relation to expected volume	1,13	1,00	1,17	1,34
Average ratio of offered volume in relation to maximum volume expected	0,90 [0,90]	0,75 [0,75]	0,92 [0,92]	1,11 [1,02]

Table 3- Underpricing and greenshoe option

Descriptive statistics regarding the price, shares and volume change after the issue date. Data was extracted from the Bloomberg terminal on September, 25th, 2010. Below the means, the medians are presented in brackets. On the right, the means difference test with probability p-value and the degree of freedom are in brackets. “\*”, “\*\*” and “\*\*\*” represent statistically significant degree below 10%, 5% and 1 %, respectively.

	All IPOs	IPOs with final offering price below or at the minimum value of the valuation range	IPO with final offering price within valuation range (excluding limits)	IPOs with final offering price above or at the maximum value of the valuation range	Means difference test		
		(1)	(2)	(3)	(1) - (2)	(1) - (3)	(2) - (3)
Initial return at first trading day	1,22% [0,68%]	1,06% [0,51%]	1,31% [0,53%]	1,34% [1,43%]	(0,819) [84]	(0,821) [71]	(0,985) [69]
IPOs with positive initial return	57,39%	54,55%	54,76%	65,52%			
Abnormal return at first trading day	0,93% [1,16%]	0,70% [0,77%]	1,07% [1,10%]	1,07% [1,83%]	(0,744) [84]	(0,763) [71]	(0,999) [69]
IPOs with positive initial abnormal return	59,13%	56,82%	57,14%	65,52%			
mean percentage change in number of shares offered	2,32% 0,00%	1,36% 0,00%	2,62% 0,00%	3,35% 0,00%	0,147	0,096 *	0,325
average difference in reais of expected volume to final volume offered	23,44 0,00	-122,98 -92,33	10,98 9,11	263,65 102,00	0,000 ***	0,000 ***	0,000 ***
new shares created with greenshoe option pos deal	8,12% 11,50%	5,84% 0,58%	8,55% 12,00%	10,98% 14,01%	0,033 **	0,000 ***	0,061 *
average difference in reais of final offer volume to volume pos green shoe	78,96 49,28	29,34 6,25	67,74 54,12	170,48 71,70	0,034 **	0,003 ***	0,032 **

Table 4 - CAR of IPOs

Descriptive statistics of the average cumulative abnormal return, stratified according to the position of the offering price in relation to the preliminary range. We extracted data from the Bloomberg terminal on September, 25th, 2010. The medians are presented below the means in brackets and the frequency, in parentheses.

On the right-hand side the means difference test, probability, p value and degrees of liberty are presented in brackets. The markings “\*”, “\*\*” and “\*\*\*” represent a statistically significant level of 10%, 5% and 1 %, respectively.

	All IPOs	IPOs with final offering price bellow or at the minimum value of the valuation range	IPO with final offering price within valuation range (excluding limits)	IPOs with final offering price above or at the maximum value of the valuation range	Means difference test		
					(1) - (2)	(1) - (3)	(2) - (3)
Average accumulated abnormal return at the end of 22 trading days	5,68%	7,12%	5,08%	4,37%	(0,569)	(0,497)	(0,836)
Observations	[5,65%] (115)	[6,82%] (44)	[4,57%] (42)	[5,65%] (29)	[84]	[71]	[69]
Offerings with positive return at the end of 22 trading days	66,09%	68,18%	64,29%	65,52%			
Average accumulated abnormal return at the end of 66 trading days	1,41%	4,48%	-2,14%	1,89%	(0,278)	(0,698)	(0,544)
Observations	[2,78%] (115)	[6,84%] (44)	[-2,60%] (42)	[3,02%] (29)	[84]	[71]	[69]
Offerings with positive return at the end of 66 trading days	53,04%	59,09%	42,86%	58,62%			
Average accumulated abnormal return at the end of 128 trading days	-16,55%	-12,13%	-23,27%	-13,52%	(0,288)	(0,897)	(0,359)
Observations	[-8,92%] (115)	[2,40%] (44)	[-18,64%] (42)	[-8,40%] (29)	[84]	[71]	[69]
Offerings with positive return at the end of 128 trading days	40,87%	52,27%	26,19%	44,83%			
Average accumulated abnormal return at the end of 255 trading days	-56,25%	-58,59%	-68,78%	-34,58%	(0,647)	(0,266)*	(0,085)**
Observations	[-46,38%] (107)	[-51,80%] (41)	[-72,50%] (39)	[-44,89%] (27)	[78]	[66]	[64]
Offerings with positive return at the end of 255 trading days	28,30%	34,15%	30,77%	15,38%			
Average accumulated abnormal return at the end of 510 trading days	-130,04%	-109,29%	-158,49%	-121,24%	(0,259)	(0,928)	(0,184)
Observations	[-124,14%] (101)	[-114,92%] (41)	[-139,98%] (37)	[-101,56%] (23)	[76]	[63]	[59]
Offerings with positive return at the end of 510 trading days	19,80%	29,27%	13,51%	13,04%			

Table 5 – Relation between pre deal information and initial return and greenshoe option

OLS regression. Data was extracted from the Bloomberg terminal on September, 25th, 2010. The t Test results are in brackets. The marks “\*”, “\*\*” and “\*\*\*” represent statistically significant degree below 10%, 5% and 1 %, respectively.

	(1)	(2)	(3)	(4)	(5)
	Abnomal Initial Return	Abnomal Initial Return	Percentage of new shares created with greenshoe option in the aftrmarket	Percentage change in final offering price in relation to expected price	Percentage change in number of shares offered
Percentage change in number of share offered	-0.0156 (-1.04)	-0.00877 (-0.59)	0.0809 (1.17)	0.0677 (0.25)	
Percentage change from final offering price to expected offering price	-0.000913 (-0.24)	-0.00215 (-0.52)	0.0959** (2.68)		0.00648 (0.24)
Percentage width of valuation band in prospectus	0.0265** (1.95)	0.00498 (0.40)	-0.255*** (-3.82)	-0.322 (-1.10)	-0.0440 (-0.40)
Natural logarithm of total volume offered (in R\$)	0.00202 (1.48)	0.00156 (1.06)	-0.00485 (-0.61)	0.0810*** (3.84)	0.00735 (0.97)
Ibovespa % change between submission and offer date	0.388*** (8.33)	0.395*** (7.83)	0.375 (1.37)	-1.167 (-1.86)	-0.379 (-1.83)
Credit Suisse or UBS Pactual lead underwriter <i>dummy</i>	0.000832 (0.39)	0.00138 (0.61)	-0.0000571 (-0.00)	0.0235 (0.59)	0.00662 (0.56)
Dummy crises	-0.00227 (-0.48)	-0.00358 (-0.80)	-0.00610 (-0.24)	-0.119* (-2.34)	-0.0138 (-0.57)
Valuation band x Ibovespa % change	-0.173*** (-3.49)		0.655* (2.07)	0.595 (0.67)	-0.316 (-1.38)
Dummy for Greenshoe in the prospectus	0.00444* (2.09)	0.00307 (1.40)		0.0827* (2.29)	0.0270** (2.80)
Intercept	-0.0446 (-1.62)	-0.0344 (-1.15)	0.227 (1.41)	-1.651*** (-3.87)	-0.124 (-0.78)
F-Statistic	12.06	10.70	5.982	3.640	1.667
R <sup>2</sup>	0.548	0.488	0.198	0.169	0.104
Observations	115	115	115	115	115