Institutional Pre-Commitment and Price Discovery in Lottery vs. Pro-rata Auction IPOs

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Abstract

This study explores how institutional pre-commitment affects price discovery in lottery and pro-rata auction IPOs. The study finds that both auction types show less deviation between issue-price and filing-price when institutions pre-commit to purchasing shares, suggesting that institutional pre-commitment promotes price discovery. In lotteries, price volatility is unaffected by price adjustments, but in pro-rata IPOs, it is positively linked, suggesting that filing-price accuracy is as crucial as unbiased share allocation for market price stability. The study uses beta regression to overcome the limitations of coefficient interpretation in linear regressions, which remain even with large data samples and robust standard errors.

JEL classification: G14, G15, G32

Keywords: Institutional investors, lottery IPOs, pro-rata IPOS, issue-price, filing-price, price volatility, price discovery, beta regression, coefficient interpretation.

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1. Introduction

The auction method of initial public offering (IPO) has attracted much interest from scholars, practitioners, and policymakers in countries around the world. Unlike book-building IPOs in which newly issued shares are almost exclusively allocated to institutional investors at the discretion of the underwriting investment bank, the open-bid, or transparent, auction IPOs—popular in emerging economies such as China and India—ensures that shares are allocated proportionally and non-discretionarily to both retail investors and institutional investors (Firla-Cuchra and Jenkison, 2016, Anagol et al. 2018; Petkevich and Samdani, 2022). While book-building is widely praised for its information production attributes—providing the underwriter with the tools necessary for incentivizing well-informed institutional investors (Benveniste and Spindt, 1989; Benveniste and Wilhlem, 1990; Sherman and Titman, 2002), open-bid auction with proportional share allocation to investors is lauded for its investor protection attributes—limiting the underwriter's ability to collude with investors at the issuing firm's expense (Bias et al., 2002; Bias and Faugeron-Crouzet, 2002).

Aware of the tradeoffs in the issue methods—book-building trades off investor protection against information production, while auction trades off information production against investment protection—the Securities and Exchange Board of India (SEBI) revised the Disclosure and Investor Protection (DIP) guidelines in July 2009. The revised DIP guidelines aim to merge the information production attributes of book-building with the investor protection benefits of open-bid auction. The resulting "hybrid" IPO allows the underwriter to commit a pre-determined portion of the institutional tranche to "anchor" institutional investors at his discretion, as in book-building, and the remaining to other institutional investors without discretion, as in the open-bid auction (Bubna and Prabhala, 2014; Anagol et al. 2018; Lu and Samdani, 2019; Samdani, 2019;

Petkevich and Samdani, 2022). Whereas anchor institutional investors place their bids prior to the initial filing of the price-range, non-anchor institutional investors and retail investors bid after the filing. If the IPO is oversubscribed and the underwriter is unable to allocate shares to all bidders, shares are assigned randomly using a lottery method; otherwise, assignment of shares is proportional. Whereas pro-rata, or proportional, shares allocation ensures all bidders receive shares, lottery allocation does not guarantee this. Anagol et al. (2018) and Petkevich and Samdani (2022) document interesting investor behavior in lottery IPOs that impacts their valuation of the IPO. Specifically, Anagol et al. (2018) document an endowment effect whereby the winners of lottery IPO shares value the shares more than the losers, which impacts trading in the secondary market. Petkevich and Samdani (2022) document an equilibrium outcome of a sequential game between promoters and institutional investors whereby the latter's utility for underpricing is higher when shares are randomly assigned compared to when they are proportionally assigned, which also affects trading in the secondary market.

Despite the attention placed on the roles of investors, both institutional and retail, underwriter discretion, and allocation criteria, empirical evidence remains scant regarding the impact of institutional commitment prior to public filing on price discovery in the auction IPO market broadly and the lottery and pro-rata IPO markets specifically. We ask: Does institutional pre-commitment affect price discovery in auction IPOs? In auction IPOs with institutional pre-commitment, does the allocation criterion (lottery vs. pro-rata) influence price discovery? Empirically, is the difference between the issue-price and filing-price in auction IPOs in which institutions pre-commit and allocation is either random or proportional a measure of information production akin to what is observed in book-building IPOs (Hanley, 1993)? How does price volatility in the secondary market respond to the price deviation in scenarios where institutions pre-commit and allocation is either random or proportional?

The answers to the above questions are relevant for policymakers responsible for designing policies that aim to ease the IPO process and instill investor confidence, such as by promoting price discovery and price stability in the capital market. The Jumpstart Our Business Startup (JOBS) Act enacted in April 2012 in the U.S., for instance, aims to revitalize the IPO market, which experienced a decline in the number of firms going public between 1999 and 2011. The JOBS Act essentially eases the IPO process by exempting firms from the internal audit controls stipulated by the Sarbanes-Oxley Act of 2002 and mitigates IPO process risk by allowing firms to "test the waters" prior to public filing (Doidge et al., 2013). Dambra et al. (2014) find that more companies chose the JOBS Act for its de-risking provision than for its burden-easing provision. This paper adds to the literature on the role of regulations in capital markets by examining the effectiveness of institutional commitment prior to public filing in reducing risk and uncertainty in auctions markets when allocation of shares is random vs when it is proportional.

The results, based on a dataset of 225 auction IPOs in India from 2009 to 2019 (anchor investments became available in India starting in 2009), reveal that IPO issue-price deviates less from the filing-price when institutions pre-commit and more when they do not. The deviation when institutions pre-commit is even smaller when shares are proportionally assigned than when they are randomly assigned. These results suggest that price discovery in auction IPOs is sensitive not only to institutional pre-commitment but also to the shares allocation criterion (pro-rata vs. lottery).

The results also reveal that price volatility decreases when institutions pledge to purchase shares prior to public filing, regardless of whether shares are assigned proportionally or randomly. Conversely, price volatility increases with an increase in price adjustment (difference between filing-price and issue-price) when institutions pre-commit and when shares are proportionally assigned, and it is not affected by institutional pre-commit when shares are randomly assigned. Taken together, these results suggest 1) that price volatility in pro-rata IPOs is sensitive to filing-price accuracy and institutional pre-commitment, and 2) that price volatility in lottery IPOs is influenced by factors other than filing-price accuracy and institutional pre-commitment. Acknowledging that price volatility in IPOs in India is sensitive to uncertainty and information asymmetry (Francis et al., 2005; Rajgopal and Venkatachalam, 2011; Samdani, 2019), the positive relation between price volatility and price adjustment in pro-rata IPOs indicates an amplified level of uncertainty about the IPO's value, especially when the issue price markedly deviates from the filing price. In contrast, the dynamics in lottery IPOs differ significantly. Here, price volatility is less likely influenced by institutional pre-commitment or price adjustment. Instead, it is more likely directly linked to investors' strategic bidding and trading behavior (Anagol et al., 2018; Petkevich and Samdani, 2022). This distinction is crucial as it underscores a fundamental difference in how price discovery and price stability are influenced in these two types of auction IPOs. While pro-rata auctions are predominantly swayed by market uncertainties and information asymmetries, lottery auctions are primarily driven by the behaviors of investors in their trading and bidding strategies. This finding highlights the nuanced ways in which different IPO processes impact price volatility and stability, providing valuable insights for investors, issuers, and regulators, and enabling these stakeholders to make more informed and strategic decisions.

Finally, the study marks an important departure from traditional analyses in the finance and accounting literature by employing a beta regression approach to examine the factors that influence price volatility and issue-price adjustment in auction IPOs. Our approach is motivated by recent studies, such as by Jennings et al. (2023) and Cohn et al. (2022), that underscore the threat posed by measurement error to causal inferences in empirical research. We contend that correct model specification, tailored to the data type at hand, is crucial for more accurate parameter estimation and meaningful interpretation. Price volatility and issue-price adjustment in our data sample are beta distributed, i.e., they are bounded between 0 and 1. We demonstrate that while a large data sample and OLS with robust standard errors might provide statistically significant results, the interpretation of coefficients are not as straightforward or meaningful when using OLS with beta-distributed data.

2. Institutional background and Hypotheses Development

2.1. Institutional background

The process of listing auction IPO shares on the stock exchanges in India begins with the issuer selecting a lead underwriter, a registrar, and a syndicate of investment banks to underwrite the IPO. The lead underwriter prepares a draft prospectus without providing information on either the filing-price range or the issue-price. After preparing the draft prospectus, the lead underwriter files the prospectus with the Securities and Exchange Board of India (SEBI). The prospectus is also distributed to banks in the syndicate group who, in turn, distribute the prospectus to investors. Following the distribution of the draft prospectus, the issuing firm embarks on a “road show” advertisement campaign to gather market-demand information and to determine the initial price range. Following this information-gathering period, the underwriter prepares a formal prospectus, which includes the filing-price range but not the issue-price. The underwriter then files the prospectus with the Registrar of Companies (ROC), which is 21 days after the draft prospectus is filed with the SEBI.

The allocation quotas for different investor types in India are fixed and pre-determined by the SEBI. More specifically, 50% of shares are reserved for institutional investors, 35% for retail investors with bids up to INR100,000 (around US$2,000), and 15% for high-net-worth retail investors bidding over INR100,000. In undersubscribed IPOs, which are not observed in the 2009–19 data sample, the underwriter redistributes shares from the undersubscribed tranche to the oversubscribed one. The share price is determined by the underwriter post bidding. Shares are proportionally allocated if all bids can be met, even if partially. In heavily oversubscribed IPOs where accommodating all bidders is impossible, the underwriter randomly assigns shares within each investor category (Anagol et al., 2018). The SEBI asserts that this approach mitigates investor type bias, a concern highlighted in studies on discretionary book-building IPOs in the U.S. (Aggarwal et al., 2002), and non-discretionary auction-type IPOs in Taiwan (Chiang et al., 2010).

In July 2009, the SEBI amended the DIP guidelines allowing the underwriter to allocate up to 30% of the institutional quota, or up to 15% of the IPO, to anchor investors prior to public filing at his discretion. In 2014, the SEBI increased the anchor portion of institutional quota from 30% to 60%, which is 30% of the total IPO. Anchor investors are institutional investors who subscribe to the issue before the IPO. Bidding for anchor investment begins one day before the IPO. Anchor investors who subscribe to the issue are guaranteed allotment. However, anchor shares are locked-in for 30 days from the day of the IPO. Whereas the anchor price is set prior to public filing and thereby, prior to the bidding phase, the issue-price is set after the bidding phase. The price at which the shares are allotted to anchor investors is the higher of the anchor price and the issue-price. The anchor price is visible to potential bidders prior to the bidding phase. The bidding phase is transparent in that bidders can electronically observe the status of all bids in the book on a half-hourly basis. Bidders can modify their bids before the issue-price is set by the underwriter. In this regard, bids in India are non-binding. Shares are allotted to investors at the issue-price, which cannot deviate from the lower and upper price bands of the filing-price range. Trading in the secondary market begins seven days after the formal document is filed with the ROC.

2.2 Hypotheses development

Jenkinson, Morrison and Wilhelm (2005) examine whether the underwriter's ability to elicit information from investors prior to the initial filing of the price range holds economic significance in Europe. Unlike the 1993 Securities Act in the U.S., which prohibits the underwriter from making any "offers" to investors prior to the filing of the price range, European securities laws permit the exchange of information between the underwriter and investors prior to initial filing. Interestingly, the filing-price in the U.S. is often revised (50% of the time), while it is rarely the case for European IPOs. Jenkinson, Morrison and Wilhelm (2005) develop a theoretical model to explain this stark empirical difference between IPO issue prices in the U.S. and those in Europe. The model essentially relates the accuracy of the filing-price to the information acquired by the underwriter through his interactions with well-informed institutional investors prior to the initial filing of the price range.

Jenkinson, Morrison and Wilhelm (2005) demonstrate that the filing-price in European IPOs is more accurate, i.e., it closely matches the market-price, owed to the fact that information production in European IPOs predominantly occurs in the pre-filing period. Consequently, there is seldom need for the underwriters of European IPOs to revise the filing-price range. Moreover, the issue-price is less likely to deviate significantly form the filing-price. In contrast, in US book-building IPOs, information production primarily takes place during the bidding period in the post-filing stage of the IPO. Therefore, the filing-price in the U.S. IPO is less accurate and the issue-price is likely to deviate significantly from the filing-price unless the latter is revised. The frequency of the filing-price revisions and the magnitude of the issue-price deviation from the initial filing-price in the Jenkinson, Morrison and Wilhelm (2005) model reflect not only the information produced pre- and post-filing-price but also the information incorporated into the IPO issue-price.

Drawing on Jenkinson, Morrison and Wilhelm (2005), we argue that in India, the underwriter's ability to solicit anchor institutional investors for information prior to the initial filing of the price range aids in price discovery. This implies that the IPO issue-price aligns more closely with the filing-price when institutional investors pre-commit to purchasing shares. Thus, we hypothesize:

H1: IPO issue-price deviates less from the filing-price when institutions pledge to purchase shares prior to public filing, and more when they do not.

Both the Jenkinson, Morrison and Wilhelm (2005) model and the Benveniste and Spindt (1989) model predict that IPO price adjustments and revisions are more pronounced when information is predominantly produced *after* the filing-price range is set by the underwriter. Additionally, the Jenkinson, Morrison and Wilhelm (2005) model predicts that IPO price adjustments and revisions are less pronounced when information is mostly produced *prior* to public filing. The underlying premise of these models is that institutional investors are well-informed and that the underwriter incentivizes them to reveal information through favorable allocations. This incentive mechanism implies that allocating shares favorably to well-informed institutional investors diminishes the uncertainty and information asymmetry about the IPO's value. Given that such uncertainties and asymmetries influence investors' trading behavior and, consequently, price volatility, we posit that, in the context of Indian IPOs, institutional pre-commitment prior to public filing reduces price volatility when anchor institutional investors are incentivized with favorable allocation. Thus, we hypothesize:

H2: In auction IPOs, price volatility is lower when institutions pre-commit to purchasing shares and when shares are allocated proportionally, as opposed to when allocation is random.

While institutional pre-commitment reduces information asymmetry and thereby, price volatility, in pro-rata IPOs, it has no effect in lottery IPOs in that its effect, if any, is crowded out by other factors, namely, institutional investors' trading behavior in the absence of favorable allocations. This reasoning is supported by Petkevich and Samdani (2022) who posit that institutional investors engage in strategic bidding when shares are assigned randomly, and by Anagol et al. (2018) who argue that lottery winners value IPO shares differently from lottery losers, influencing trading in the secondary market.

Given these insights, we propose that in lottery IPOs, the adjustment of the issue-price, or its deviation from the filing-price, which generally reflects uncertainty and information asymmetry about the IPO's value, has minimal impact on price volatility. This holds true regardless of whether institutions pre-commit to purchasing shares. Conversely, in pro-rata IPOs, we argue that price volatility increases with an increase in information asymmetry, as indicated by greater issue-price adjustments, especially when institutional investors have pre-committed. This leads us to our next hypothesis:

H3: In auction IPOs, particularly those involving pro-rata allocation and pre-commitment by institutional investors, price volatility increases with an increase in issue-price deviation.

3. Empirical strategy

Jennings et al. (2023) survey papers published in reputable accounting journals, such as *The Accounting Review, Journal of Accounting and Economics, Journal of Accounting Research,* and *Review of Accounting Studies.* They find that while there is growing interest in causal inferences, the concerns related to measurement errors have declined in recent decades. Their survey reveals that researchers are increasingly focused on econometric identification, with scant consideration given to measurement error. They demonstrate, theoretically and empirically, that measurement error can spuriously estimate a causal effect when none exists (Type I error) and that the common practice of including high-dimensional fixed-effects can amplify measurement error bias, increasing the likelihood of Type I error.

Recognizing the potential threat measurement error poses to causal inferences in empirical research, we have deliberately selected a statistical model that aligns with our data type. Our model selection approach acknowledges the influence of data type on measurement error and considers the suitability of model specification relative to the data type. For continuous data, for instance, we deem the widely utilized OLS regression to be the most suitable. If the data exhibits heteroskedasticity, or if there is a presence of measurement error, models such as the Weighted Least Squares (WLS) and the Generalized Least Squares (GLS) are deemed more suitable (Hayes and Cai, 2007). If the data is binary or categorical, then logistic regressions, such as logit and probit, are more fitting. Undertaking sensitivity analysis can prove beneficial to assess how robust the results are to potential measurement error in the binary variable (Goldstein et al., 2008). For count data, Cohn et al. (2022) recommend the use of the Poisson model. If count data has measurement error, simulation-extrapolation could be useful. If the data is continuous proportions, i.e., if the dependent variable is a proportion bounded between 0 and 1, beta regression is ideal. Given our dependent variables, namely, price volatility and issue-price adjustment, are proportions bounded between 0 and 1, beta regression is the logical choice for our analysis.

In a correctly specified regression model, the residuals (i.e., the differences between the observed and predicted values) are expected to be distributed randomly around zero. This property, known as homoskedasticity, implies a constant variance in the residuals. If the residuals are evenly spread around a mean of zero (i.e., the residuals are distributed randomly around zero, or the residuals have symmetric distribution with constant variance), the model is considered to be doing a good job of predicting the average value of the dependent variable, given the predictors. If there is a pattern in the residuals (e.g., they spread out more for larger fitted values), it might indicate heteroskedasticity, which violates the constant variance assumption and can lead to inefficient and potentially biased estimates.

The above holds true in the context of OLS regression models, which are often used in analyses where the dependent variable is continuous and unbounded. For models where the dependent variable is bounded or follows a different distribution (like beta distribution), other diagnostic tools and considerations are necessary. For beta distributed data, the half-normal probability plot with a simulated envelope is a useful diagnostic tool for examining the adequacy of the fitted model (Neter et al., 1989; Ferrari and Cribari-Neto, 2004). The simulated envelope effectively highlights the extreme values (Atkinson, 1981). For example, when using 19 simulations, the probability of the absolute residual falling outside of the simulated envelope is 5 percent (1/20). Large deviations of points from the mean of the simulated values, or occurrence of points near to or outside the simulated envelope, are indications that the fitted model is not appropriate. Cases in which the absolute deviance residuals fall outside of the simulated envelope limits are therefore worthy of additional investigation. It is important to note that the half-normal probability plot of the absolute residuals may not necessarily provide straight line even when the fitted model is correct (Ferrari and Cribari-Neto, 2004; Neter et al., 1989).

Indeed, the literature has proposed correction methods in which the dependent variable is first transformed and then the mean of the transformed dependent variable is computed as a linear predictor based on a set of exogenous variables (Kieschnick and McCullough, 2003). A common correction to meet the normality and homoskedasticity (constant variance in the errors) assumptions in linear models is to transform the dependent variable and make the distribution symmetrical, such as by taking the log of the dependent variable (Box and Cox, 1964). Even though transformations, including the Box-Cox transformation, minimize the risk of false positive in linear regressions, the interpretation of the regression coefficients is unclear. Cohn et al. (2022) argue and demonstrate that transforming the log of one plus (log1plus) regression to the original scale, i.e., linear regression, produces estimates with unclear interpretation. Thus, by fixing one problem, i.e., Type I error, transformation in linear regressions creates another problem, i.e., unclear interpretation of regression coefficients.

We acknowledge that a large sample size can increase the power of statistical tests, making it more likely to detect statistically significant effects even when the data deviates from normality or other assumptions. Furthermore, the use of robust standard errors can improve the reliability of hypothesis tests in the presence of heteroscedasticity or other violations of classical assumptions—robust standard errors help account for potential issues related to the distribution of residuals. Even though beta-distributed data is not normally distributed, in certain circumstances and with a sufficiently large sample size, the Central Limit Theorem suggests that the distribution of sample means can approximate normality. If there are outliers in the data, robust standard errors can help mitigate their impact, potentially leading to statistically significant results. While these factors contribute to obtaining statistically significant results with OLS, it is important to note that, as pointed out by Cohn et al. (2022), the interpretation of coefficients may not be as straightforward or meaningful when using OLS with bounded distributed data.

Given the bounded nature of the dependent variables, namely, price volatility and issue-price adjustment, we use beta regression in our analysis. Beta regression is particularly effective for continuous variables that assume values in the standard unit interval (0, 1). To contextualize the findings, we compare the results of beta regression with those obtained from linear regression models, specifically the Ordinary Least Squares (OLS) model and the Box-Cox model. This comparison aims to highlight situations where linear regressions yield results akin to beta regressions and instances where the outcomes diverge. Such an approach not only validates the suitability of beta regression for this analysis but also provides a comprehensive understanding of the data's behavior under different statistical modeling techniques.

4. Data

The IPO data sample is collected from Prime Database, Chittorgarh, the Bombay Stock Exchange (BSE), and the National Stock Exchange (NSE) in India. The market data is collected from Money Control. The main data sample consists of 226 auction IPOs in the July 2009–19 period in India. The descriptive statistics are shown in Table 1.

[Insert Table 1]

From the exploratory analysis—whose descriptive statistics are displayed in Table 1, Panel A—we notice that the mean of some predictor variables is larger than the median, indicating potential skewness in the explanatory variables. The table also reveals a large range for predictor variables, for instance, the values of institutional demand vary from 0.03 to 143.62. Furthermore, the associated ratio of institutional demand, which is 4787, exceeds 100. Following the guidance of Cook and Weisberg (2009), we transform the predictor variables using the logarithm transformation method, and present the summarized results in Panel B. The mean and the median of the transformed predictor variables, as shown in Panel B, are closely aligned, which indicates the effectiveness of the logarithm transformation.

To offer a more tangible illustration, Figure 1 presents boxplots of those predictor variables that initially displayed pronounced variability.

[Insert Figure 1]

The primary benefit of logarithm transformation, as evidenced by the graphical representation in Figure 1, is that it makes the distribution of the predictor variables less skewed and more symmetrical. By compressing the spread of the larger values, the transformation ensures the overall data distribution leans towards symmetry. Such a transformation is very useful, especially for statistical techniques that presuppose a normal data distribution.

Next, we examine the correlations between the variables used in the analysis. The Pearson's correlation matrix is shown in Table 2.

[Insert Table 2]

The correlation coefficients reported in Column 1 of Table 2 reveal a correlation between price volatility and various IPO characteristics, such as issue-price adjustment, underpricing, issue amount, institutional demand, retail demand, earning-per-share, and majority shareholders' retained equity. Column 2 of Table indicates a correlation between issue-price adjustment and factors like issue amount, institutional demand, and majority shareholders' retained equity. These correlations suggest the importance of controlling for firm-specific characteristics in the analysis. Instances where the pre-issue holding is zero have been excluded to avoid undefined divisions. Complete definitions of these variables are found in Appendix B.

Next, we present the descriptive statistics of independent variables categorized by lottery pre-commitment, pro rata pre-commitment, and year in Table 3 and Table 4.

[Insert Table 3]

[Insert Table 4]

The summary statistics presented in Table 3 reveal that the mean, median, and standard deviation values of both price volatility and issue-price adjustment in lottery IPOs are relatively lower with institutional pre-commitment prior to public filing compared to without. This observation aligns with the predictions of Hypotheses H1 and H2. The table also shows that the mean, median, and standard deviation of both price volatility and issue-price adjustment in pro-rata IPOs are relatively lower with institutional pre-commitment compared to without, which also align with the predictions of H1 and H2.

Table 4 indicates that the distribution of IPOs by year is not homogenous across the lottery and pro-rata pre-commitment categories—lottery yes pre-commitment, lottery no pre-commitment, pro-rata yes pre-commitment, and pro-rata no pre-commitment. This suggests the importance of controlling for year fixed-effects, in addition to controlling for industry fixed-effects, in the regressions.

Boxplots, indeed, are powerful tools for visually summarizing data. They provide a quick glance at the distribution of a dataset, highlighting its central tendency, variability, and skewness. The median, a key feature of the boxplot, is indicated by the line that divides the box into two parts. This line represents the middle value of the data set, with half of the data points lying above this value and the other half below.

In a boxplot, the box itself represents the interquartile range, encompassing the middle 50% of the dataset, namely the range between the 25th percentile (lower quartile) and the 75th percentile (upper quartile). The position of the median within this box gives an indication of the data's skewness: When the median is centrally located within the box, it implies that the lower 25% and the upper 25% of the data values are roughly equally distributed on either side of the median. This indicates a symmetrical distribution. If the median is closer to the bottom of the box (towards the lower quartile), it suggests that the distribution is positively skewed. In positively skewed distributions, a larger number of observations fall below the median, and the 'tail' of the distribution extends towards higher values. Conversely, when the median is closer to the top of the box (towards the upper quartile), the distribution is negatively skewed. Here, more observations lie above the median, and the distribution's 'tail' is towards the lower values.

Additionally, boxplots also display 'whiskers' which extend from the box to show the range of the data, and points outside the whiskers can indicate potential outliers.

In our case, the boxplots for Table 3 and Table 4, as shown in Figure 1 and Figure 2, provide a visual representation of these aspects of the datasets. By examining these boxplots, we can quickly assess the central tendency, spread, and skewness of the data in each table.

[Insert Figure 2]

[Insert Figure 3]

The boxplots in Figure 2 effectively illustrate the differences in price volatility and issue-price adjustment between the lottery IPOs with institutional pre-commitment and pro-rata IPOs with institutional pre-commitment categories. The key observations from the boxplots are as follows: 1) The median line for price volatility in the boxplot of lottery IPOs with institutional pre-commitment is positioned lower than that in the boxplot for lottery IPOs without institutional pre-commitment. This indicates that the median price volatility is lower for lottery IPOs with institutional pre-commitment. 2) Similarly, the boxplot shows that the median of price volatility for pro-rata IPOs with institutional pre-commitment is lower compared to that without institutional pre-commitment. This suggests a lesser median price volatility in pro-rata IPOs with institutional pre-commitment. 3) The median line of the issue-price adjustment for lottery IPOs with institutional pre-commitment is lower than that without any pre-commitment. This observation implies a lower median issue-price adjustment in lottery IPOs with institutional pre-commitment. 4) In the case of pro-rata IPOs with institutional pre-commitment, the median line for issue-price adjustment is also lower compared to that without institutional pre-commitment, indicating a lower median issue-price adjustment for pro-rata IPOs with institutional pre-commitment.

These findings from Figure 2 provide empirical support for hypotheses H1 and H2. They suggest that the lottery and pro-rata IPOs with institutional pre-commitment have a significant impact on price volatility and issue-price adjustment, which aligns with the predictions made in these hypotheses. The lower median lines in the boxplots for both price volatility and issue-price adjustment in the institutional pre-commitment categories indicate a tangible difference when compared to IPOs without such pre-commitments. This variance in medians highlights the influence of pre-commitment mechanisms on the IPO market's pricing dynamics, offering valuable insights into how these pre-commitment strategies affect market behavior and outcomes.

Similarly, the boxplots in Figure 3 compare price volatility and issue-price adjustment across different years. The figure shows that the median line for price volatility in some years extends beyond the range of other years in the boxplot. Likewise, the median line for issue-price adjustment in certain years also deviates from those in other years. These variations provide evidence of differences between the years following the 2009 policy change. This underscores the need to control for year fixed-effects in the regressions, in addition to industry fixed-effects.

Industry fixed-effects, a common feature in econometric and statistical models, are utilized to control for variations across different industries within the economy. They specifically aim to account for characteristics that are either unobservable or unmeasured within each industry. By including these fixed-effects in the regression models, the analysis effectively eliminates variation attributable to industry-specific factors. This allows for a more concentrated focus on the impact of the predictor variables of interest, thereby enhancing the accuracy and reliability of the regression results.

The next step prior to fitting the regression models is to define the response variables: price volatility and issue-price adjustment. Taking cues from Mangiafico (2016), who defines the response variable as a function of student sodium intake, and Cribari-Neto and Zeileis (2010), who define the response variable as a function of reading accuracy, we define price volatility as a function of daily price change over a thirty-day period starting from the second day of trading (the first-day of trading captures IPO underpricing). The average daily price volatility over a thirty-day period in our data sample is, not surprisingly, continuous proportions between 0 and 1. We define issue-price adjustment as a function of issue-price divided by the midpoint of the initial price range, where the filing-price range is the price range set by the underwriter prior to the bidding phase and the issue-price is the price at which IPO shares are offered to investors in the primary market. SEBI guidelines stipulate that the upper bound of the filing-price range cannot exceed the lower bound by more than 20%, and the issue price must fall within the lower and upper bounds of the filing-price range. Owing to these constraints and the function design, the issue-price adjustment variable in the data sample is also continuous proportions between 0 and 1. Consequently, the standard beta distribution is the logical choice for modeling this type of data distribution. The histogram with the density curve for price volatility and issue-price adjustment are shown in Figure 4.

[Insert Figure 4]

The histogram overlaid with a density function in Figure 4 illustrates that price volatility is confined within the standard interval of 0 to 1. Correspondingly, Table 1 reveals that the mean and median of price volatility are closely aligned, indicating a symmetric distribution of the data. However, the skewness value of 1.53 suggests a positive skew, characterized by a more pronounced right tail in the distribution. This positive skewness in the response variable, price volatility, could lead to skewed residuals in regression analysis, potentially challenging the assumptions of linearity and normality. Such deviations could affect the validity of statistical tests and influence the significance and magnitude of regression coefficients.

The kurtosis value for price volatility, standing at 5.36, points to a leptokurtic distribution. This implies that the distribution has heavier tails and is more prone to extreme values compared to a normal distribution, which typically has a kurtosis of 3. High kurtosis could signal the presence of outliers or influential data points, warranting closer scrutiny in the analysis.

Figure 4 also demonstrates that issue-price adjustment values range between 0 and 1. With a skewness of 0.81 and a kurtosis of 3.03, the distribution of issue-price adjustment is less skewed and approximates a normal distribution. These higher moments - skewness and kurtosis - are crucial for understanding the data's distribution. Such insights not only aid in determining the appropriate statistical analysis and modeling approach but also in tailoring model specifications to accurately reflect the underlying data characteristics. By recognizing and addressing these distributional properties, the analysis can be more accurately aligned with the data's inherent structure, enhancing the reliability and interpretability of the findings. This understanding is particularly important in linear regression analysis, where the assumption of normally distributed residuals is central to the validity of many statistical inferences. Therefore, acknowledging and accounting for these distribution characteristics in price volatility and issue-price adjustment is vital for robust and meaningful analysis in this context.

5. Analysis and results

We present our analysis and discuss the results in two subsections. In the first subsection, we summarize the results of the first specification (Hypotheses H1) derived from beta regressions, zero inflated beta, OLS, and Box-Cox regressions. The dependent variable in this specification, IPO issue-price adjustment, is beta distributed. In the second subsection, we delineate the results of the second specification (Hypotheses H2 and H3) from the beta regression analysis and juxtapose them with findings from the OLS and Box-Cox analyses. The dependent variable in H2 and H3, price volatility, is also beta distributed.

5.1 Is issue-price adjustment in auction IPOs sensitive to institutional investors' pledge to purchase shares prior to the initial filing of the price range?

In this section, we investigate the relationship between IPO issue-price adjustment—defined as the deviation in the issue-price from the filing-price range and institutional commitment prior to public filing. We use the following specification for this examination:

$$Issue\ Price\ Adjustemnt = \beta_0 + \beta_1 Lottery\ pre\text{–}\ commitment\ + \beta_2\ Pro\text{–}\ rata\ Pre\text{–}\ commitment +\ Controls + \varepsilon \qquad (1)$$

We use beta regression with issue-price adjustment as the response variable and lottery pre-commitment and pro rata pre-commitment as the key predictor variables. We fit the regression models based on the specification in Eq. (1). The regression results are reported in Table 5.

[Insert Table 5]

Eight out of ten beta regression models in Table 5 show that the coefficient for the lottery pre-commitment variable is negative and statistically significant. All ten beta regression models in Table 5 show the coefficient for the pro-rata pre-commitment variable is negative and statistically significant. Except for the two models in which the coefficients for lottery pre-commitment are not statistically significant, the results confirm the predictions of H1.

Figure 5 shows the diagnostic plots of the residuals, which are useful for checking the fit of the multivariate regression Model 10 in Table 5.

[Insert Figure 5]

The analysis of various residual plots in Figure 5 offers insights into the model fit and the data's characteristics. The top left residual plot reveals no apparent pattern, suggesting a good fit between the model and the data. The deviance residuals, as seen in the bottom right plot, center around zero, further indicating an adequate model fit. The half-normal plot of residuals, displayed in the bottom left, highlights a few observations deviating from the majority, which are closely clustered within the confidence bands of the simulated envelope. These values align well with the mean of the simulated values, as indicated by the dashed lines, implying effective performance of the beta model.

In the scatterplot of Cook's distance versus the number of observations, shown in the top right, all Cook’s distance values are below 0.5. This suggests the absence of highly influential points in the dataset, reinforcing the reliability of the model.

The beta regression method employed so far assumes no observations equal to zero for the response variable. To meet this constraint, we excluded two observations with a zero percentage in the data sample (where the issue-price equals the mid-point of the filing-price range). Next, we test the sensitivity of our results in Specification 1 (Table 5) to IPOs with an issue-price adjustment equal to zero. We include the observations with a zero value and fit the zero-inflated beta regression models according to the specification in Eq. (1). The results of zero-inflated beta regression are reported in Table A1 in Appendix A.

[Insert Table A1]

The analysis of the regression models in Table A1 reveals that the coefficients for both pro-rata and lottery IPOs with institutional pre-commitments prior to public filing are statistically significant and negative across all models. This consistency in the results, which persists even when including IPOs with zero issue-price adjustment, suggests that the original findings are robust. The inclusion of these additional IPOs and employing the zero-inflated beta regression approach appears not only to confirm the initial results but may even enhance their validity. Consequently, these findings lend strong support to the predictions of H1 and H2, reinforcing the initial conclusions drawn from the data

Figure A1 in Appendix A shows the trace plots of the coefficients in Model 10 for zero-inflated beta model.

[Insert Figure A1]

The trace plots of the coefficients for zero-inflated beta model suggest that the Markov chains have mixed well and achieved satisfactory convergence. Markov Chain Monte Carlo (MCMC) is a class of methods used for sampling from complex probability distributions (Liu et al., 2014; Liu et al., 2015). Each sample In an MCMC algorithm is drawn depending on the current state of a Markov Chain, hence the name. The main purpose of MCMC methods is to generate a series of samples, where the sequence of samples approximates the underlying target distribution. The benefit of these methods is that they can be used to sample from distributions that are difficult to handle directly, due to their high dimensionality or complexity. An important aspect of MCMC methods is the idea of "convergence to equilibrium." This means that, as the MCMC algorithm runs, the distribution of the samples it generates becomes closer and closer to the target distribution. This property is key to the ability of MCMC methods to approximate complex distributions. One common tool for checking the convergence of MCMC algorithms is the trace plot. A trace plot shows the values of the samples generated by the MCMC algorithm over time. By examining a trace plot, one can check whether the Markov Chain appears to be converging to a stable distribution (indicating that the algorithm is doing a good job of approximating the target distribution) or whether it is still "exploring" the space of possible values (indicating that the algorithm may need more time to converge).

Next, we employ OLS regressions to examine the relation between issue-price adjustment, allocation criterion (lottery vs. pro-rata), and institutional pre-commitment. We fit the OLS models based on the specification outlined in Eq. (1). The results of OLS regressions are presented in Table A2 in Appendix A.

[Insert Table A2]

The statistically significant and negative coefficients for both lottery pre-commitment and pro-rata pre-commitment variables in Table A2 are aligned with the beta regression results (Table 5) and the zero-inflated beta regression results (Table A1). This alignment further corroborates the predictions of H1 and H2.

The diagnostic plots for OLS Model 10 in Table A2 are shown in Figure A2 in Appendix A.

[Insert Figure A2]

The residuals shown in the upper left panel in Figure A2 suggest the constant variance assumption is not violated. Additionally, the distribution of the residuals in the probability plot in the upper right panel is not symmetrical. The Breusch-Pagan test of heteroskedasticity in the residuals (p-value = 0.929) provides evidence that the residuals have a constant variance. Furthermore, the Jarque Bera test of normality in the residuals (p-value < 0.01) indicates a departure from normality in the residuals. Interestingly, even though the normality plot in Figure A2 implies that OLS is ill-suited for this type of data (beta distributed), the OLS regression results (Table A2) still confirm the predictions of H1. One plausible explanation for this is that in situations of non-normality, OLS tends to bias the regression coefficients, leading to excessively large t-test ratios and the rejection of null hypotheses, and consequently the interpretation of the coefficients may not be clear or meaningful.

Nevertheless, to comply with normality assumption, we use the Box-Cox approach in which we define the power transformation for y as follows:

$$y^{(\lambda)} = \begin{cases} (y^{\lambda} - 1)/\lambda & if\ \lambda \neq 0 \\ log(y) & if\ \lambda = 0 \end{cases}$$

In our data sample, $\lambda = 0.36$, which is not close to zero, suggesting that $(y^{\lambda} - 1)/\lambda$ transformation is appropriate for examining the relation between issue-price adjustment (response variable) and lottery pre-commitment and pro rata pre-commitment (predictor variables). The Box-Cox regression results based on the specification of Eq. (1) are reported in Table A3 in Appendix A.

[Insert Table A3]

The results of Box-Cox regressions in Table A3 are consistent with beta regressions in Table 5, which further supports the predictions of H1.

The diagnostic plots for Box-Cox Model 10 in Table A3 are shown in Figure A3 in Appendix A.

[Insert Figure A3]

The residuals displayed in the upper left panel of Figure A3 do exhibit a random pattern. The Breusch-Pagan test of heteroskedasticity in the residuals (p-value = 0.225), further support the evidence of no violation of the constant variance assumption. Similarly, the Jarque Bera test of normality in the residuals, which is not significant (*p*-value = 0.003), shows evidence against the normality assumption. However, the distribution of the residuals in the probability plot shown in the upper right panel is reasonable, suggesting an approximate normal distribution. Furthermore, the standardized residuals shown in the bottom left panel fall within the range of -3 and 3, which implies the absence of outliers. The bottom right panel displays residuals against leverage and reveal no influential points in the dataset, as all data points are fall within the dashed lines of Cook's distance.

In a final robustness check to substantiate the predictions of Hypothesis H1, we conduct beta regressions with additional controls for the intraday price band constraints imposed by the policy change in January 2012. This analysis utilizes data from 412 IPOs in India from November 2005 to March 2019, excluding five IPOs with zero issue-price adjustment due to the low percentage of zeros in the dataset.

According to the new policy, the price band for returns on IPOs with proceeds below INR 2.5 billion is set at 5%, while for IPOs with proceeds above this threshold, it is 20%. Gatchev et al. (2023) observe that post-regulation, price variability during initial trading days is reduced and remains lower for thirty days in the post-regulation period compared to the pre-regulation period. Following this observation, we introduce a dummy variable for the post-January 1, 2012 period and another for IPOs with proceeds below INR 2.5 billion. The interaction of these two variables is then examined in the regressions.

As reported in Table A4, the coefficient for the interaction term is positive and statistically significant in both Model 9 and Model 10. This suggests that the policy change in January 2012 indeed influences issue-price adjustment. Crucially, the results, even after controlling for the January 1, 2012 policy change, align with those presented in Table A1 Model 9 and Table 5 Model

10, which also account for this policy change. The coefficients for lottery pre-commitment and pro-rata pre-commitment variables remain negative and statistically significant across these models, using the dataset of IPOs in India between November 2005 and March 2019.

This consistency in findings across Table A4, as well as in Table 5, Table A1, Table A2, and Table A3, offers robust support for the predictions of Hypothesis H1. The results collectively demonstrate that the January 2012 policy change, along with the lottery and pro-rata pre-commitment factors, significantly impacts issue-price adjustments, reinforcing the validity of H1.

Figure A4 shows the diagnostic plots of the residuals for Model 10 in Table A4.

[Insert Figure A4]

In Figure A4, the various residual plots collectively indicate a robust fit of the beta model to the data. The top left residual plot shows no discernible pattern, suggesting a satisfactory model-data fit. The deviance residuals in the bottom right plot, with their median close to zero, further confirm the adequacy of the model fit. The half-normal plot of residuals in the bottom left demonstrates that most residuals lie within the confidence bands of the simulated envelope and close to the mean of the simulated values, as indicated by the dashed lines, signifying the model's effective performance. Additionally, Cook's distance values in the top right plot are all below 0.5, pointing to the absence of highly influential points in the dataset, thereby enhancing the reliability of the model's results.

Next, we fit OLS regressions using the data of 412 IPOs in India between November 2005 and March 2019. We also interact institutional demand with post July 2009 dummy to examine the effect of July 2009 policy change on the relation between institutional demand on issue-price adjustment. The results of the OLS regressions are reported in Table A5.

[Insert Table A5]

Table A5 presents findings that the coefficient for the interaction term, Amount < 2.5b x Post 2012, is negative and statistically significant in Model 9 and Model 10, aligning with Table A4's results. This consistency supports the idea that the January 2012 policy change influences issue-price adjustment. Additionally, the negative and statistically significant coefficients for both lottery and pro-rata IPOs with institutional pre-commitment in these models echo the findings in Table 5, Table A1, Table A2, and Table A3, bolstering the support for Hypothesis H1.

Diagnostic plots in Figure A5 for Model 10 in Table A5 indicate a reasonable adherence to the constant variance and normality assumptions.

[Insert Figure A5]

The Breusch-Pagan test (p-value = 0.0579) and the Jarque Bera test (p-value = 0.089) show no significant violation of these assumptions. The standardized residuals are within the -3 to 3 range, suggesting no outliers, and the bottom right panel displays no influential points, as indicated by Cook's distance.

The results of Box-Cox regressions using the same dataset of 412 IPOs in India, detailed in Table A6, mirror those in Table A5 and are consistent with the findings in Table 5, Table A1, Table A2, and Table A3, further confirming the predictions of Hypothesis H1.

[Insert Table A6]

Figure A6's residual plots for Model 10 in Table A6 visually confirm the satisfaction of constant variance and normality assumptions.

[Insert Figure A6]

The Breusch-Pagan test (p-value = 0.115) and the Jarque Bera test (p-value = 0.052) indicate no significant violations of these assumptions. The standardized residuals, remaining between -3 and 3, imply the absence of outliers. Additionally, the residuals against leverage show no influential points, as all fall within Cook's distance threshold.

5.2 Is price volatility in auction IPOs sensitive to issue-price adjustment, allocation criterion (lottery vs. pro-rata) and institutional pre-commitment?

In this section, we examine whether price volatility in auction IPOs is related to issue-price adjustment and lottery pre-commitment and pro-rata pre-commitment using the following specification:

$$
\begin{aligned}
&Price\ Volitility \\
&\quad = \beta_0 + \ \beta_1 Issue\ Price\ Adjustemnt + \beta_2 Lottery\ Pre\text{–}\ commitment \\
&\quad + \beta_3 Pro\text{–}\ rata\ Pre\text{–}\ commitment \\
&\quad + \ \beta_4 Issue\ Price\ Adjustemnt \times Lottery\ Pre\text{–}\ commitment \\
&\quad + \beta_5 Issue\ Price\ Adjustemnt \times Pro\text{–}\ rata\ Pre\text{–}\ commitment \\
&\quad + Controls + \varepsilon \qquad (2)
\end{aligned}
$$

We use beta regression with price volatility as the response variable and issue-price adjustment interacted with lottery pre-commitment and pro-rata pre-commitment as the key predictor variables. We fit the models based on the specification in Eq. (2). The regression results are reported in Table 6.

[Insert Table 6]

In Table 6, the coefficients for the main effect of pro-rata pre-commitment are consistently negative and statistically significant across all models. Additionally, the coefficient for the interaction term, issue price adjustment * pro-rata pre-commitment, is statistically significant and positive in all models. The positive coefficient for the interaction term supports the predictions of Hypotheses H2 and H3. Notably, there is a significant increase in the percentage of Pseudo R-squared, from 22% in Model 1 to about 60% in Model 10, indicating a marked improvement in the model's explanatory power. Furthermore, the precision parameters in the beta regressions show a substantial increase from 177.04 to 356.78. This increase implies that the variance of price volatility, which is a function of its mean and precision parameter, decreases as the precision parameter increases. Such a trend indicates that the beta regression model is well-suited for capturing the variability in price volatility, further validating the appropriateness of beta regression for the analysis.

Figure 6 shows the diagnostic plots of the residuals of the multivariate Model 10 in Table 6.

[Insert Figure 6]

The top left residual plot in Figure 6 shows no apparent pattern—the residuals are evenly spread around zero, suggesting a constant variance. Additionally, the median of deviance residuals (bottom right plot) is close to zero, indicating that the fit of the model with the data is appropriate. From the half-normal plot of the residuals (bottom left plot), it appears that only a few observations are separated and most of the absolute deviance residuals do not fall outside of the confidence bands provided by the simulated envelope. These values are close to the mean of the simulated values (dashed line), suggesting that the fitted model is suitable. The Cook's distance values from the scatterplot of Cook's distance versus the number of observations (top right plot) are less than 0.5, indicating that there is no highly influential point in the dataset.

Next, we use OLS regression with price volatility as the dependent variable and issue-price adjustment together with lottery pre-commitment and pro rata pre-commitment as the key predictor variables. We fit the OLS models based on the specification in Eq. (2). The OLS regression results are reported in Table A7 in Appendix A.

[Insert Table A7]

The coefficients for main effect of pro-rata pre-commitment variable are negative and statistically significant across all models. Moreover, the coefficients for the interaction term $Issue\ Price\ Adjustemnt \times Pro\text{–}rata\ Pre\text{–}commitment$ support the predictions of H2 and H3.

Recent literature underscores the importance of addressing the threat posed by measurement error and heteroskedasticity to causal inferences in accounting and finance research (Jennings et al., 2023; Cohn et al., 2022). The textbook approach recommends using diagnostic plots to evaluate the fit of the model to the data type. The diagnostic plots for OLS Model 10 in Table A7 in which price volatility is the outcome variable are shown in Figure A7 in Appendix A.

[Insert Figure A7]

The residuals in the upper left panel of Figure A7 show a pattern, suggesting that the residuals violate the constant variance assumption. The distribution of the residuals in the probability plot shown in the upper right panel is not symmetrical. From the Breusch-Pagan test of heteroskedasticity in the residuals result (p-value < 0.01), there is evidence of violations of the constant variance. The Jarque Bera test of normality in the residuals is not significant (p-value < 0.01), there is evidence against normality in the residuals. These statistics suggest that the data violates the normality and homoskedasticity assumptions and that using OLS on beta distributed data is likely to produce erroneous results. Whereas the main effect of lottery pre-commitment is negative and becomes statistically significant in seven out of ten models in Table A7, the main effect is statistically significant in only three out of ten beta regression models in Table 6. Thus, following the literature, we next use the Box-Cox approach to meet the normality and homoskedasticity assumptions.

In our case, $\lambda = -0.015$, which is close to zero. We adopt logarithm transformation so that the errors are normally distributed with mean zero and constant variance (Cook and Weisberg, 2009, page 323). We run the analysis using Box-Cox regressions with price volatility as the dependent variable and issue-price adjustment together with lottery pre-commitment and pro-rata pre-commitment as the key predictor variables. The Box-Cox regression results based on the specification in Eq. (2) are reported in Table A8 in Appendix A.

[Insert Table A8]

The coefficients for the main effect of pro-rata pre-commitment are negative statistically significant across all models in Table A8, and the coefficients for the interaction term, issue price adjustment * pro-rata pre-commitment, are statistically significant and positive only in eight out of ten models. The positive coefficient for the interaction term $Offer\ Price\ Adjustemnt \times Pro\ Rata\ Pre\ Commitment$ in the eight models support the predictions of H2 and H3.

Model 1 through Model 10 are the reduced and full Box-Cox models that include the interaction term $Issue\ Price\ Adjustemnt \times Lottery\ Pre\!-commitment$ and the interaction term $Issue\ Price\ Adjustemnt \times Pro\!-rata\ Pre\!-commitment.$ The results using Box-Cox regressions in Table A6 are consistent with beta regression results in Table 6, which also support the predictions of H2 and H3. The diagnostic plots for Box-Cox Model 10 in Table A8 in which price volatility is the dependent variable are shown in Figure A8 in Appendix A.

[Insert Figure A8]

The diagnostic plots for the Box-Cox Model 10 shown in Figure A8 indicate that the residuals are normally distributed and have constant variance. Furthermore, the Breusch-Pagan test of heteroskedasticity in the residuals result (p-value = 0.687) indicates that there is no evidence of violations of the constant variance. The Jarque Bera test of normality in the residuals (p-value = 0.618) implies that there is no evidence against normality in the residuals.

Next, we conduct beta regressions in which we control for intraday price band constraints brought about by the January 2012 policy change. We use data from 417 IPOs in India between November 2005 and March 2019. The results of the regressions are reported in Table A9.

[Insert Table A9]

We find that the coefficient for the interaction term is positive and statistically not significant in Model 9 and Model 10, suggesting that the January 2012 policy change does not affect price volatility. More importantly, the results, after controlling for the January 1, 2012, policy change, are consistent with the results reported in Table 6. In fact, the main effect of the pro-rata pre-commitment variable is negative and statistically significant across all models in Table A9, and the coefficients for the interaction term, issue price adjustment * pro-rata pre-commitment, are statistically significant and positive across all models. These results are consistent with the beta results reported in Table 6 using IPOs after 2009. The results further confirm the predictions of H2 and H3.

Figure A9 shows the diagnostic plots of the residuals for Model 10 in Table A9.

[Insert Figure A9]

Figure A9 provides a series of residual plots that collectively indicate a robust fit for the beta model. The top left residual plot shows a random pattern, suggesting no systematic deviations that could indicate a problem with the model. The deviance residuals, depicted in the bottom right plot, have a median close to zero, signifying that the model's predictions align well with the actual data. In the half-normal plot of residuals, seen in the bottom left, most residuals are within the confidence bands of the simulated envelope and near the mean of the simulated values, as shown by the dashed lines. This proximity indicates that the beta model is performing effectively. Additionally, Cook's distance values in the top right plot are all below 0.5, which indicates that there are no highly influential points in the dataset, enhancing the reliability of the model's results. These aspects of Figure A9 collectively demonstrate the appropriateness and effectiveness of the beta model in the analysis.

Next, we fit OLS regressions for price volatility using data from 412 IPOs in India between November 2005 and March 2019. The results of the OLS regressions are reported in Table A10.

[Insert Table A10]

The results in Table A10 shows the coefficient for the interaction term is positive and statistically not significant in Model 9 and Model 10, which is consistent with the results in Table 6 suggesting that the January 2012 policy change does not affect price volatility. The main effect of pro-rata pre-commitment is negative statistically significant cross all models in Table A10, and the coefficient of the interaction term of issue price adjustment and pro rata pre-commitment are statistically significant and positive across all models, these results are consistent with beta results in Table 6 using the IPOs after 2009, which further confirm the predictions of H2 and H3.

Figure A10 shows the diagnostic plots of the residuals for Model 10 in Table A10.

[Insert Figure A10]

The residual plots in Figure A10 indicate that the assumptions of constant variance and normality for the model are not met. The Breusch-Pagan test results (p-value < 0.01) confirm the violation of the constant variance assumption, indicating heteroskedasticity in the residuals. Additionally, the Jarque Bera test results (p-value < 0.01) demonstrate a significant departure from normality. Despite these issues, the standardized residuals, as shown in the bottom left panel, are within the -3 to 3 range, suggesting no outliers are present. The bottom right panel, which displays residuals against leverage, also shows no influential points, as all data points are within Cook's distance thresholds.

Given these findings, and the result that λ=-0.015 is close to zero, a logarithm transformation is adopted. Consequently, Box-Cox regressions for price volatility are conducted using data from 412 IPOs in India between November 2005 and March 2019. The results of these regressions are presented in Table A11 and show consistency with results in Tables 6, A7, A8, A9, and A10, further confirming the predictions of Hypotheses H2 and H3.

[Insert Table A11]

Figure A11 features diagnostic plots of the residuals for Model 10 in Table A11.

[Insert Figure A11]

The plots in Figure A11 show a random pattern and symmetrical distribution, indicating better compliance with the assumptions. The Breusch-Pagan test (p-value = 0.683) suggests that the constant variance assumption is satisfied, and the Jarque Bera test (p-value = 0.504) also supports the normality assumption. Additionally, the standardized residuals lie between -3 and 3, implying an absence of outliers, and the bottom right panel indicates no influential points in the dataset, as evidenced by all data points falling within Cook's distance.

[Insert Table A11]

The analysis reveals that beta regression, OLS, and Box-Cox regression can sometimes produce similar results when applied to bounded data, such as price volatility. This convergence of results is particularly notable in data samples concentrated near a lower bound, close to zero. However, the skewness and kurtosis, indicating deviation from a normal distribution, suggest that beta regression is more naturally suited for such data. This is due to its inherent ability to accommodate skewness in the dependent variable's distribution.

While OLS and Box-Cox regression can at times yield comparable results to beta regression, as indicated by similar Root Mean Square Errors (RMSEs), their suitability is less clear.

In cases where the data deviate from normality, OLS and Box-Cox regressions face interpretational challenges, primarily because these methods assume normality of residuals. Beta regression, on the other hand, operates within the natural constraints of the data, often resulting in a more accurate and reliable model. This is evidenced by the increase in Pseudo R-squared values and precision parameters in beta regression, which suggest a better fit for the data compared to Box-Cox regression.

Further, when robustness tests do not support OLS and Box-Cox results, interpreting these models becomes difficult. In contrast, when beta regression is supported by robustness tests, its results are more straightforward to interpret. This is exemplified in the context of IPO issue-price adjustments, where beta regression demonstrates a statistically significant relationship, whereas OLS and Box-Cox do not. While linear regression models can quantify marginal effects in terms of averages or economic magnitudes, their lack of statistical significance, combined with assumptions violations, makes them less reliable in this context. Beta regression,

with its ability to directly handle skewed and bounded data, provides a more precise and faithful modeling of the data, making it a more appropriate choice in such scenarios. Therefore, while all three models may sometimes align in their findings, the robustness and interpretability of beta regression make it a more reliable tool for analyzing bounded data like price volatility in this study.

6. Summary and conclusion

This paper investigates the impact of disclosure rules and institutional investors' commitment, prior to public filing, to purchase shares on price discovery in open-bid auction IPOs. The paper finds that IPO issue-price deviates less from the filing-price when institutions pledge to purchase shares prior to public filing. Conversely, the deviation is more substantial when there is no such pledge. These findings support the view that institutional commitment prior to public filing promotes price discovery in the capital market. The findings also reveal that when institutions pledge to purchase shares prior to public filing, and they are guaranteed allocation, even if it is proportional, price volatility increases with an increase in uncertainty in the value of the filing price, as evident from the increase in price adjustment. However, when allocation is random, institutional investors' pledge has little to no effect on price volatility. This is because price volatility in IPO shares that are assigned randomly is influenced by investors bidding and trading strategically.

The study marks an important departure from conventional analyses in the existing literature by employing a beta regression approach, alongside a linear regression and a transformed linear regression approach, to demonstrate that linear regressions can sometimes produce results similar to beta regressions and sometimes different from beta regressions. Specifically, the study highlights the importance of robustness test and the consequence, i.e., difficulty in interpretation of coefficients, when tests do not validate the results.

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TABLES AND FIGURES

Table 1

Descriptive statistics of the variables in the analysis of IPOs in India (07/2009-03/2019). This table shows the descriptive statistics of independent variables used in the analysis. The dataset consists of 224 IPOs in India between July 2009 and March 2019 (two IPOs with issue-price adjustment equal to zero are excluded). Panel A shows the primary summary statistics for all variables. Panel B shows the summary statistics for all variables with logarithm transformation of issue amount, institutional demand, and retail demand. The variables are defined in Appendix B.

Panel A: Summary statistics						
	Median	Mean	SD	Min	Max	Ratio
Price Volatility	0.02	0.03	0.01	0.01	0.08	8.00
Issue Price Adjustment	0.02	0.03	0.02	0.001	0.09	90.00
Underpricing	0.04	0.12	0.31	-0.64	1.53	-2.39
Issue Amount	4000000000	8,923,900,679	17,998,019,831	230,045,000	151,994,402,000	660.72
Institutional Demand	2.76	12.57	20.29	0.03	143.62	4787.33
Retail Demand	2.53	5.59	8.62	0.02	74.37	3718.50
EPS	6.89	10.10	17.47	-97.75	170.30	-1.74
Retained Equity	0.78	0.78	0.42	0.419	1.00	2.39
Panel B: Summary statistics with logarithm transformation						
	Median	Mean	SD	Min	Max	Ratio
Price Volatility	0.02	0.03	0.01	0.01	0.08	8.00
Issue Price Adjustment	0.02	0.03	0.02	0.001	0.09	90.00
Underpricing	0.04	0.12	0.31	-0.64	1.53	-2.39
Ln(Issue Amount)	22.11	21.97	1.34	19.75	25.75	1.30
Ln(Institutional Demand)	1.01	1.36	1.64	-3.46	4.97	-1.44
Ln(Retail Demand)	0.93	0.89	1.39	-3.91	4.31	-1.10
EPS	6.89	10.10	17.47	-97.75	170.30	-1.74
Retained Equity	0.78	0.78	0.42	0.419	1.00	2.39

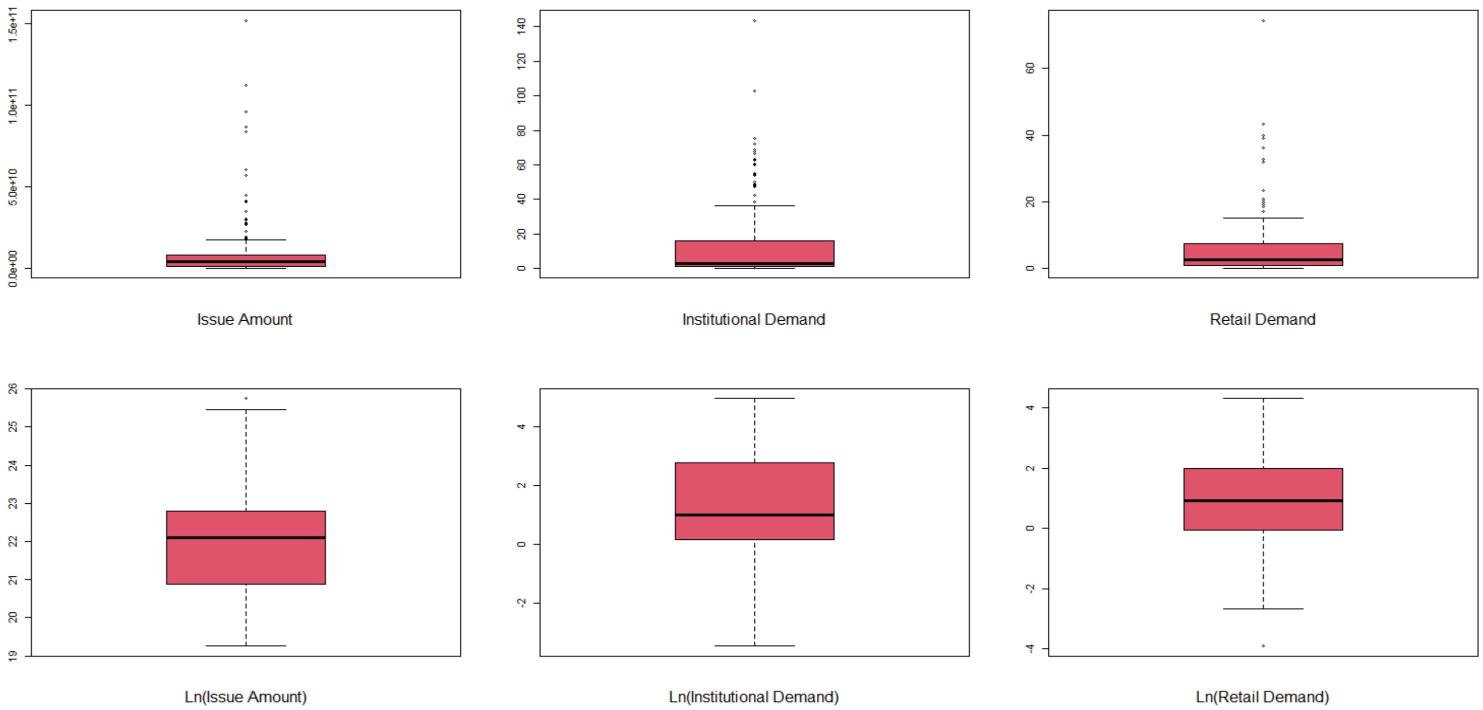

Figure 1. The boxplots for predictor variables, issue amount, institutional demand, and retail demand before and after logarithm transformation.

Table 2

Pairwise correlation of the variables used in the analysis. This table presents Pearson partial correlation of the variables used in the analysis. The dataset consists of 224 IPO in India between July 2009 and March 2019 (two IPOs with issue-price adjustment equal to zero are excluded). The corresponding significance levels (if no asterisks, the predictor is not statistically significant, while asterisks ***, **, and * denote significance at the 1%, 5%, and 10%, respectively). The variables are defined in Appendix B.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Price Volatility	1.00							
Issue Price Adjustment	0.29***	1.00						
Underpricing	0.28***	-0.04	1.00					
Ln(Issue Amount)	-0.63***	-0.29***	-0.10	1.00				
Ln(Institutional Demand)	-0.44***	-0.28***	0.37***	0.42***	1.00			
Ln(Retail Demand)	0.16*	0.02	0.39***	-0.27***	0.42***	1.00		
EPS	-0.20**	-0.11	0.08	0.18**	0.30***	0.15*	1.00	
Retained Equity	-0.53***	-0.28***	0.04	0.57***	0.54***	0.05	0.17*	1.00

*p<0.1; **p<0.05; ***p<0.01.

Table 3

Descriptive and summary statistics of IPO characteristics by lottery pre-commitment and pro rata pre-commitment. This table shows the number of IPOs, mean, median, and standard deviation (SD) of the variables used in the analysis by lottery pre-commitment and pro rata pre-commitment. The dataset consists of 224 IPOs in India between July 2009 and March 2019 (two IPOs with issue-price adjustment equal to zero are excluded). The variables shown in the table are defined in Appendix B.

Number of IPOs and mean, median, and standard deviation of IPO characteristics by lottery pre-commitment and pro rata pre-commitment.

	Lottery No Pre-commitment			Lottery Yes Pre-commitment			Pro-rata No Pre-commitment			Pro-rata Yes Pre-commitment		
Number of IPOs	(168)			(56)			(142)			(82)		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Price Volatility	0.027	0.022	0.016	0.019	0.019	0.007	0.028	0.023	0.016	0.020	0.017	0.009
Issue-price Adjustment	0.032	0.030	0.023	0.024	0.020	0.019	0.035	0.032	0.022	0.022	0.016	0.020
Underpricing	0.056	0.001	0.307	0.305	0.267	0.243	0.193	0.149	0.360	-0.011	-0.004	0.117
Ln(Issue Amount)	21.781	21.860	1.401	22.518	22.388	0.948	21.718	21.621	1.433	22.394	22.347	1.036
Ln(Institutional Demand)	0.743	0.582	1.402	3.193	3.143	0.612	1.578	2.146	1.977	0.970	0.899	0.612
Ln(Retail Demand)	0.591	0.542	1.381	1.774	1.902	0.990	1.351	1.528	1.236	0.084	0.144	1.277
EPS	7.893	6.330	13.948	16.711	9.770	24.240	12.130	7.300	18.909	6.577	6.460	14.080
Retained Equity	0.751	0.750	0.122	0.852	0.872	0.074	0.761	0.752	0.132	0.802	0.800	0.092

Table 4

Descriptive and summary statistics of IPO characteristics in India by year. This table shows the descriptive statistics of the variables used in the analysis of IPO characteristics by year. The dataset consists of 224 IPOs in India in India between July 2009 and March 2019 (two IPOs with issue-price adjustment equal to zero are excluded). The variables are defined in Appendix B.

Number of IPOs (respect to lottery pre-commitment and pro rata pre-commitment) and mean, median, and standard deviation of IPO characteristics by year.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
					Number of IPOs						
Lottery No Pre-commitment	12	48	27	8	3	2	12	15	20	19	2
Lottery Yes Pre-commitment	2	14	2	1	0	3	8	9	12	5	0
Pro-rata No Pre-commitment	13	47	25	3	0	3	10	11	18	12	0
Pro-rata No Pre-commitment	1	15	4	6	3	2	10	13	14	12	2
					Mean						
Price Volatility	0.026	0.026	0.043	0.023	0.020	0.028	0.022	0.019	0.018	0.019	0.026
Issue-price Adjustment	0.044	0.039	0.045	0.039	0.031	0.034	0.029	0.026	0.012	0.009	0.020
Underpricing	0.115	0.127	0.093	0.030	0.022	0.261	0.088	0.131	0.188	0.075	-0.036
Ln(Issue Amount)	21.502	21.554	20.801	21.710	21.775	21.517	22.276	22.536	22.925	22.856	21.388
Ln(Institutional Demand)	0.784	1.501	-0.336	1.297	1.095	2.213	1.410	1.713	2.190	1.770	0.721
Ln(Retail Demand)	0.291	0.987	1.108	0.378	0.050	2.283	0.280	1.031	1.491	0.470	-1.537
EPS	12.528	11.739	4.731	11.921	8.247	11.508	9.126	12.536	8.584	15.393	-47.840
Retained Equity	0.743	0.746	0.678	0.783	0.828	0.780	0.821	0.831	0.827	0.826	0.729
					Median						
Price Volatility	0.019	0.022	0.040	0.022	0.022	0.028	0.021	0.019	0.015	0.018	0.026
Issue-price Adjustment	0.038	0.035	0.045	0.038	0.024	0.037	0.022	0.016	0.009	0.007	0.020
Underpricing	0.021	0.087	0.007	0.001	-0.023	0.261	0.026	0.136	0.032	0.000	-0.036
Ln(Issue Amount)	20.704	21.366	20.531	21.308	21.717	21.403	22.313	22.445	22.652	22.969	21.388
Ln(Institutional Demand)	0.038	1.290	-0.197	1.349	0.955	2.487	0.904	1.628	1.824	1.629	0.721
Ln(Retail Demand)	0.533	1.155	1.118	0.470	-0.315	1.991	0.329	0.739	1.753	0.274	-1.537
EPS	7.750	7.130	3.510	8.490	5.910	10.310	6.845	10.690	7.465	9.520	-47.840

Retained Equity	0.745	0.779	0.729	0.806	0.846	0.748	0.843	0.846	0.849	0.862	0.729
					SD						
Price Volatility	0.018	0.014	0.018	0.010	0.003	0.008	0.008	0.008	0.010	0.009	0.016
Issue Price Adjustment	0.024	0.018	0.022	0.030	0.014	0.013	0.019	0.024	0.011	0.007	0.016
Underpricing	0.378	0.279	0.514	0.122	0.116	0.329	0.188	0.203	0.344	0.231	0.103
Ln(Issue Amount)	1.734	1.240	0.989	1.300	1.139	0.462	0.815	0.916	1.217	0.990	3.018
Ln(Institutional Demand)	1.788	1.819	1.300	1.066	0.780	0.764	1.249	1.157	1.522	1.356	0.284
Ln(Retail Demand)	1.030	1.589	1.102	1.378	1.037	0.797	0.944	1.024	1.283	1.464	3.358
EPS	23.473	22.154	5.702	11.686	4.125	8.597	14.964	12.087	9.471	13.995	70.583
Retained Equity	0.121	0.128	0.114	0.144	0.074	0.066	0.081	0.091	0.093	0.104	0.022

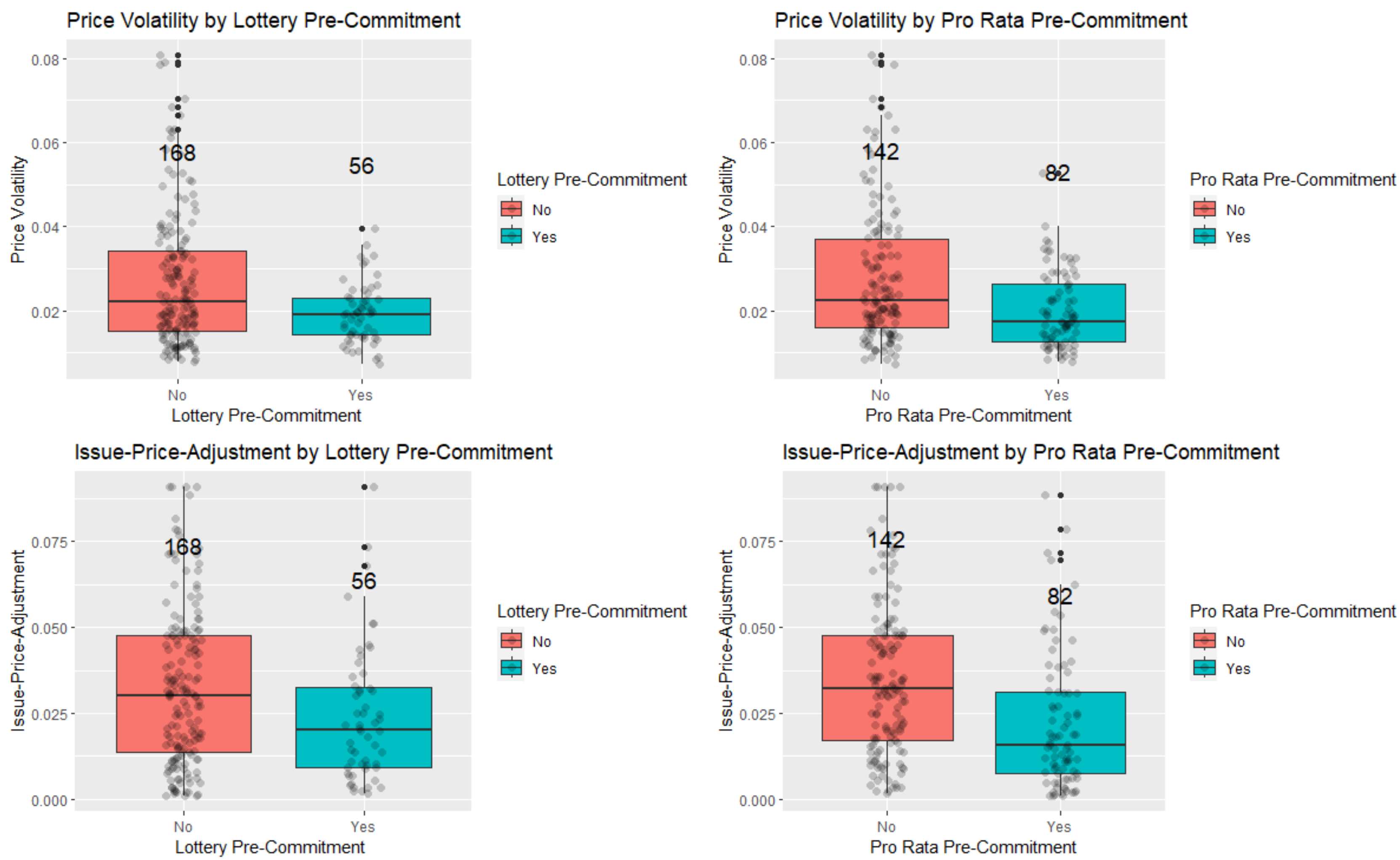

Figure 2. Boxplots for Table 3 reflecting the median and number of IPOs of the price volatility and issue-price adjustment with respect to the lottery pre-commitment and pro rata pre-commitment considered in the analysis between July 2009 and March 2019 in India.

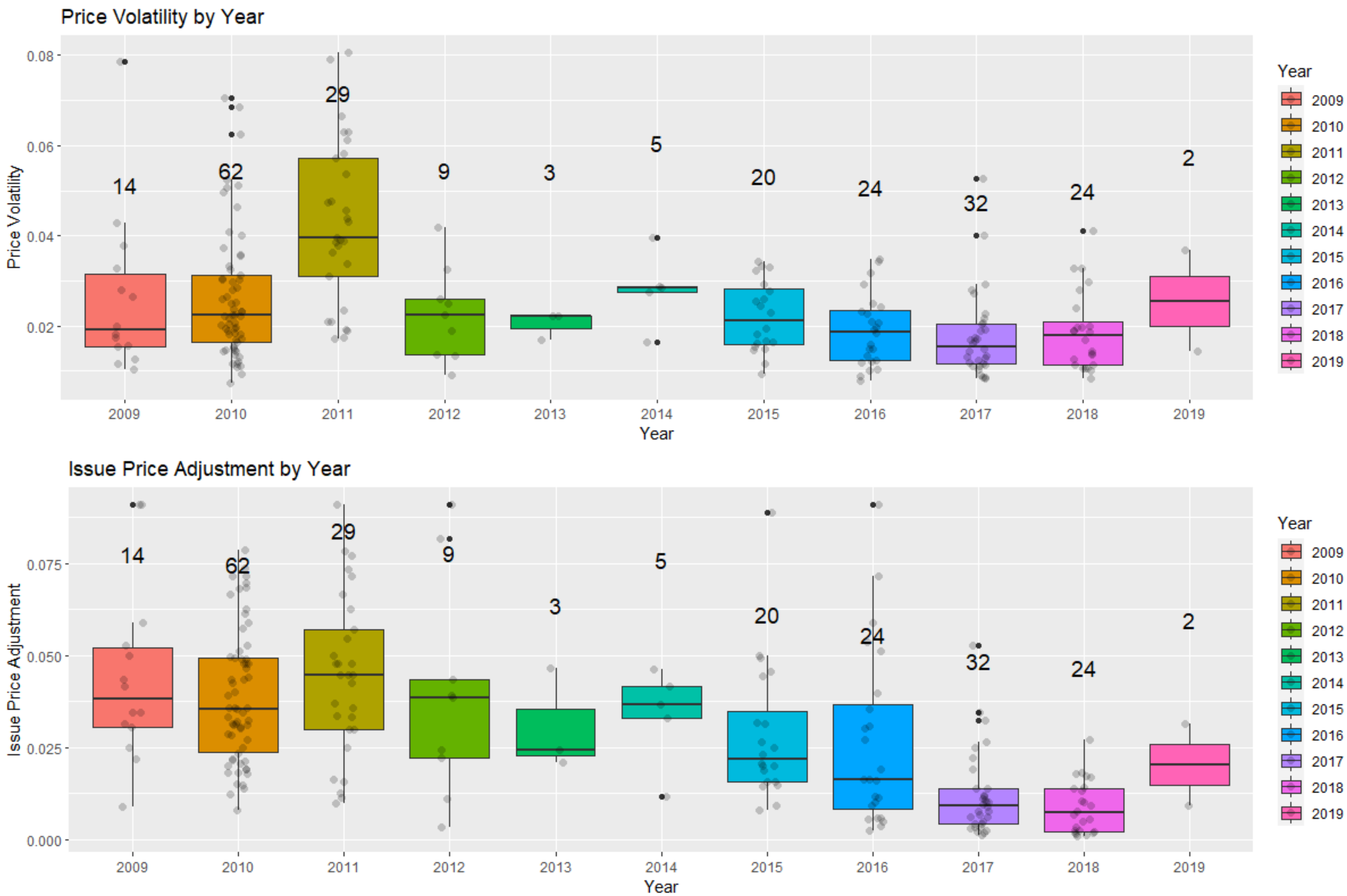

Figure 3. Boxplot for Table 4 reflecting the median and number of IPOs of the price volatility and issue-price adjustment by year prior to public filing considered in the analysis between July 2009 and December 2019 in India.

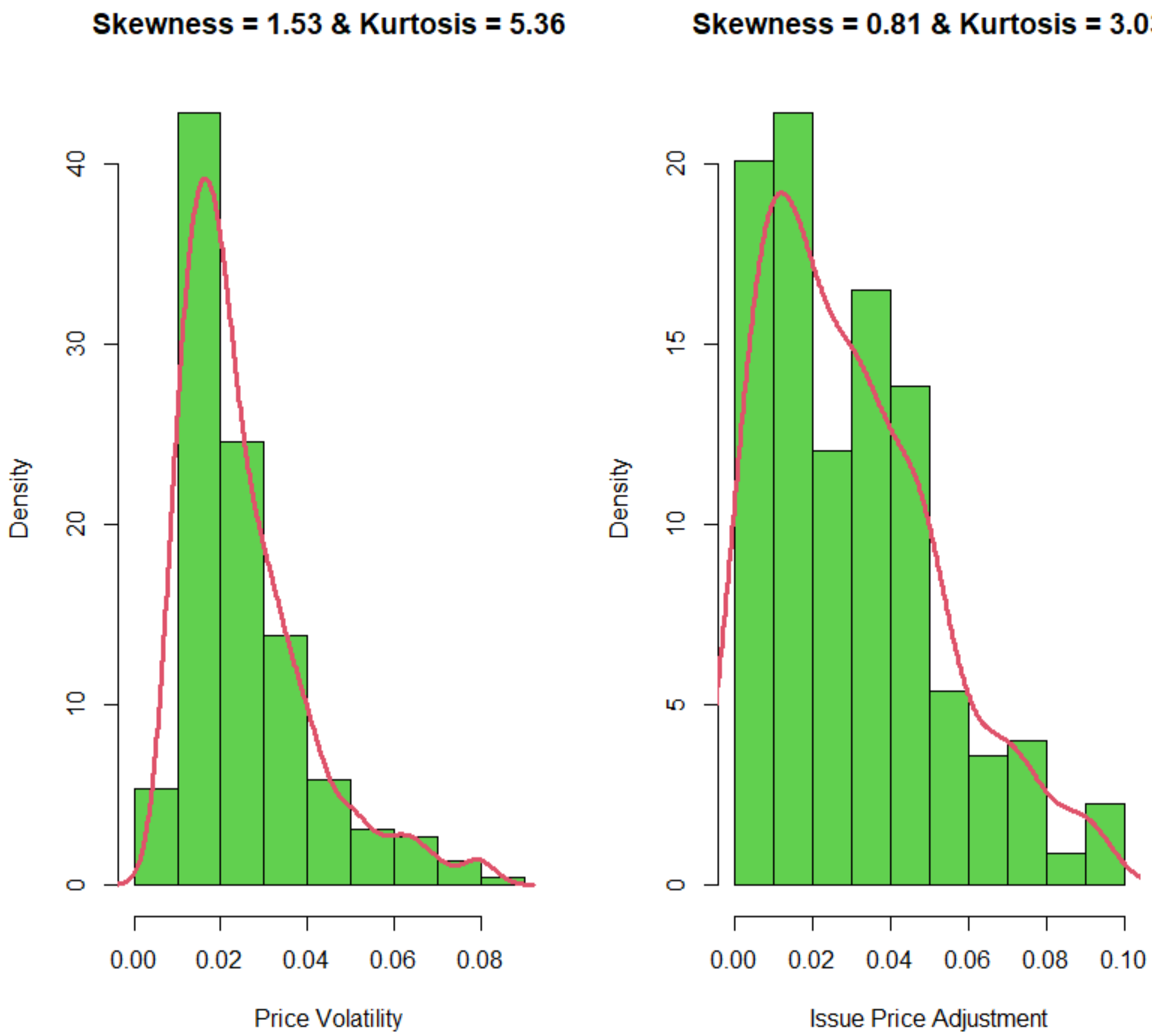

Figure 4. The histogram with the density curve, skewness, and kurtosis for price volatility and issue-price adjustment.

Table 5

In this table we report results of beta regressions for issue-price adjustment as a response variable on lottery pre-commitment and pro rata pre-commitment, interaction terms as a key predictor variable and controls. The dataset consists of 224 IPOs in India between July 2009 and December 2019 (two IPO with issue price adjustment equal to zero is excluded). Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix B.

	Issue Price Adjustment (Beta Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-3.096***	-3.024***	-3.053***	-2.999***	-1.010	-4.194***	-0.682	-4.715***	-2.327*	-2.437*
	(0.063)	(0.116)	(0.062)	(0.117)	(0.809)	(0.756)	(0.933)	(0.890)	(1.325)	(1.336)
Lottery Pre-commitment	-0.621***	-0.422***	-0.317**	-0.305**	-0.251*	-0.329***	-0.260*	-0.319**	-0.177	-0.184
	(0.113)	(0.106)	(0.145)	(0.128)	(0.145)	(0.127)	(0.147)	(0.128)	(0.137)	(0.137)
Pro-rata Pre-commitment	-0.759***	-0.537***	-0.704***	-0.525***	-0.585***	-0.571***	-0.655***	-0.554***	-0.553***	-0.566***
	(0.102)	(0.102)	(0.103)	(0.102)	(0.110)	(0.106)	(0.117)	(0.112)	(0.120)	(0.121)
Ln(Institutional Demand)			-0.110***	-0.049	-0.082**	-0.063**	-0.058	-0.076**	-0.086**	-0.079**
			(0.032)	(0.030)	(0.034)	(0.031)	(0.040)	(0.038)	(0.038)	(0.039)
Ln(Issue Amount)					-0.098**	0.057	-0.117**	0.077*	-0.030	-0.024
					(0.039)	(0.035)	(0.046)	(0.044)	(0.059)	(0.060)
Ln(Retail Demand)							-0.053	0.038	-0.007	-0.012
							(0.041)	(0.040)	(0.039)	(0.040)
EPS							-0.005	-0.004*	-0.004	-0.003
							(0.003)	(0.003)	(0.003)	(0.003)
Retained Equity							0.230	0.130	0.369	0.303
							(0.462)	(0.430)	(0.434)	(0.456)
Amount < 2.5b									-0.318*	-0.314*
									(0.172)	(0.173)
Post 2012									-0.800***	-0.812***
									(0.115)	(0.117)
Amount < 2.5b × Post 2012									0.712***	0.759***
									(0.191)	(0.195)

Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	224	224	224	224	224	224	224	224	224	224
Pseudo R^2	0.192	0.530	0.219	0.531	0.240	0.532	0.253	0.541	0.368	0.382
φ	62.857	99.429	66.047	100.647	67.842	101.850	69.130	103.25	82.718	84.753
RMSE	0.020	0.017	0.020	0.017	0.020	0.017	0.020	0.017	0.018	0.018

*p<0.1; **p<0.05; ***p<0.01

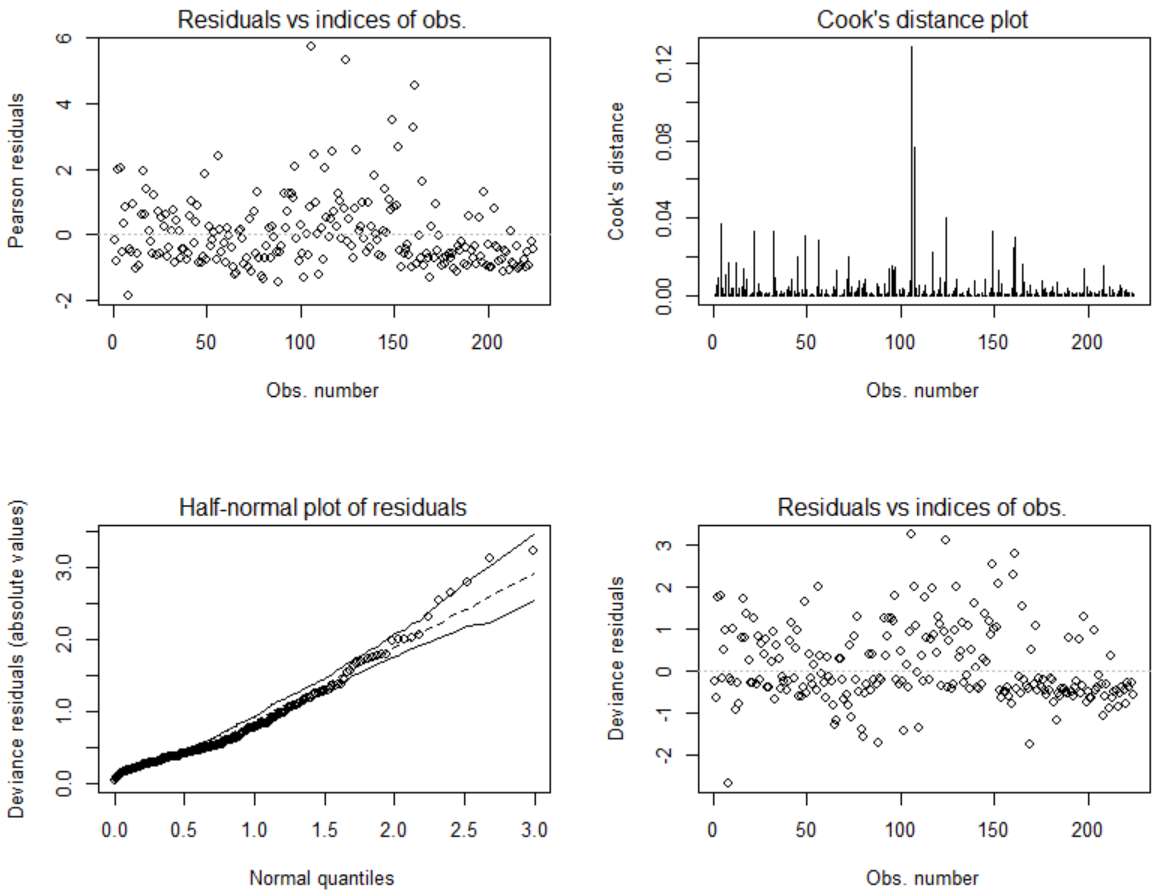

Figure 5. Diagnostic plots for the beta regression Model 10 in Table 5. The upper left panel is the plot of Pearson residuals versus the number of observations, the upper right panel is the Cook's distance versus the number of observations, the lower left panel displays the half-normal plot of absolute deviance residuals with simulated envelope, the lower right panel is the plot of deviance residuals versus the number of observations.

Table 6

This table reports the results of beta regressions of price volatility on issue-price adjustment lottery pre-commitment and pro rata pre-commitment, interaction terms, and controls. The dataset consists of 226 IPOs in India between July 2009 and December 2019. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Price Volatility (Beta Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-3.478***	0.264	0.052	0.088	-0.120	-0.083	-0.094	-0.108	-1.315	-1.267
	(0.094)	(0.538)	(0.552)	(0.620)	(0.549)	(0.617)	(0.547)	(0.611)	(0.823)	(0.820)
Issue Price Adjustment	1.288	-1.447	-1.436	-1.521	-1.945	-2.151	-1.722	-1.742	-1.696	-1.844
	(2.004)	(1.562)	(1.605)	(1.565)	(1.605)	(1.563)	(1.610)	(1.561)	(1.605)	(1.575)
Lottery Pre-commitment	-0.397***	-0.178	-0.177	-0.181	-0.200*	-0.195*	-0.166	-0.145	-0.136	-0.134
	(0.141)	(0.120)	(0.121)	(0.120)	(0.120)	(0.119)	(0.121)	(0.120)	(0.124)	(0.122)
Pro-rata Pre-commitment	-0.519***	-0.287***	-0.304***	-0.280***	-0.337***	-0.299***	-0.298***	-0.240**	-0.266**	-0.243**
	(0.125)	(0.104)	(0.101)	(0.105)	(0.101)	(0.104)	(0.103)	(0.105)	(0.108)	(0.107)
Issue Price Adjustment × Lottery Pre-commitment	-0.263	2.211	2.739	2.151	3.552	2.867	3.107	2.131	3.102	3.063
	(3.924)	(3.144)	(3.176)	(3.142)	(3.161)	(3.124)	(3.155)	(3.104)	(3.194)	(3.111)
Issue Price Adjustment × Pro-rata Pre-commitment	5.471*	6.000**	7.037***	6.060**	7.090***	5.915**	6.689***	5.290**	6.744***	6.876***
	(3.252)	(2.531)	(2.573)	(2.529)	(2.556)	(2.507)	(2.551)	(2.487)	(2.545)	(2.482)
Underpricing		0.409***	0.439***	0.408***	0.440***	0.408***	0.417***	0.372***	0.403***	0.387***
		(0.067)	(0.070)	(0.067)	(0.069)	(0.066)	(0.069)	(0.066)	(0.069)	(0.068)
Ln(Institutional Demand)		-0.070***	-0.100***	-0.076***	-0.099***	-0.074***	-0.088***	-0.059**	-0.084***	-0.078***
		(0.021)	(0.022)	(0.023)	(0.022)	(0.023)	(0.023)	(0.024)	(0.023)	(0.023)
Ln(Issue Amount)		-0.173***	-0.164***	-0.165***	-0.154***	-0.154***	-0.142***	-0.134***	-0.093**	-0.091**
		(0.025)	(0.026)	(0.029)	(0.026)	(0.029)	(0.027)	(0.030)	(0.037)	(0.037)
Ln(Retail Demand)			0.029	0.016	0.032	0.021	0.036	0.029	0.037	0.034
			(0.023)	(0.025)	(0.023)	(0.025)	(0.023)	(0.025)	(0.023)	(0.023)
EPS					-0.003**	-0.004**	-0.003**	-0.004**	-0.004**	-0.003**
					(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Retained Equity							-0.410	-0.604**	-0.364	-0.515**

							(0.253)	(0.254)	(0.254)	(0.259)
Amount < 2.5b									0.206^{*}	0.250^{**}
									(0.110)	(0.108)
Post 2012									0.016	0.034
									(0.080)	(0.081)
Amount < 2.5b × Post 2012									-0.091	-0.142
									(0.117)	(0.118)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	226	226	226	226	226	226	226	226	226	226
Pseudo R^2	0.216	0.581	0.547	0.579	0.560	0.591	0.568	0.604	0.578	0.593
φ	177.04	356.06	321.78	356.76	328.96	366.82	332.60	375.67	338.38	356.78
RMSE	0.020	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021

*p<0.1; **p<0.05; ***p<0.01

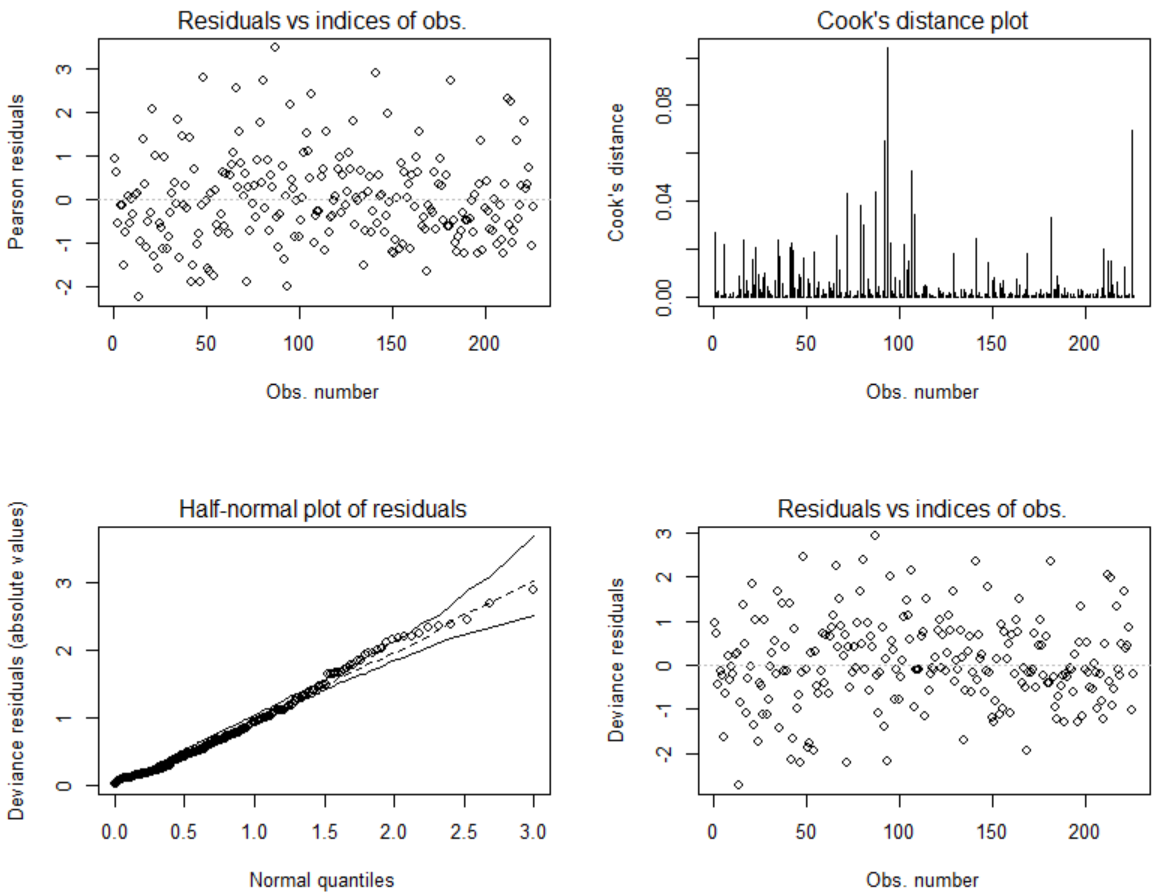

Figure 6. Diagnostic plots for the beta regression Model 10 in Table 6. The upper left panel is the plot of Pearson residuals versus the number of observations, the upper right panel is the Cook's distance versus the number of observations, the lower left panel displays the half-normal plot of absolute deviance residuals with simulated envelope, the lower right panel is the plot of deviance residuals versus the number of observations.

APPENDIX A

Table A1

In this table we report results of zero-inflated beta regressions with issue-price adjustment as the response variable on lottery pre-commitment and pro rata pre-commitment, interaction terms and controls. The dataset consists of 226 IPOs between July 2009 and March 2019. The dataset includes IPOs (two) with issue price adjustment equal to zero. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Issue Price Adjustment (Zero-Inflated Beta Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-3.098***	-3.140***	-3.051***	-3.096***	-1.042***	-1.045***	-0.775***	-0.734***	-2.217***	-2.374***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.043)	(0.046)	(0.051)	(0.062)	(0.071)	(0.069)
Lottery Pre-commitment	-0.621***	-0.623***	-0.311***	-0.315***	-0.232***	-0.238***	-0.255***	-0.263***	-0.173***	-0.185***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)	(0.007)	(0.007)
Pro-rata Pre-commitment	-0.759***	-0.781***	-0.706***	-0.714***	-0.580***	-0.600***	-0.643***	-0.679***	-0.545***	-0.560***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.005)
Ln(Institutional Demand)			-0.113***	-0.106***	-0.085***	-0.084***	-0.060***	-0.055***	-0.087***	-0.082***
			(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Ln(Issue Amount)					-0.096***	-0.098***	-0.050***	0.051***	-0.010**	-0.009***
					(0.039)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Ln(Retail Demand)							-0.111***	-0.117***	-0.035***	-0.026***
							(0.003)	(0.003)	(0.003)	(0.003)
EPS							-0.004***	-0.004***	-0.003***	-0.004***
							(0.001)	(0.001)	(0.001)	(0.001)
Retained Equity							0.169***	0.247***	0.353***	0.294***
							(0.024)	(0.025)	(0.022)	(0.022)
Amount < 2.5b									-0.318***	-0.323***
									(0.009)	(0.008)
Post 2012									-0.778***	-0.795***
									(0.006)	(0.008)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Amount < 2.5b × Post 2012									0.674***	0.018**
									(0.007)	(0.010)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	226	226	226	226	226	226	226	226	226	226

*p<0.1; **p<0.05; ***p<0.01

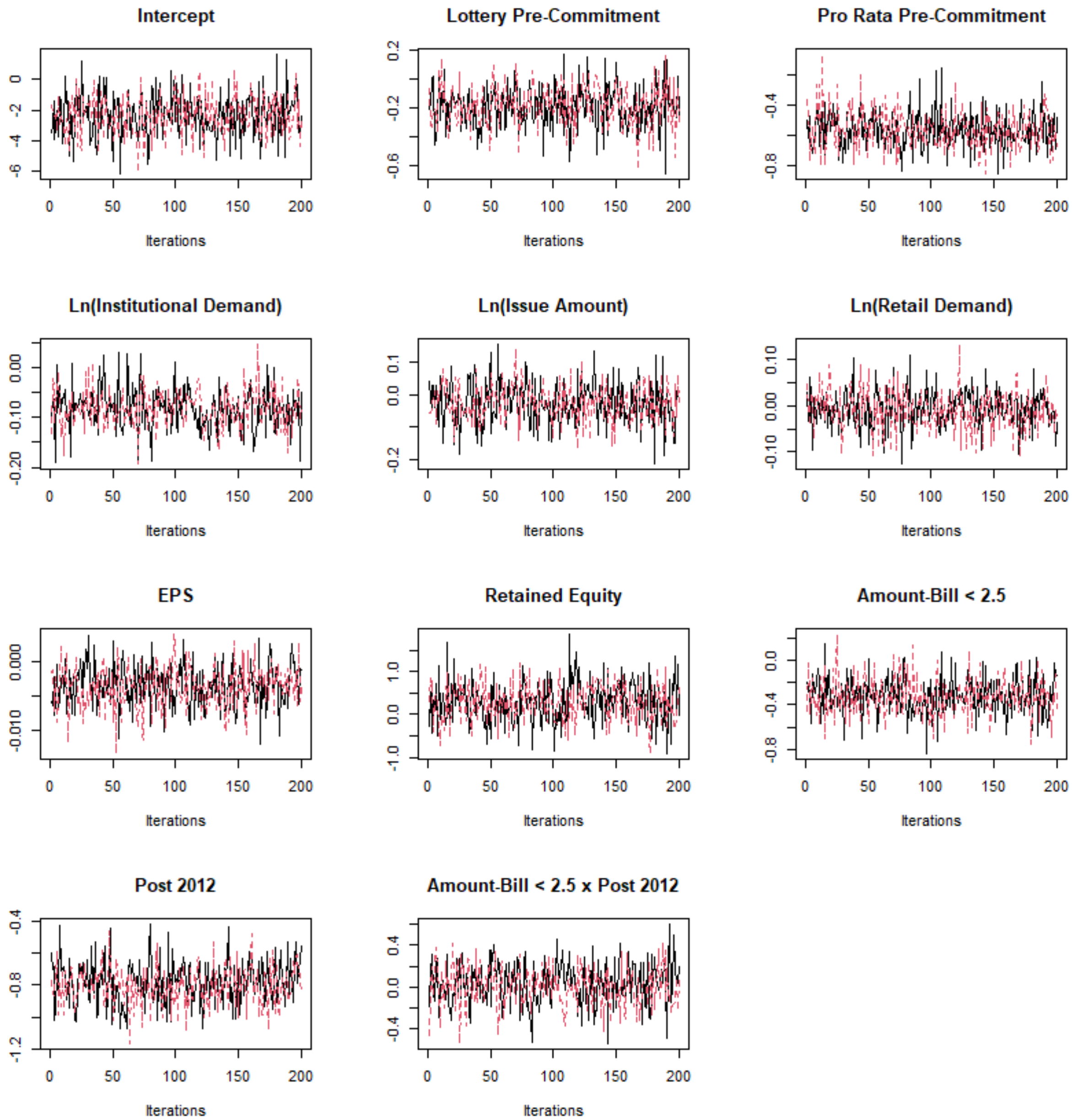

Figure A1. Trace plots for the zero-inflated beta regression Model 10 in Table A1.

Table A2.

In this table we report results of OLS regressions of issue-price adjustment as a response variable and lottery pre-commitment and pro rata pre-commitment as a key predictor variables and controls. The dataset consists of 224 IPOs in India in India between July 2009 and December 2019 (two IPOs with issue price adjustment equal to zero is excluded). All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Issue Price Adjustment (OLS Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.042***	0.044***	0.044***	0.046***	0.068***	0.012	0.069**	-0.019	0.040	0.042
	(0.002)	(0.004)	(0.002)	(0.004)	(0.025)	(0.026)	(0.029)	(0.029)	(0.040)	(0.041)
Lottery Pre-commitment	-0.018***	-0.014***	-0.009**	-0.011**	-0.009*	-0.011***	-0.009*	-0.011***	-0.006	-0.006
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Pro-rata Pre-commitment	-0.020***	-0.014***	-0.018***	-0.014***	-0.017***	-0.015***	-0.018***	-0.015***	-0.014***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Ln(Institutional Demand)			-0.003***	-0.001	-0.003***	-0.002	-0.003*	-0.003*	-0.004***	-0.003***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Issue Amount)					-0.001	0.002	-0.001	0.003**	0.0004	0.0003
					(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Ln(Retail Demand)							-0.0003	0.002*	0.001	0.001
							(0.001)	(0.001)	(0.001)	(0.001)
EPS							-0.0001	-0.0001*	-0.0001	-0.0001
							(0.0001)	(0.0001)	(0.0001)	(0.0001)
Retained Equity							-0.00004	0.002	0.006	0.007
							(0.016)	(0.014)	(0.014)	(0.015)
Amount-Bill_< 2.5									-0.010*	-0.010*
									(0.005)	(0.005)
Post 2012									-0.021***	-0.021***
									(0.004)	(0.004)
Amount < 2.5b × Post 2012									0.018***	0.019***
									(0.006)	(0.006)

Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	224	224	224	224	224	224	224	224	224	224
R^2	0.174	0.398	0.207	0.404	0.210	0.409	0.214	0.425	0.313	0.323
Adjusted R^2	0.167	0.352	0.196	0.355	0.196	0.357	0.188	0.365	0.281	0.267
RMSE	0.020	0.017	0.020	0.017	0.020	0.017	0.020	0.017	0.01	0.018

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

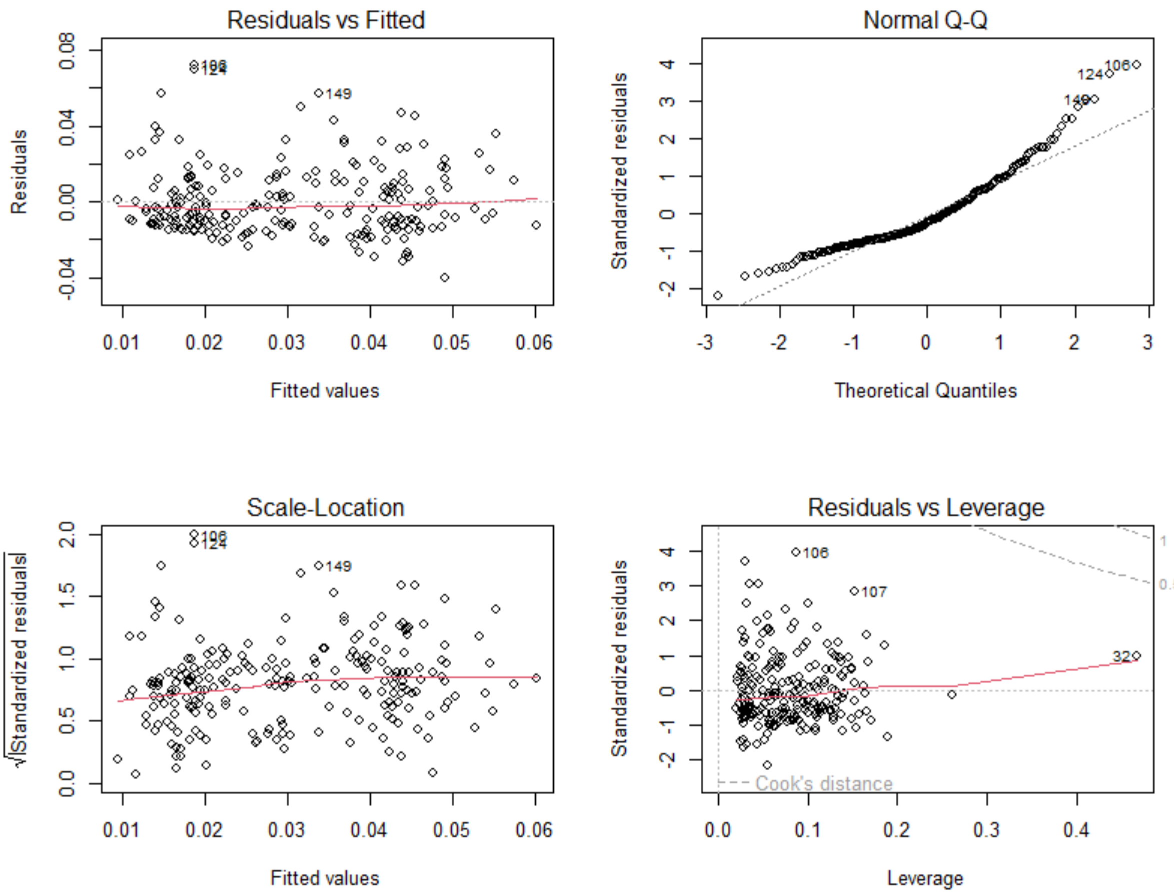

Figure A2. Diagnostic plots for the OLS regression Model 10 in Table A2. The upper left panel is the plot of residuals versus the fitted values, the upper right panel is the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A3

In this table we report the results of Box-Cox regressions with issue-price adjustment as the response variable and lottery pre-commitment and pro rata pre-commitment as key predictors variable and controls. The dataset consists of 224 IPOs in India between July 2009 and December 2019 (two IPOs with issue price adjustment equal to zero is excluded from the data sample). All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Issue-price Adjustment (Box-Cox Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-1.920***	-1.876***	-1.903***	-1.868***	-1.403***	-2.152***	-1.246***	-2.358***	-1.528***	-1.603***
	(0.018)	(0.035)	(0.017)	(0.035)	(0.248)	(0.236)	(0.303)	(0.276)	(0.404)	(0.402)
Lottery Pre-commitment	-0.188***	-0.139***	-0.101**	-0.112***	-0.090**	-0.117***	-0.090*	-0.118***	-0.056	-0.056
	(0.034)	(0.029)	(0.043)	(0.039)	(0.045)	(0.038)	(0.047)	(0.038)	(0.040)	(0.040)
Pro-rata Pre-commitment	-0.221***	-0.161***	-0.206***	-0.160***	-0.181***	-0.171***	-0.197***	-0.169***	-0.155***	-0.161***
	(0.031)	(0.031)	(0.032)	(0.031)	(0.034)	(0.031)	(0.038)	(0.031)	(0.038)	(0.040)
Ln(Institutional Demand)			-0.033***	-0.012	-0.025**	-0.015	-0.015	-0.018	-0.027**	-0.026**
			(0.010)	(0.010)	(0.010)	(0.010)	(0.013)	(0.013)	(0.011)	(0.011)
Ln(Issue Amount)					-0.024**	0.013	-0.030**	0.023*	-0.014	-0.010
					(0.012)	(0.011)	(0.015)	(0.014)	(0.018)	(0.018)
Ln(Retail Demand)							-0.016	0.013	-0.002	-0.002
							(0.013)	(0.012)	(0.011)	(0.011)
EPS							-0.001	-0.001*	-0.001	-0.001
							(0.001)	(0.001)	(0.001)	(0.001)
Retained Equity							0.003	0.013	0.068	0.066
							(0.151)	(0.131)	(0.135)	(0.141)
Amount-Bill_< 2.5									-0.114**	-0.118**
									(0.052)	(0.052)
Post 2012									-0.233***	-0.240***
									(0.035)	(0.036)
Amount < 2.5b × Post 2012									0.203***	0.218***
									(0.058)	(0.057)

Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	224	224	224	224	224	224	224	224	224	224
R^2	0.198	0.506	0.229	0.510	0.243	0.513	0.253	0.525	0.371	0.384
Adjusted R^2	0.191	0.468	0.219	0.469	0.229	0.470	0.228	0.476	0.341	0.333
RMSE	0.205	0.161	0.203	0.160	0.200	0.160	0.200	0.158	0.183	0.182

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

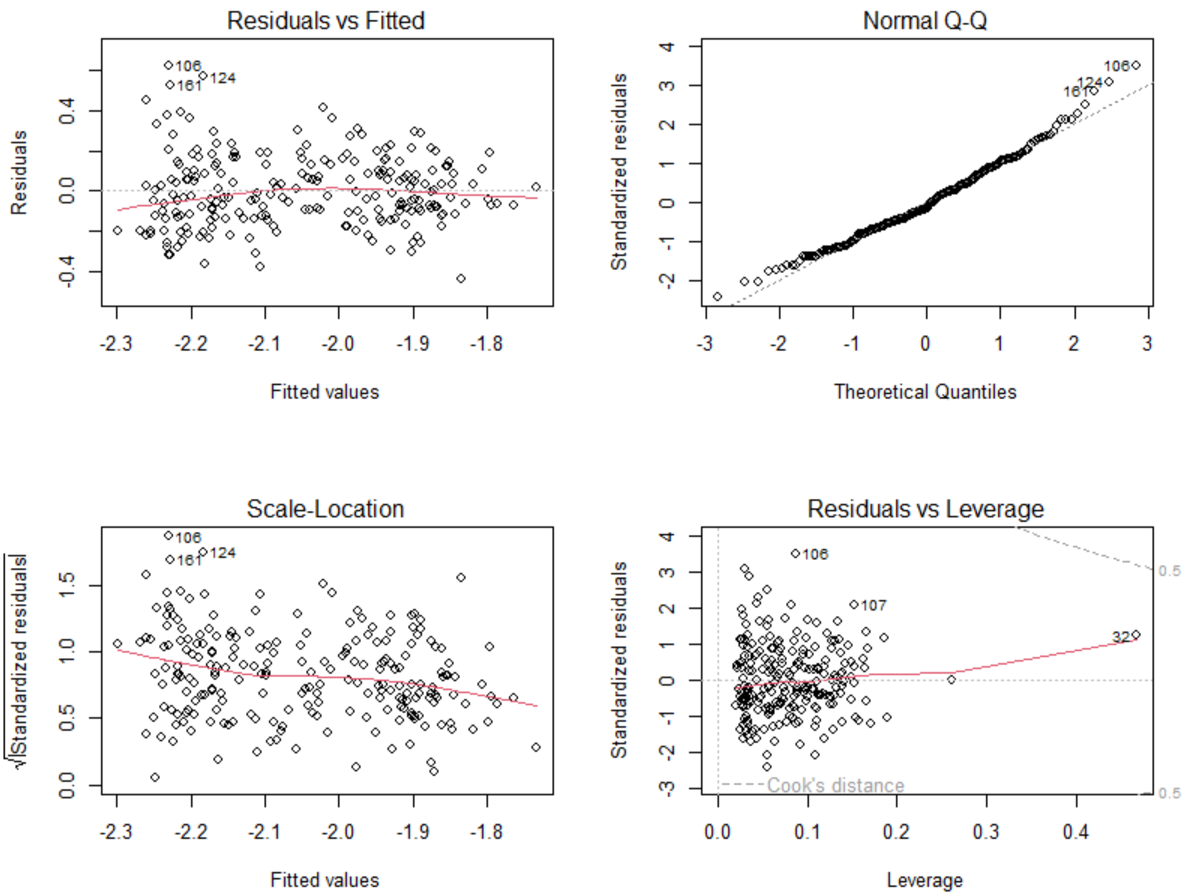

Figure A3. Diagnostic plots for the Box-Cox regression Model 10 in Table A3. The upper left panel is the plot of residuals versus the fitted values, the upper right panel is the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A4

In this table we report results of beta regressions of issue-price adjustment as a response variable and lottery pre-commitment and pro rata pre-commitment as key predictors variable and controls. The dataset consists of 412 IPOs in India between November 2005 and March 2019 (five IPO with issue price adjustment equal to zero is excluded). All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Issue Price Adjustment (Beta Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-2.831***	-2.697***	-2.818***	-2.641***	-2.134***	-3.832***	-2.540***	-4.766***	-2.640***	-2.701***
	(0.033)	(0.051)	(0.058)	(0.074)	(0.518)	(0.478)	(0.608)	(0.561)	(0.920)	(0.916)
Lottery Pre-commitment	-0.953***	-0.530***	-0.444***	-0.271*	-0.427***	-0.281**	-0.431***	-0.248*	-0.225	-0.223
	(0.115)	(0.108)	(0.156)	(0.141)	(0.156)	(0.140)	(0.156)	(0.139)	(0.148)	(0.148)
Pro-rata Pre-commitment	-0.967***	-0.675***	-0.667***	-0.460***	-0.627***	-0.506***	-0.610***	-0.434***	-0.350***	-0.350***
	(0.082)	(0.080)	(0.097)	(0.101)	(0.100)	(0.102)	(0.102)	(0.104)	(0.107)	(0.107)
Ln(Institutional Demand)			0.043**	0.004	0.052**	-0.013	0.034	-0.066**	-0.005	-0.011
			(0.020)	(0.019)	(0.021)	(0.020)	(0.030)	(0.028)	(0.029)	(0.029)
Post 2009			-0.248***	-0.346**	-0.224***	-0.395***	-0.265***	-0.459***	-0.231***	-0.252***
			(0.083)	(0.141)	(0.084)	(0.141)	(0.087)	(0.142)	(0.083)	(0.083)
Ln(Institutional Demand) × Post 2009			-0.131***	-0.046	-0.130***	-0.046	-0.118***	-0.031	-0.070**	-0.066*
			(0.037)	(0.035)	(0.037)	(0.035)	(0.037)	(0.035)	(0.035)	(0.035)
Ln(Issue Amount)					-0.034	0.059**	-0.005	0.106***	0.006	0.012
					(0.025)	(0.023)	(0.030)	(0.028)	(0.042)	(0.041)
Ln(Retail Demand)							0.032	0.084***	0.059**	0.060**
							(0.029)	(0.028)	(0.028)	(0.028)
EPS							-0.001	-0.0001	-0.001	-0.0002
							(0.001)	(0.001)	(0.001)	(0.001)
Retained Equity							-0.261	-0.107	-0.168	-0.234
							(0.291)	(0.262)	(0.277)	(0.279)
Amount < 2.5b									-0.217**	-0.245**
									(0.105)	(0.105)

Post 2012									-0.795***	-0.821***
									(0.108)	(0.108)
Amount < 2.5b × Post 2012									0.600***	0.651***
									(0.164)	(0.164)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	412	412	412	412	412	412	412	412	412	412
Pseudo R^2	0.341	0.584	0.381	0.588	0.386	0.589	0.386	0.591	0.467	0.478
φ	61.536	89.783	69.197	90.008	69.405	93.472	70.118	95.885	79.060	80.990
RMSE	0.023	0.020	0.022	0.020	0.022	0.019	0.021	0.019	0.021	0.020

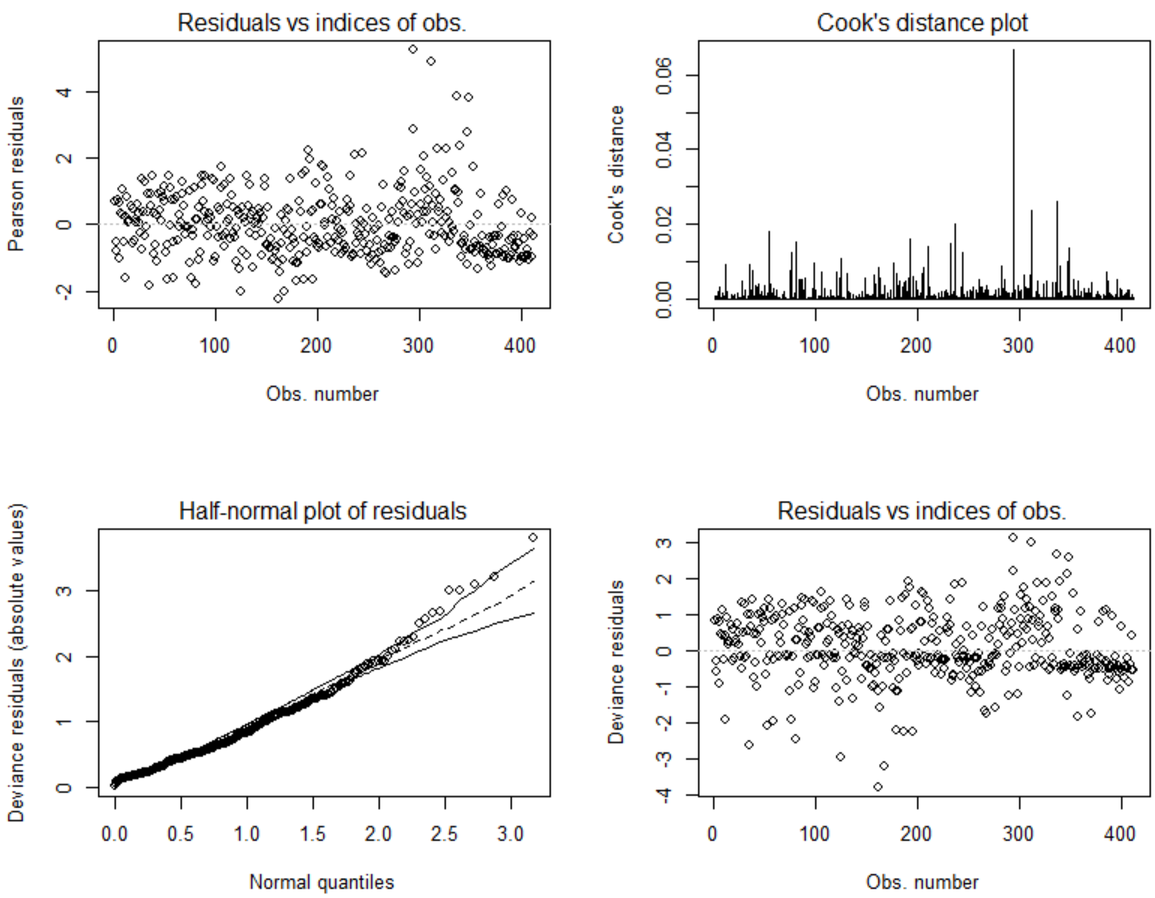

Figure A4. Diagnostic plots for the beta regression Model 10 in Table A4. The upper left panel is the plot of Pearson residuals versus the number of observations, the upper right panel is the Cook's distance versus the number of observations, the lower left panel displays the half-normal plot of absolute deviance residuals with simulated envelope, the lower right panel is the plot of deviance residuals versus the number of observations.

Table A5

In this table we report results of OLS regressions of issue-price adjustment as a response variable and lottery pre-commitment and pro rata pre-commitment as key predictors variable and controls. The dataset consists of 412 IPOs in India between November 2005 and March 2019 (five IPO with issue price adjustment equal to zero is excluded). All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Issue-Price Adjustment (OLS regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.055***	0.062***	0.059***	0.069***	0.057***	0.019	0.040*	-0.015	0.055	0.058*
	(0.001)	(0.002)	(0.003)	(0.004)	(0.020)	(0.019)	(0.023)	(0.023)	(0.033)	(0.034)
Lottery Pre-commitment	-0.033***	-0.021***	-0.012**	-0.010**	-0.012**	-0.010**	-0.011**	-0.010**	-0.007*	-0.007*
	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Pro-rata Pre-commitment	-0.032***	-0.023***	-0.017***	-0.013***	-0.017***	-0.016***	-0.016***	-0.014***	-0.011***	-0.011***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
Ln(Institutional Demand)			0.001	-0.001	0.001	-0.001	0.0003	-0.003***	-0.001	-0.001
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Post 2009			-0.016***	-0.024***	-0.016***	-0.025***	-0.017***	-0.027***	-0.017***	-0.017***
			(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.004)
Ln(Institutional Demand) × Post 2009			-0.004***	-0.001	-0.004***	-0.001	-0.003**	-0.0002	-0.002*	-0.002
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Issue Amount)					0.0001	0.002***	0.001	0.004***	0.001	0.001
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Ln(Retail Demand)							0.002	0.003***	0.003**	0.002**
							(0.001)	(0.001)	(0.001)	(0.001)
EPS							-0.0001***	-0.00004	-0.00004**	-0.00003*
							(0.00002)	(0.00002)	(0.00002)	(0.00002)
Retained Equity							-0.013	-0.005	-0.009	-0.010
							(0.012)	(0.011)	(0.012)	(0.012)
Amount < 2.5b									-0.010**	-0.011***
									(0.004)	(0.004)

Post 2012									-0.021^{***}	-0.022^{***}
									(0.003)	(0.004)
Amount < 2.5b × Post 2012									0.018^{***}	0.019^{***}
									(0.005)	(0.005)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	412	412	412	412	412	412	412	412	412	412
R^2	0.310	0.476	0.394	0.505	0.394	0.513	0.403	0.524	0.449	0.459
Adjusted R^2	0.307	0.452	0.386	0.478	0.385	0.485	0.390	0.493	0.433	0.433
RMSE	0.023	0.020	0.021	0.019	0.021	0.019	0.021	0.019	0.020	0.020

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

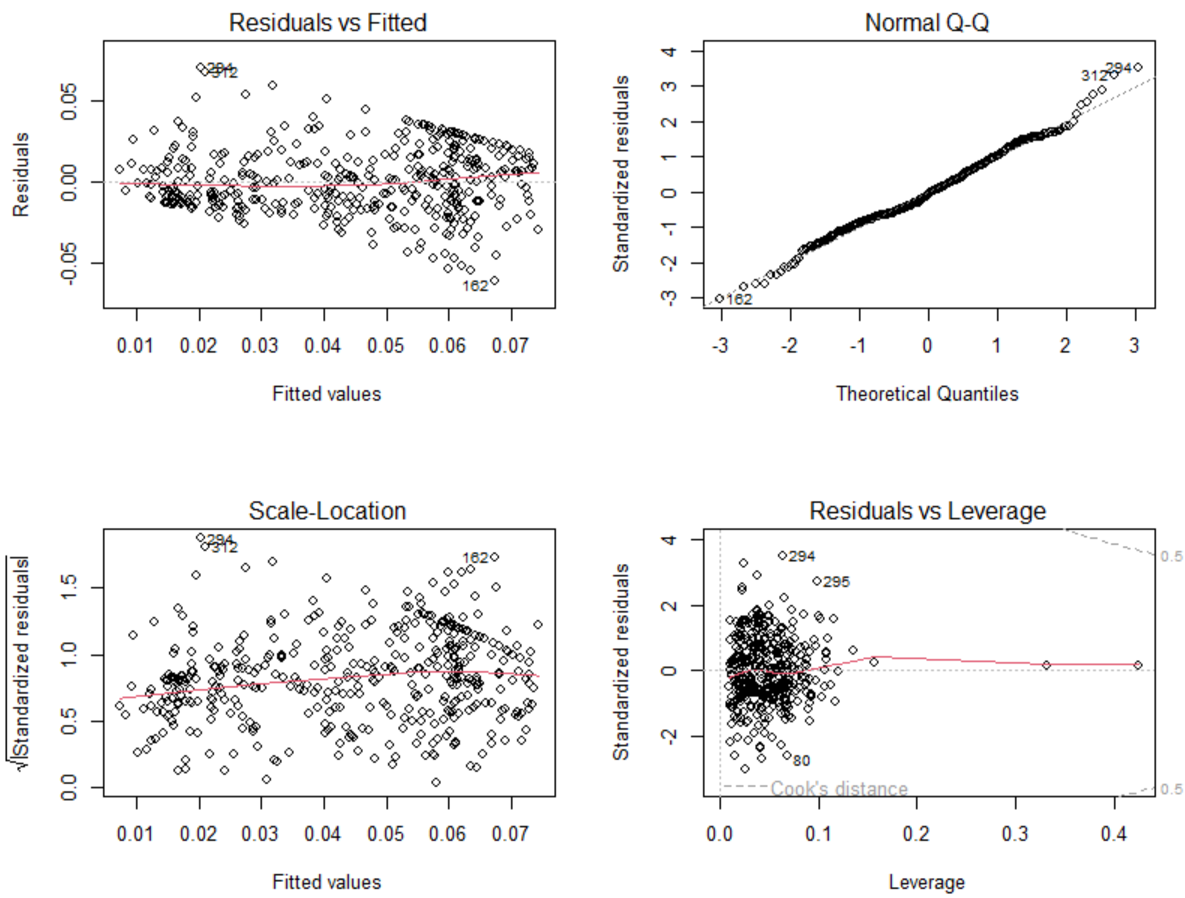

Figure A5. Diagnostic plots for the OLS regression Model 10 in Table A5. The upper left panel is the plot of residuals versus the fitted values, the upper right panel is the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A6

In this table we report results of Box-Cox regressions of issue-price adjustment as a response variable and lottery pre-commitment and pro rata pre-commitment as key predictors variable and controls. The dataset consists of 412 IPOs in India between November 2005 and March 2019 (five IPO with issue price adjustment equal to zero is excluded). All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Issue-Price Adjustment (Box-Cox Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-1.543***	-1.513***	-1.531***	-1.486***	-1.428***	-1.701***	-1.475***	-1.861***	-1.450***	-1.454***
	(0.007)	(0.011)	(0.015)	(0.018)	(0.104)	(0.096)	(0.123)	(0.119)	(0.178)	(0.179)
Lottery Pre-commitment	-0.183***	-0.111***	-0.079***	-0.066***	-0.078***	-0.067***	-0.076***	-0.064***	-0.049**	-0.048*
	(0.020)	(0.017)	(0.028)	(0.024)	(0.028)	(0.025)	(0.029)	(0.025)	(0.025)	(0.024)
Pro-rata Pre-commitment	-0.181***	-0.125***	-0.111***	-0.086***	-0.105***	-0.095***	-0.101***	-0.086***	-0.064***	-0.065***
	(0.015)	(0.015)	(0.018)	(0.018)	(0.019)	(0.018)	(0.020)	(0.018)	(0.020)	(0.021)
Ln(Institutional Demand)			0.007	-0.001	0.008*	-0.004	0.007	-0.013**	-0.002	-0.002
			(0.004)	(0.004)	(0.005)	(0.004)	(0.007)	(0.006)	(0.006)	(0.006)
Post 2009			-0.066***	-0.089***	-0.063***	-0.097***	-0.068***	-0.104***	-0.062***	-0.065***
			(0.018)	(0.029)	(0.019)	(0.029)	(0.019)	(0.028)	(0.018)	(0.018)
Ln(Institutional Demand) × Post 2009			-0.022***	-0.005	-0.021***	-0.005	-0.020***	-0.003	-0.013*	-0.013*
			(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Ln(Issue Amount)					-0.005	0.011**	-0.001	0.019***	-0.0004	0.0003
					(0.005)	(0.005)	(0.006)	(0.006)	(0.008)	(0.008)
Ln(Retail Demand)							0.004	0.014**	0.010*	0.010*
							(0.006)	(0.006)	(0.006)	(0.006)
EPS							-0.0002**	-0.0001	-0.0002*	-0.0001
							(0.0001)	(0.0001)	(0.0001)	(0.0001)
Retained Equity							-0.060	-0.023	-0.036	-0.042
							(0.062)	(0.053)	(0.058)	(0.058)
Amount < 2.5b									-0.054**	-0.058***
									(0.021)	(0.021)

Post 2012									-0.133***	-0.137***
									(0.019)	(0.019)
Amount < 2.5b × Post 2012									0.105***	0.112***
									(0.031)	(0.030)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	412	412	412	412	412	412	412	412	412	412
R^2	0.343	0.543	0.408	0.559	0.410	0.564	0.415	0.572	0.479	0.488
Adjusted R^2	0.340	0.522	0.401	0.535	0.401	0.539	0.402	0.545	0.463	0.464
RMSE	0.119	0.099	0.113	0.097	0.113	0.097	0.112	0.096	0.106	0.105

*p<0.1; **p<0.05; ***p<0.01

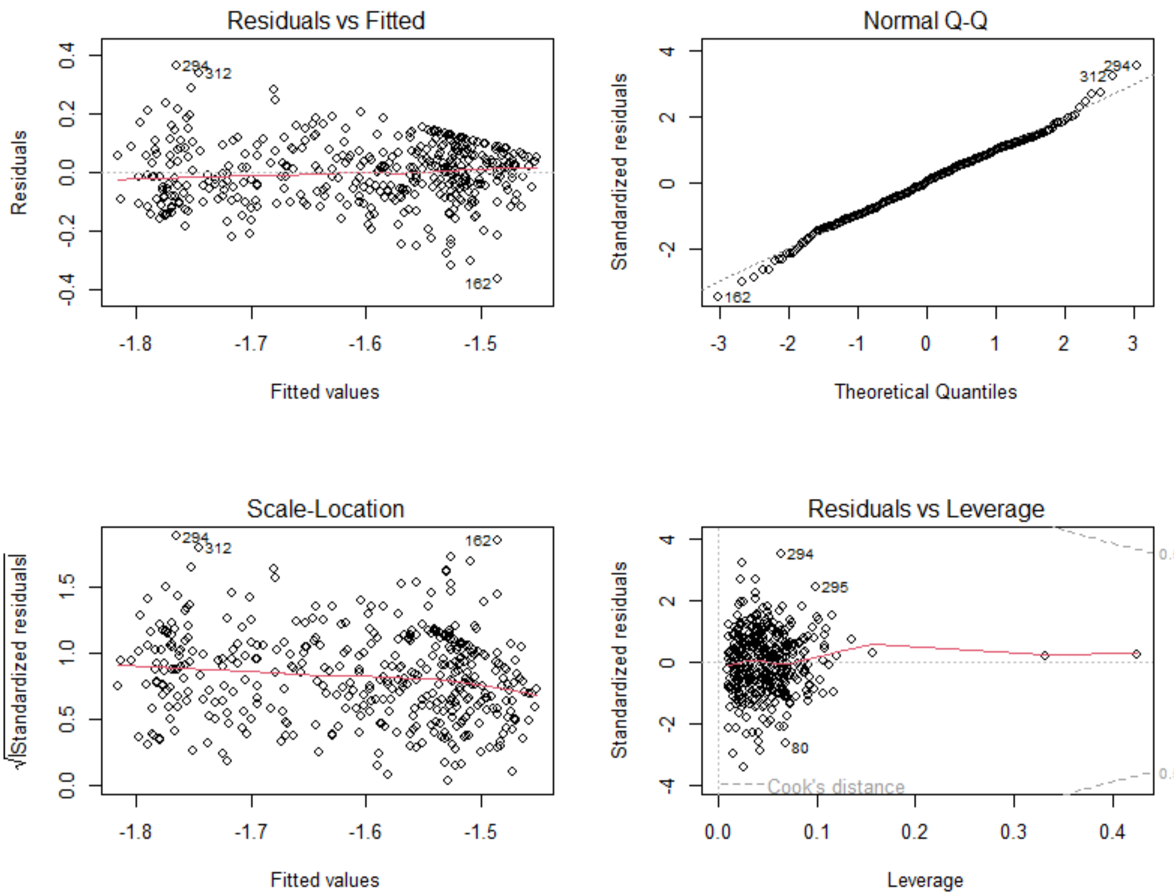

Figure A6. Diagnostic plots for the Box-Cox regression Model 10 in Table A6. The upper left panel is the plot of residuals versus the fitted values, the upper right panel is the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A7

In this table we report results of OLS regressions of price volatility on issue-price adjustment, and lottery pre-commitment and pro rata pre-commitment as key predictors variable and controls. The dataset consists of 226 IPOs in India between July 2009 and December 2019. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Price Volatility (OLS Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.031***	0.111***	0.110***	0.104***	0.108***	0.102***	0.108***	0.101***	0.080***	0.082***
	(0.004)	(0.012)	(0.011)	(0.013)	(0.011)	(0.013)	(0.011)	(0.013)	(0.016)	(0.016)
Issue Price Adjustment	0.053	-0.032	-0.042	-0.036	-0.049	-0.044	-0.043	-0.035	-0.048	-0.046
	(0.087)	(0.057)	(0.058)	(0.057)	(0.057)	(0.055)	(0.056)	(0.054)	(0.055)	(0.054)
Lottery Pre-commitment	-0.012***	-0.006*	-0.006*	-0.006*	-0.006**	-0.006**	-0.005*	-0.005	-0.004	-0.004
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Pro-rata Pre-commitment	-0.014***	-0.007**	-0.008***	-0.007**	-0.009***	-0.007**	-0.008***	-0.005*	-0.006**	-0.006**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Issue Price Adjustment × Lottery Pre-commitment	-0.029	0.075	0.090	0.074	0.102	0.084	0.087	0.063	0.090	0.089
	(0.098)	(0.073)	(0.076)	(0.073)	(0.073)	(0.069)	(0.073)	(0.069)	(0.070)	(0.072)
Issue Price Adjustment × Pro-rata Pre-commitment	0.094	0.110*	0.147**	0.114*	0.146**	0.110*	0.136**	0.093	0.140**	0.134**
	(0.097)	(0.066)	(0.065)	(0.066)	(0.065)	(0.066)	(0.063)	(0.065)	(0.062)	(0.062)
Underpricing		0.017***	0.017***	0.016***	0.017***	0.017***	0.016***	0.016***	0.016***	0.015***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Ln(Institutional Demand)		-0.003***	-0.004***	-0.003***	-0.004***	-0.003***	-0.003***	-0.002***	-0.003***	-0.003***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Issue Amount)		-0.004***	-0.004***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.002***	-0.002***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Retail Demand)			0.001	0.001	0.001	0.001	0.001	0.001	0.001*	0.001
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
EPS					-0.0001**	-0.0001**	-0.0001**	-0.0001**	-0.0001***	-0.0001***
					(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00002)	(0.00003)
Retained Equity							-0.013*	-0.019**	-0.012	-0.016**

							(0.008)	(0.008)	(0.008)	(0.008)
Amount < 2.5b									0.006**	0.006***
									(0.002)	(0.002)
Post 2012									-0.00001	0.0003
									(0.001)	(0.002)
Amount < 2.5b × Post 2012									-0.004	-0.005**
									(0.003)	(0.003)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	226	226	226	226	226	226	226	226	226	226
R^2	0.226	0.611	0.570	0.612	0.575	0.617	0.582	0.628	0.591	0.609
Adjusted R^2	0.209	0.569	0.552	0.568	0.555	0.571	0.560	0.582	0.563	0.569
RMSE	0.020	0.022	0.021	0.022	0.021	0.022	0.021	0.022	0.021	0.022

*p<0.1; **p<0.05; ***p<0.01

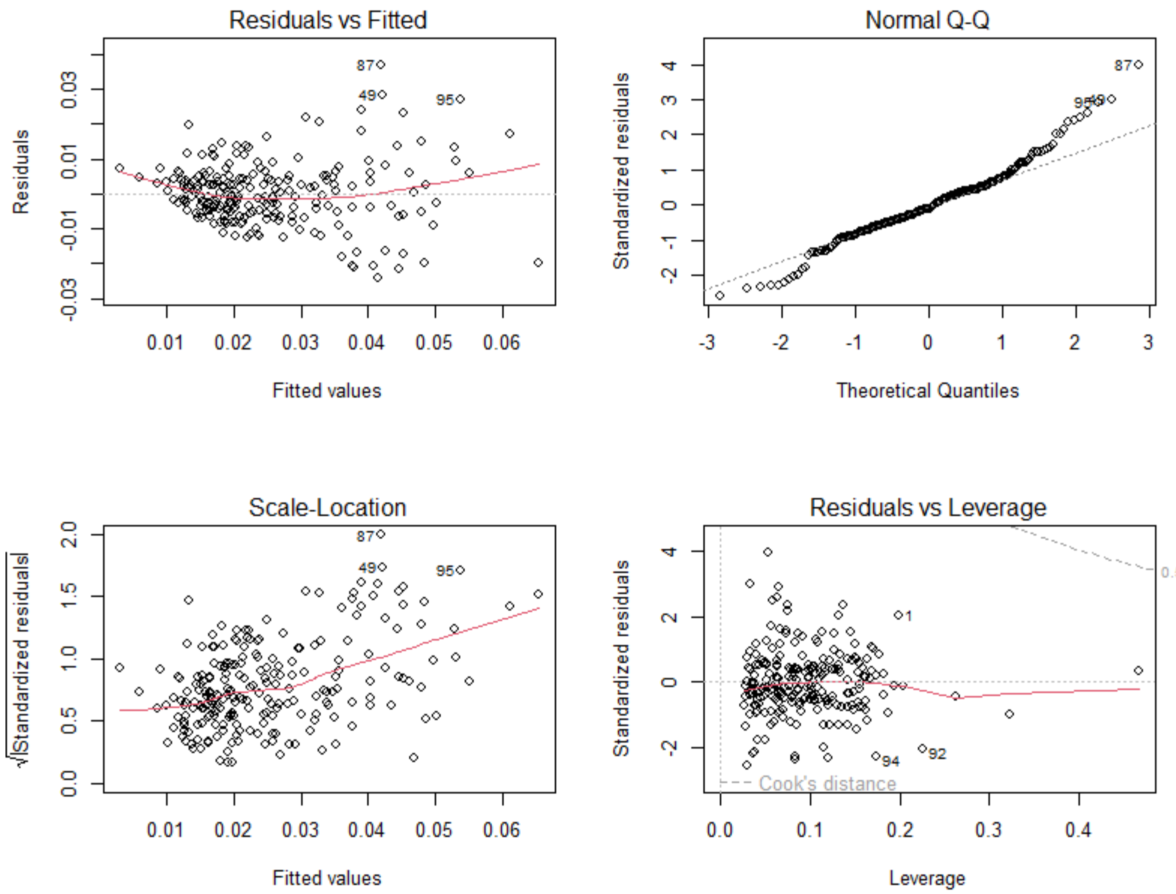

Figure A7. Diagnostic plots for the OLS regression Model 10 in Table A7. The upper left panel is the plot of residuals versus the fitted values, the upper right panel is the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A8

In this table we report results of Box-Cox regressions of price volatility on issue-price adjustment, and lottery pre-commitment and pro rata pre-commitment with interaction terms as key predictors variable and controls. The dataset consists of 226 IPOs in India between July 2009 and March 2019. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively.

	Price Volatility (Box-Cox Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-3.610***	0.032	0.097	0.110	-0.001	-0.037	-0.001	-0.069	-1.232**	-1.087*
	(0.130)	(0.471)	(0.450)	(0.509)	(0.442)	(0.493)	(0.426)	(0.474)	(0.604)	(0.618)
Issue Price Adjustment	1.489	-1.604	-1.746	-1.563	-2.152	-2.076	-1.875	-1.702	-2.079	-2.065
	(2.899)	(1.745)	(1.798)	(1.759)	(1.731)	(1.677)	(1.691)	(1.641)	(1.668)	(1.665)
Lottery Pre-commitment	-0.430***	-0.166	-0.152	-0.166	-0.176	-0.187*	-0.131	-0.133	-0.105	-0.112
	(0.150)	(0.118)	(0.117)	(0.118)	(0.112)	(0.111)	(0.116)	(0.115)	(0.117)	(0.121)
Pro-rata Pre-commitment	-0.568***	-0.302***	-0.337***	-0.305***	-0.363***	-0.322***	-0.318***	-0.261**	-0.289***	-0.273***
	(0.146)	(0.107)	(0.105)	(0.107)	(0.101)	(0.102)	(0.098)	(0.102)	(0.103)	(0.103)
Issue Price Adjustment × Lottery Pre-commitment	-0.200	2.662	3.300	2.677	4.006	3.230	3.333	2.394	3.573	3.413
	(3.756)	(3.022)	(2.945)	(3.018)	(2.811)	(2.799)	(2.816)	(2.792)	(2.781)	(2.907)
Issue Price Adjustment × Pro-rata Pre-commitment	6.224*	6.709***	7.628***	6.667***	7.600***	6.468***	7.148***	5.776**	7.496***	7.507***
	(3.505)	(2.390)	(2.323)	(2.392)	(2.292)	(2.352)	(2.241)	(2.302)	(2.192)	(2.199)
Underpricing		0.457***	0.465***	0.458***	0.462***	0.459***	0.445***	0.439***	0.422***	0.411***
		(0.081)	(0.082)	(0.082)	(0.082)	(0.084)	(0.089)	(0.093)	(0.089)	(0.086)
Ln(Institutional Demand)		-0.082***	-0.107***	-0.078***	-0.101***	-0.072***	-0.087***	-0.051**	-0.081***	-0.070***
		(0.021)	(0.023)	(0.025)	(0.022)	(0.025)	(0.023)	(0.026)	(0.024)	(0.025)
Ln(Issue Amount)		-0.166***	-0.169***	-0.170***	-0.162***	-0.161***	-0.144***	-0.134***	-0.095***	-0.098***
		(0.023)	(0.021)	(0.024)	(0.020)	(0.024)	(0.020)	(0.025)	(0.026)	(0.028)
Ln(Retail Demand)			0.010	-0.006	0.013	-0.003	0.016	0.001	0.019	0.012
			(0.022)	(0.025)	(0.022)	(0.024)	(0.022)	(0.025)	(0.022)	(0.022)
EPS					-0.003**	-0.004**	-0.003***	-0.004**	-0.004***	-0.004***
					(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Retained Equity							-0.583**	-0.786***	-0.525*	-0.648**

							(0.273)	(0.296)	(0.275)	(0.289)
Amount < 2.5b									0.224**	0.249**
									(0.101)	(0.096)
Post 2012									0.014	0.026
									(0.070)	(0.073)
Amount < 2.5b × Post 2012									-0.085	-0.113
									(0.105)	(0.105)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	226	226	226	226	226	226	226	226	226	226
R^2	0.215	0.581	0.548	0.581	0.560	0.593	0.569	0.608	0.579	0.596
Adjusted R^2	0.197	0.536	0.529	0.533	0.540	0.545	0.547	0.559	0.551	0.554
RMSE	0.462	0.337	0.350	0.337	0.346	0.332	0.342	0.326	0.339	0.332

*p<0.1; **p<0.05; ***p<0.01

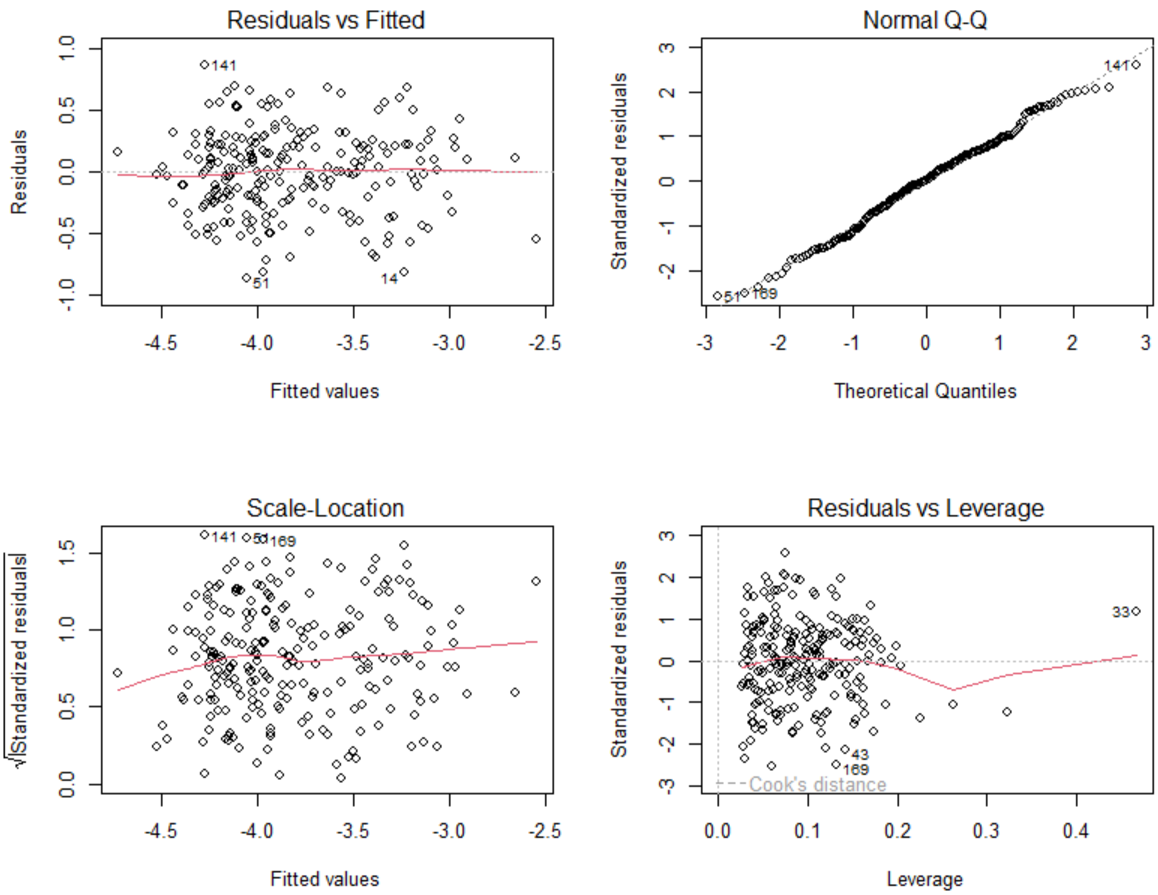

Figure A8. Diagnostic plots for Box-Cox transformation Model 10 in Table A8. The upper left panel shows the residuals versus the fitted values, the upper right panel shows the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A9

This table reports the results of beta regressions of price volatility on issue-price adjustment lottery pre-commitment and pro rata pre-commitment with the interaction terms as key predictors variable and controls. The dataset consists of 417 IPOs in India between November 2005 and March 2019. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively

	Price Volatility (Beta Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-3.348***	-0.184	0.053	-0.043	0.047	-0.031	0.056	-0.003	-0.136	-0.033
	(0.056)	(0.370)	(0.411)	(0.422)	(0.412)	(0.422)	(0.412)	(0.421)	(0.641)	(0.641)
Issue Price Adjustment	-0.163	-0.500	-1.631*	-0.421	-1.608*	-0.434	-1.625*	-0.404	-1.700**	-1.597*
	(0.932)	(0.837)	(0.849)	(0.844)	(0.851)	(0.844)	(0.851)	(0.842)	(0.857)	(0.854)
Lottery Pre-commitment	-0.488***	-0.093	-0.115	-0.092	-0.113	-0.094	-0.108	-0.079	-0.074	-0.086
	(0.126)	(0.125)	(0.125)	(0.125)	(0.125)	(0.125)	(0.126)	(0.125)	(0.131)	(0.130)
Pro-rata Pre-commitment	-0.663***	-0.320***	-0.404***	-0.323***	-0.403***	-0.324***	-0.395***	-0.305***	-0.370***	-0.362***
	(0.096)	(0.092)	(0.087)	(0.093)	(0.087)	(0.093)	(0.087)	(0.093)	(0.096)	(0.095)
Issue Price Adjustment × Lottery Pre-commitment	-0.697	-1.383	0.116	-1.324	0.060	-1.263	0.092	-1.308	-0.490	-0.081
	(3.928)	(3.455)	(3.455)	(3.454)	(3.458)	(3.454)	(3.454)	(3.435)	(3.557)	(3.484)
Issue Price Adjustment × Pro-rata Pre-commitment	7.110***	5.630**	7.696***	5.571**	7.707***	5.540**	7.609***	5.270**	7.209***	7.012***
	(2.548)	(2.221)	(2.202)	(2.221)	(2.202)	(2.222)	(2.201)	(2.213)	(2.239)	(2.220)
Underpricing		0.205***	0.238***	0.209***	0.239***	0.208***	0.237***	0.201***	0.241***	0.236***
		(0.043)	(0.044)	(0.043)	(0.044)	(0.043)	(0.044)	(0.043)	(0.044)	(0.045)
Ln(Institutional Demand)		-0.005	-0.026	0.002	-0.026	0.003	-0.021	0.015	-0.025	-0.026
		(0.016)	(0.019)	(0.020)	(0.019)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
Post 2009		0.117	-0.065	0.123	-0.063	0.124	-0.061	0.146	-0.063	-0.063
		(0.098)	(0.056)	(0.099)	(0.056)	(0.099)	(0.056)	(0.099)	(0.057)	(0.057)
Ln(Institutional Demand) × Post 2009		-0.048**	-0.053**	-0.050**	-0.054**	-0.049**	-0.055**	-0.053**	-0.053**	-0.050**
		(0.024)	(0.024)	(0.025)	(0.024)	(0.025)	(0.024)	(0.025)	(0.024)	(0.024)
Ln(Issue Amount)		-0.158***	-0.157***	-0.165***	-0.157***	-0.165***	-0.153***	-0.157***	-0.144***	-0.148***
		(0.018)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)	(0.021)	(0.029)	(0.029)
Ln(Retail Demand)			-0.008	-0.013	-0.008	-0.014	-0.009	-0.017	-0.006	-0.009
			(0.018)	(0.018)	(0.018)	(0.019)	(0.018)	(0.019)	(0.019)	(0.019)

EPS					0.0002	-0.0003	0.0002	-0.0002	0.0002	0.0001
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Retained Equity							-0.131	-0.312*	-0.125	-0.175
							(0.183)	(0.177)	(0.183)	(0.184)
Amount < 2.5b									-0.002	0.010
									(0.076)	(0.077)
Post 2012									-0.069	-0.043
									(0.075)	(0.075)
Amount < 2.5b × Post 2012									0.089	0.046
									(0.102)	(0.104)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	417	417	417	417	417	417	417	417	417	417
Pseudo R^2	0.271	0.566	0.519	0.567	0.519	0.567	0.521	0.573	0.523	0.532
φ	183.53	312.30	276.66	312.70	276.75	312.86	277.05	312.22	277.91	283.60
RMSE	0.029	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030

*p<0.1; **p<0.05; ***p<0.01

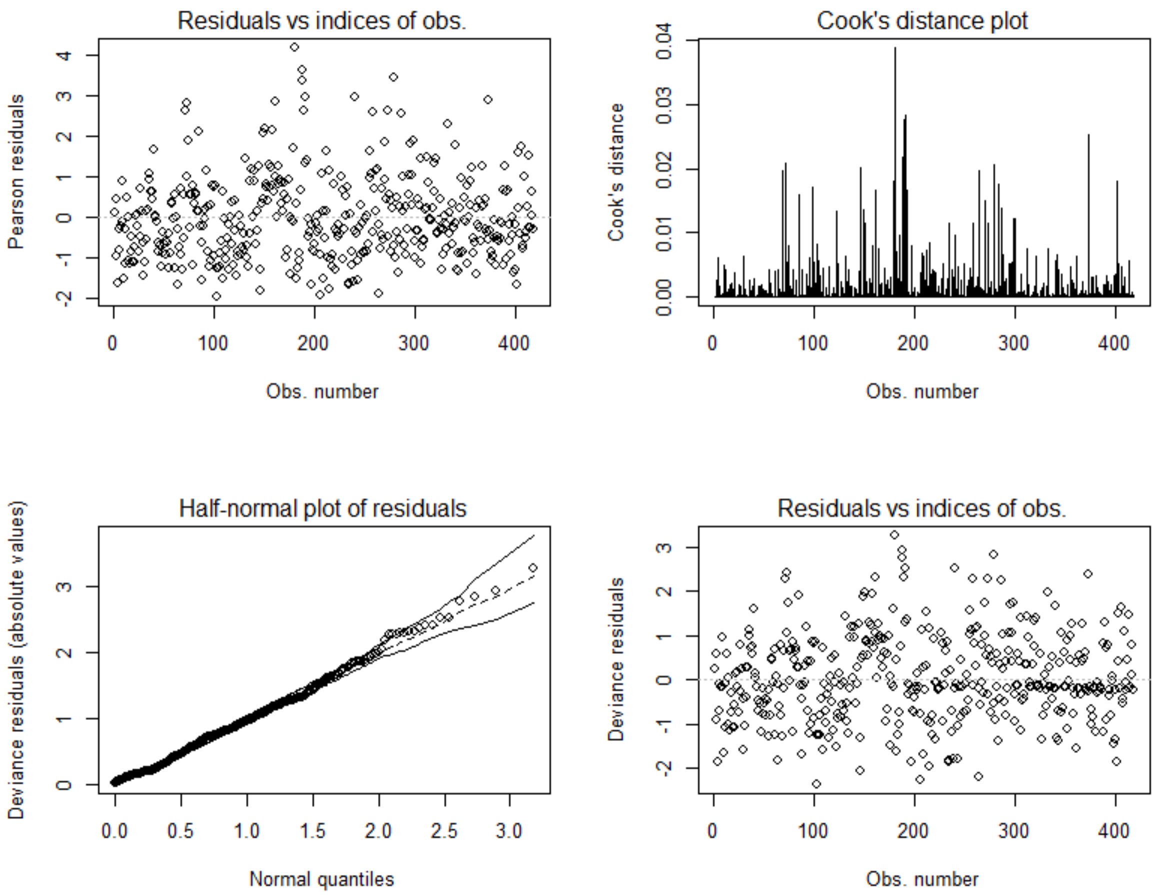

Figure A9. Diagnostic plots for the beta regression Model 10 in Table A9. The upper left panel is the plot of Pearson residuals versus the number of observations, the upper right panel is the Cook's distance versus the number of observations, the lower left panel displays the half-normal plot of absolute deviance residuals with simulated envelope, the lower right panel is the plot of deviance residuals versus the number of observations.

Table A10

This table reports the results of OLS regressions of price volatility on issue-price adjustment lottery pre-commitment and pro rata pre-commitment with interaction terms as key predictors variable and controls. The dataset consists of 417 IPOs in India between November 2005 and March 2019. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively

	Price Volatility (OLS regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.036^{***}	0.118^{***}	0.121^{***}	0.120^{***}	0.121^{***}	0.121^{***}	0.121^{***}	0.121^{***}	0.117^{***}	0.119^{***}
	(0.002)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.017)	(0.017)
Issue Price Adjustment	-0.027	-0.022	-0.064^{**}	-0.020	-0.064^{**}	-0.021	-0.064^{**}	-0.021	-0.066^{**}	-0.062^{**}
	(0.036)	(0.032)	(0.030)	(0.032)	(0.030)	(0.032)	(0.030)	(0.032)	(0.031)	(0.031)
Lottery Pre-commitment	-0.016^{***}	-0.004^{*}	-0.005^{**}	-0.004^{*}	-0.005^{**}	-0.004^{*}	-0.005^{**}	-0.004^{*}	-0.004	-0.004^{*}
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pro-rata Pre-commitment	-0.019^{***}	-0.008^{***}	-0.011^{***}	-0.008^{***}	-0.011^{***}	-0.008^{***}	-0.011^{***}	-0.008^{***}	-0.010^{***}	-0.010^{***}
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Issue Price Adjustment × Lottery Pre-commitment	0.008	0.004	0.042	0.004	0.041	0.005	0.041	0.006	0.026	0.037
	(0.056)	(0.053)	(0.049)	(0.053)	(0.049)	(0.053)	(0.049)	(0.053)	(0.047)	(0.050)
Issue Price Adjustment × Pro-rata Pre-commitment	0.178^{***}	0.125^{***}	0.185^{***}	0.124^{***}	0.185^{***}	0.124^{***}	0.183^{***}	0.118^{**}	0.174^{***}	0.169^{***}
	(0.054)	(0.046)	(0.043)	(0.046)	(0.043)	(0.047)	(0.043)	(0.046)	(0.044)	(0.044)
Underpricing		0.009^{***}	0.010^{***}	0.009^{***}	0.010^{***}	0.009^{***}	0.010^{***}	0.009^{***}	0.010^{***}	0.010^{***}
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Ln(Institutional Demand)		-0.001	-0.002^{**}	-0.001	-0.002^{**}	-0.001	-0.002^{**}	-0.0003	-0.002^{**}	-0.002^{**}
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Post 2009		0.003	-0.003	0.003	-0.003	0.003	-0.003	0.004	-0.002	-0.002
		(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Ln(Institutional Demand) × Post 2009		-0.001^{*}	-0.001^{*}	-0.001^{*}	-0.001^{*}	-0.001^{*}	-0.001^{*}	-0.001^{*}	-0.001	-0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Issue Amount)		-0.004^{***}	-0.004^{***}	-0.004^{***}	-0.004^{***}	-0.004^{***}	-0.004^{***}	-0.004^{***}	-0.004^{***}	-0.004^{***}
		(0.0005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Retail Demand)			0.0001	-0.0002	0.0001	-0.0002	0.00004	-0.0003	0.0001	0.00002
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

EPS					0.00001	-0.00001	0.00001	-0.00000	0.00001	0.00000
					(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Retained Equity							-0.003	-0.009	-0.003	-0.004
							(0.006)	(0.006)	(0.006)	(0.007)
Amount < 2.5b									0.0002	0.001
									(0.002)	(0.002)
Post 2012									-0.002	-0.001
									(0.001)	(0.002)
Amount < 2.5b × Post 2012									0.0003	-0.001
									(0.002)	(0.002)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	417	417	417	417	417	417	417	417	417	417
R^2	0.220	0.528	0.464	0.528	0.465	0.528	0.465	0.531	0.466	0.475
Adjusted R^2	0.210	0.496	0.450	0.495	0.449	0.494	0.448	0.496	0.444	0.444
RMSE	0.013	0.010	0.011	0.010	0.011	0.010	0.011	0.010	0.011	0.011

*p<0.1; **p<0.05; ***p<0.01

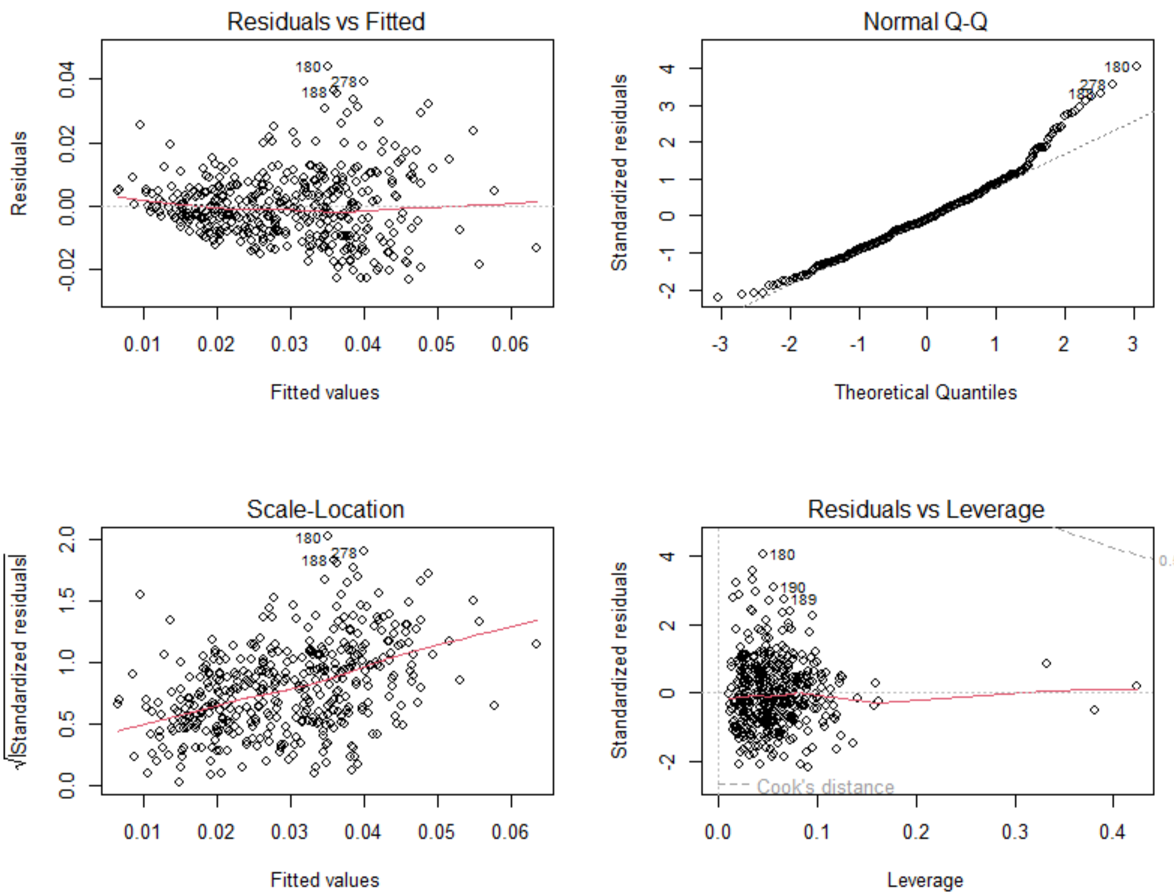

Figure A10. Diagnostic plots for OLS transformation Model 10 in Table A10. The upper left panel shows the residuals versus the fitted values, the upper right panel shows the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

Table A11

This table reports the results of Box-Cox regressions of price volatility on issue-price adjustment lottery pre-commitment and pro rata pre-commitment with the interaction terms as key predictors variable and controls. The dataset consists of 417 IPOs in India between November 2005 and March 2019. All variables are defined in Appendix B. Robust standard errors are reported in brackets. ***, **, and * indicate significant at the 1%, 5%, and 10% level, respectively

	Price Volatility (Box-Cox Regressions)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-3.464***	-0.228	-0.035	-0.108	-0.034	-0.092	-0.008	-0.048	-0.433	-0.355
	(0.070)	(0.331)	(0.376)	(0.384)	(0.378)	(0.385)	(0.377)	(0.383)	(0.577)	(0.583)
Issue Price Adjustment	-0.156	-0.696	-1.791**	-0.623	-1.794**	-0.650	-1.842**	-0.678	-1.907**	-1.763**
	(1.101)	(0.910)	(0.871)	(0.915)	(0.872)	(0.912)	(0.871)	(0.905)	(0.871)	(0.881)
Lottery Pre-commitment	-0.521***	-0.057	-0.074	-0.060	-0.074	-0.063	-0.063	-0.046	-0.031	-0.048
	(0.104)	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)	(0.102)	(0.101)	(0.102)	(0.103)
Pro-rata Pre-commitment	-0.728***	-0.330***	-0.412***	-0.335***	-0.412***	-0.336***	-0.398***	-0.315***	-0.376***	-0.374***
	(0.095)	(0.087)	(0.079)	(0.087)	(0.079)	(0.087)	(0.079)	(0.086)	(0.086)	(0.087)
Issue Price Adjustment × Lottery Pre-commitment	-0.923	-1.324	0.046	-1.283	0.053	-1.209	0.093	-1.196	-0.295	0.083
	(2.553)	(2.404)	(2.225)	(2.399)	(2.229)	(2.382)	(2.253)	(2.419)	(2.196)	(2.310)
Issue Price Adjustment × Pro-rata Pre-commitment	8.151***	6.660***	8.643***	6.601***	8.642***	6.576***	8.507***	6.280***	8.199***	8.067***
	(2.161)	(1.825)	(1.715)	(1.819)	(1.715)	(1.820)	(1.715)	(1.809)	(1.736)	(1.750)
Underpricing		0.232***	0.260***	0.235***	0.260***	0.234***	0.256***	0.227***	0.260***	0.252***
		(0.052)	(0.056)	(0.052)	(0.057)	(0.052)	(0.057)	(0.053)	(0.057)	(0.056)
Ln(Institutional Demand)		-0.001	-0.020	0.006	-0.020	0.006	-0.011	0.023	-0.016	-0.015
		(0.016)	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)	(0.021)	(0.021)	(0.021)
Post 2009		0.112	-0.080	0.120	-0.081	0.120	-0.078	0.144	-0.083	-0.084
		(0.091)	(0.062)	(0.090)	(0.063)	(0.090)	(0.063)	(0.089)	(0.064)	(0.064)
Ln(Institutional Demand) × Post 2009		-0.065***	-0.074***	-0.067***	-0.074***	-0.066***	-0.075***	-0.068***	-0.073***	-0.069***
		(0.024)	(0.023)	(0.024)	(0.023)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Ln(Issue Amount)		-0.160***	-0.157***	-0.166***	-0.158***	-0.166***	-0.150***	-0.154***	-0.131***	-0.135***
		(0.016)	(0.018)	(0.019)	(0.018)	(0.019)	(0.019)	(0.019)	(0.026)	(0.027)
Ln(Retail Demand)			-0.005	-0.012	-0.005	-0.013	-0.006	-0.017	-0.003	-0.008
			(0.019)	(0.020)	(0.019)	(0.020)	(0.019)	(0.020)	(0.020)	(0.020)

EPS					-0.00003	-0.0004	0.00001	-0.0003	0.00001	-0.0001
					(0.0004)	(0.001)	(0.0004)	(0.001)	(0.0004)	(0.0005)
Retained Equity							-0.263	-0.442**	-0.247	-0.290
							(0.193)	(0.184)	(0.194)	(0.196)
Amount < 2.5b									0.031	0.048
									(0.071)	(0.068)
Post 2012									-0.057	-0.031
									(0.066)	(0.067)
Amount < 2.5b × Post 2012									0.105	0.073
									(0.090)	(0.092)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Obs.	417	417	417	417	417	417	417	417	417	417
R^2	0.273	0.568	0.522	0.569	0.522	0.569	0.524	0.575	0.527	0.536
Adjusted R^2	0.264	0.540	0.509	0.539	0.508	0.538	0.509	0.543	0.508	0.509
RMSE	0.430	0.331	0.348	0.331	0.348	0.331	0.348	0.328	0.347	0.343

*p<0.1; **p<0.05; ***p<0.01

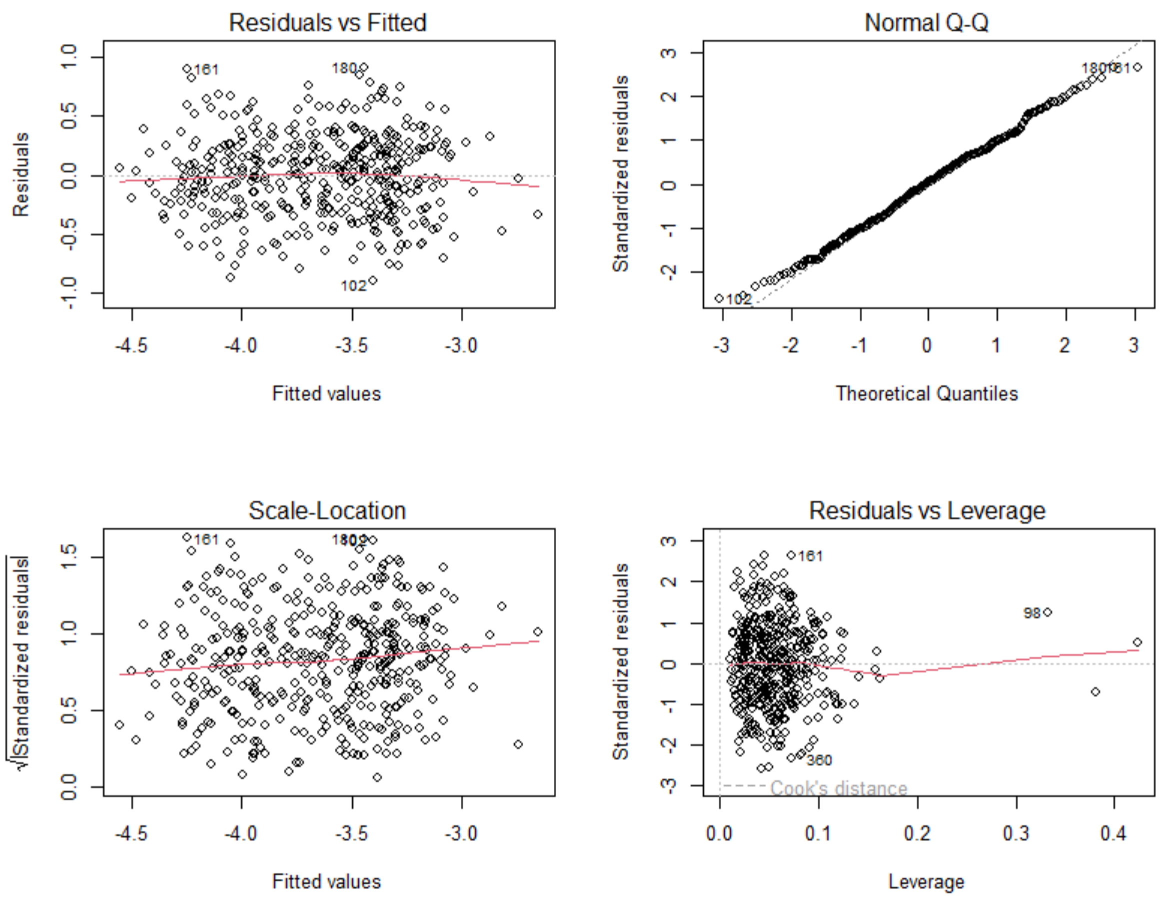

Figure A11. Diagnostic plots for Box-Cox transformation Model 10 in Table A11. The upper left panel shows the residuals versus the fitted values, the upper right panel shows the normal Q-Q plot, the lower left panel is the square root of the standardized residuals versus the fitted values, and the lower right panel is the plot of residuals versus leverage.

APPENDIX B
List of variable definitions

Price Volatility	Average daily price volatility during the initial 30 days of trading: $\dfrac{\sum_{t=1}^{30}\left(\sqrt{\left(\left(\frac{Closing\ Price_{t+1}}{Closing\ Price_{t}}\right)-1\right)^{2}}\right)}{30}$ where *t=1* is the first-day of trading.
Lottery Pre-commitment	Takes a value 1 when anchor institutional investors pre-commit and allocation to non-anchor institutional investors is random. Zero when anchor institutional investors do not pre-commit.
Pro-rata Pre-commitment	Takes a value 1 when anchor institutional investors pre-commit and allocation to non-anchor institutional investors is proportional. Zero when anchor institutional investors do not pre-commit.
Filing-price Range	The price range set by the underwriter prior to the bidding phase.
Issue-price	The price at which IPO shares are offered to investors in the primary market
Issue-price Adjustment	(Issue-price / midpoint of Filing-price Range) –1.
Institutional Demand	Times IPO is oversubscribed by non-anchor institutional investors.
Retail Demand	Times IPO is oversubscribed by retail investors.
Issue Amount	Issue-price * number of shares issued.
Retained Equity	The ratio of majority shareholders' post-issue shares (%) to their pre-issue shares (%).
Underpricing	(The closing price on the first trading day / Issue price) –1.
EPS	Earnings-per-share reported in the prospectus.