

# **IPO underpricing in the primary market: Evidence from the Spanish market\***

**ABSTRACT** This study contributes to broadening the international scope of empirical research on IPO underpricing in the primary market. We investigate the primary underpricing for a sample of 67 IPOs placed on the Spanish stock market. In particular, we want to know whether the primary (offer-to-open) return is related to the climate of the stock market, the offer-specific characteristics and/or the firm-specific characteristics (i.e. with information asymmetries associated with offers and/or firms). Our findings reveal that the primary underpricing of IPOs are positively related to previous market return, market return during execution period, price adjustment, share adjustment and retained proportion, and negatively related to offering price, subscription proportion and offering size.

**JEL Classification** G12, G14, G24

**KEYWORDS** Initial public offerings (IPOs), initial underpricing, primary underpricing

## 1. Introduction

Most of the literature examining initial public offerings (IPOs) focuses on the analysis of the initial underpricing of these offerings during the first day of trading, computed from the offering price to the closing price on the first trading day. That is, the IPO initial return is defined as the first day closing price minus the offering price divided by the offering price (see Ritter and Welch, 2002, for an overview of the evidence). There are nevertheless a few studies that have analysed the IPO underpricing dividing the initial return (offer-to-close return) into the initial return of the primary market (offer-to-open return) and the initial return of the secondary market (open-to-close return), among which should be noted Barry and Jennings (1993), Chang et al. (2008), Bradley et al. (2009), Song et al. (2014) and Acedo and Ruiz-Cabestre (2014).

Barry and Jennings (1993) show that all the initial return of IPOs occurs at the opening transaction. They also demonstrate that this underpricing is solved by the price-setting process that establishes the opening price and, therefore, these offerings only create trading opportunities during the first trading day for investors able to obtain very favourable transaction costs. Later, Chang et al. (2008) find that the initial return in the secondary market during the first trading day is significantly positive (more specifically, 1.55%) and is positively related to the market return and negatively related to offering price. Bradley et al. (2009) also show that the IPO stock prices increase significantly, 2.35%, on the first trading day of secondary market and explore several possible non-mutually-exclusive hypotheses to explain their findings (price support, laddering, information asymmetry and retail sentiment). Song et al. (2014) find that average initial (offer-to-close) return is 66% and that the offer-to-open and open-to-close returns are between 14-22% and 44-53%, respectively<sup>1</sup>. Finally, Acedo and Ruiz-Cabestre (2014) find that the intraday or secondary (open-to-close) return, also on the first trading day, is significantly positive, 2.30%, and confirm the influence of the primary market over the secondary price formation process on the first trading day. In particular, they observe that the combination of cold and offer-to-open (primary) return variables allow to partly explain the intraday (open-to-close) price variation and their results

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<sup>1</sup> This article is not comparable with the other papers since it measures the primary and secondary returns based on the IPO firms' intrinsic values. They use two methods for assessing intrinsic values: analyst forecasts and comparisons to similar firms.

are fully consistent with the price support arguments for cold IPOs and, to a lesser degree, the cascade effect for hot IPOs.

In this context, we present our study, which investigates the primary price formation process for a sample of 67 IPOs placed on the Spanish stock market from January 1993 to December 2008, in order to contribute to broadening the international scope of empirical research on IPO underpricing in the primary market. In particular, as an important part of the movements of share prices on the first trading day on the Spanish stock market are determined by the reaction of investors (including underwriters) to the opening prices through the price support of underwriters, and the cascade effect of investors, (see Acedo and Ruiz-Cabestre, 2014), we analyse the underpricing of IPOs on the primary market. Thus, we use opening prices because closing prices are contaminated by the influence of the primary market over the secondary price formation process on the first trading day. More specifically, we want to know whether the primary underpricing is related to the climate of the stock market, the offer-specific characteristics and/or the firm-specific characteristics (i.e. with information asymmetries associated with offers and/or firms).

Our empirical findings show that two of the variables that represent the climate of the stock market (i.e. previous market return and market return during the execution period) exhibit a positive relationship with the underpricing of IPOs in the primary market. Furthermore, we find that price adjustment and shares adjustment have a positive relationship with the primary (offer-to-open) return, which is consistent with the argument that the return represents the payment for participating in the presale market revealing information (Benveniste and Spindt, 1989). The offering price has a negative impact on the offer-to-open return in the primary market since the higher the offering price, the less room for further price appreciation. We also confirm a negative relationship between the subscription proportion (new share issues or primary shares) and the primary (offer-to-open) underpricing because the dilution losses for old shareholders are proportional to the number of new (primary) shares being sold. One offer-specific characteristic, namely, the retained proportion reveals a positive relationship with the offer-to-open underpricing and suggests that firms with greater share retention will have greater primary return because the cost of underpricing for the issuer is lower (Barry, 1989; and Bradley and Jordan, 2002). Finally, the offering size shows a negative relationship with offer-to-open return (Bradley et al., 2009), which is consistent with the view that lower underpricing accrues to large firm with less information asymmetries (Lowry et al., 2010).

Our study differs from previous research in several ways. The first is that we only analyse the primary (offer-to-open) return to avoid the fact that underpricing in the secondary market is contaminated by movements and reactions of investors and underwriters to the opening prices on the first trading day, since Acedo and Ruiz-Cabestre (2014), also for a sample of Spanish IPOs, confirm the influence of the primary market over the secondary price formation process on the first trading day. Secondly, we include in our analysis variables that measure not only the previous market return but also the market returns during the execution period and the market return from the execution day to the opening day. A third difference is that we add new IPO characteristics, such as retail proportion and subscription proportion, to try to explain the primary underpricing, that have not been used by Barry and Jennings (1993), Chang et al. (2008) and Bradley et al. (2009). The fourth difference is that we use bootstrap procedures in order to provide robustness and to confirm our findings, given the limited number of observations in our sample of Spanish IPOs, despite including all IPOs during the analyzed period. The fifth and final difference is our research scenario since we analyse the underpricing of IPOs in a small order-driven market, which may differ from large price-driven markets both in size and microstructure characteristics.

The Spanish stock market, with the characteristic features of the French or German bank-oriented systems, differs considerably from the United States or Great Britain market-oriented Anglo-Saxon systems (Rajan and Zingales, 1995; and Saá-Requejo, 1996). In fact, the majority of Spanish firms use bank financing instead of capital markets to search for financing. This means that the degree of information asymmetry between the banks and firms is much lower, also taking into account that banking groups are usually among their shareholders. Moreover, the age at which Spanish firms transition to public status is much higher than the companies of the Anglo-Saxon countries<sup>2</sup>, which also implies lower degrees of information asymmetries. Furthermore, our firms have a more concentrated ownership structure, with less separation between property and control, making it easier for majority shareholders to monitor managerial performance and, thereby, reduce agency costs, whereas firms listed on the Anglo-Saxon stock markets tend to have less concentrated ownership structures. Finally, the legal system plays a key role in the protection of shareholders. Legal structures with little creditor protection exacerbate information asymmetries and contracting

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<sup>2</sup> More specifically, the average age of the firms in our sample is approximately twenty four years old compared to the companies stipulated in Bradley et al. (2009) which are approximately twelve years of age.

costs (La Porta et al., 1998; and Bancel and Mittoo, 2004). Bancel and Mittoo (2004) conclude that the Common-Law system (Anglo-Saxon markets) provides better protection for investors than the Civil-Law system (Spanish market). All these particular characteristics of the Spanish stock market may influence the underpricing of IPOs and the revelation of information during the process and justifies a specific analysis.

The paper is structured in five sections. Section two presents the theoretical framework and hypotheses. Section three shows the data base. Section four contains the empirical evidence. The final section summarises the main conclusions.

## **2. Theoretical framework and hypotheses**

It is well known that IPOs are underpriced (see, among others, Logue, 1973; Ibbotson, 1975; Ibbotson and Jaffe, 1975; Ritter, 1984; Miller and Reilly, 1987; Ibbotson et al, 1988; and Loughran and Ritter, 2002 and 2004). On average, the offer price of IPO shares is substantially lower than the closing price on the first day of trading. Several papers show that underpricing is an efficient response to problems of valuation of new firms entering the market in the presence of asymmetric information between firms, underwriters and investors (Rock, 1986; Beatty and Ritter, 1986; Benveniste and Spindt, 1989; and Welch, 1992).

Despite the voluminous IPO underpricing literature, there is little research focusing on the offer-to-close return distinguishing between two markets: the primary market (offer-to-open return) and the secondary market (open-to-close return). Thus, Barry and Jennings (1993), Chang et al. (2008), Bradley et al. (2009), Song et al. (2014) and Acedo y Ruiz-Cabestre (2014) divide the total (primary and secondary) return in the offer-to-open (primary) return and the open-to-close (secondary or intraday) return.

Barry and Jennings (1993) demonstrate that virtually all of the initial underpricing of IPOs (offer-to-close underpricing of 6.78%) occurs at the primary market (offer-to-open underpricing of 6.16%) and that the secondary market underpricing is only 0.60%. Thus, investors fortunate enough to be allocated shares at the offer price obtain virtually all of the initial underpricing. Chang et al. (2008) show that the secondary (open-to-close) return is 1.55% while the primary (offer-to-open) return is 121.78%, indicating that the initial return in the primary market is much more substantial than that on the first trading day (secondary market). Bradley et al. (2009) also found that the underpricing on the primary market (offer-to-open return of 27.50%) is higher than that of the secondary market (open-to-close return of

2.35%) with an average initial underpricing of 30.78% (offer-to-close return). Recently, Acedo and Ruiz-Cabestre (2014) point out that the underpricing of IPOs does not go beyond the first trading day and that the opening price of IPOs does not fully solve the underpricing of IPOs but that this phenomenon persists for the first trading day, showing a primary return of 8.03% higher than the secondary return of 2.30%.

Initially, all the valuation problems of new firms should be resolved at the beginning of the first trading day, thus affecting the offer-to-open return but not the open-to-close (intraday) return, which should be zero (Barry and Jennings, 1993). Indeed, Rock (1986) and Benveniste and Spindt (1989) point out in this direction. However, issues such as price support, the cascade effect and laddering could push the prices and returns upwards in the secondary market on the first trading day<sup>3</sup>. Therefore, closing prices on the first trading day will be contaminated by the movements and reactions of investors (including underwriters) to opening prices, so it does not seem appropriate to use these closing prices to evaluate the underpricing of IPOs. So, we work with opening prices since these prices are free of those movements. In particular, in order to try to determine which variables are behind the primary underpricing, we propose different variables and hypotheses concerning the climate of the stock market and offers and/or firm characteristics.

It is quite evident that the climate of the stock market is a variable that affects the development of IPOs and their underpricing. Previous studies show that there is a relationship between these variables. Bradley et al. (2009) find a positive relationship between the previous market return and the primary (offer-to-open) underpricing. We incorporate in our paper two more variables related to the climate of the stock market (i.e. market return during the execution period and market return from the execution day to the opening day) and formulate the following hypotheses:

H<sub>1a</sub>: *“A positive relationship is expected between previous market return and offer-to-open return”*

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<sup>3</sup> The price support will determine that in cold IPOs (IPOs with low return in the primary market) the open-to-close return will be greater the lower the offer-to-open return (Bradley et al., 2009; and Acedo and Ruiz-Cabestre, 2014). The cascade effect will determine that IPOs with a large offer-to-open return will have a high open-to-close return in the secondary market as investors try to “get on the bandwagon” (Barry and Jennings, 1993). Finally, laddering is a quid pro quo arrangement between the investors and the underwriter, according to which the latter allocates hot IPO shares to the former, and as a compensation for the allocation, the investors commit themselves to buy more shares of the IPO in the secondary market. This artificial buying behaviour can help the underwriter to provide price support for cold IPOs and price increase for hot IPOs (Hao, 2007).

H<sub>1b</sub>: “A positive relationship is expected between market return during the execution period and offer-to-open return”

H<sub>1c</sub>: “A positive relationship is expected between market return from the execution day to the opening day and offer-to-open return”

Since Beatty and Ritter (1986) suggested that IPOs characterised by higher information asymmetry would be more underpriced, this prediction has received considerable empirical support. For example, Lowry et al. (2010) find that information asymmetry, using offer- and firm-specific characteristics as proxies, affects the underpricing. For this reason, information asymmetry associated with offer-specific characteristics (i.e. price adjustment, share adjustment, price, retail proportion, subscription proportion and retained proportion) can help to explain the offer-to-open return in the primary market (Barry and Jennings, 1993; Chang et al. 2008; Bradley et al, 2009).

The adjustment in price and share number between the initial registration statement (prospectus) and their final value is a proxy for the amount of learning that occurs during the registration period (Lowry et al., 2010). Substantial learning (i.e. a higher value of price and share adjustment) is more likely for firms whose value is more uncertain. Thus, following Benveniste and Spind’s (1989) partial adjustment phenomenon and Hanley (1993), we propose the following hypothesis:

H<sub>2a</sub>: “A positive relationship is expected between price adjustment and offer-to-open return”

H<sub>2b</sub>: “A positive relationship is expected between share adjustment and offer-to-open return”

The offering price will have a negative impact on the offer-to-open return in the primary market since the higher the offering price, the less room for further underpricing. In addition, higher offering prices would exclude some investors with less capital (Chang et al., 2008). Therefore, we predict the following relationship:

H<sub>3</sub>: “A negative relationship is expected between offering price and offer-to-open return”

Advertisement of IPO operations in order to attract sentiment investors can provide important advantages to the issuer and the investors, since these marketing campaigns could

increase the stock prices, the firm valuation and the returns of investors (Cook et al., 2006). In the particular case of retail investors, their sentiments are not justified by the fact at hand but by an overoptimistic view about the operation that pushes the prices and return upwards (Bradley et al., 2009). So, the retail composition of the offering, which defines the ownership structure of the offering in terms of the percentage of uninformed investors, may have an important effect on its underpricing and, therefore, support retail sentiment arguments. Then, we include the following hypothesis:

H<sub>4</sub>: “A *positive relationship is expected between retail proportion and offer-to-open return*”

Habib and Ljungqvist (2001) point out that shareholders worry about underpricing due to dilution losses they endure on their retained shares which are proportional to the number of new shares being sold. They show that returns are lower the greater the increase in shares outstanding as a result of the issuance of primary shares. Ljungqvist and Wilhelm (2003) also find empirical evidence that underpricing is more severe when the number of primary shares sold is lower. Thus, we propose the following relationship:

H<sub>5</sub>: “A *negative relationship is expected between subscription proportion and offer-to-open return*”

The economic cost of underpricing is lower the greater the retained shares are, because only the sold shares are undervalued (Bradley and Jordan, 2002). This negative relationship between retained proportion and the cost of underpricing to the issuer suggests that companies with greater share retention will have greater underpricing (Barry, 1989; and Bradley and Jordan, 2002). Bradley et al. (2009) find that primary (offer-to-open) return is positively related to the share retention variable. Therefore, we formulate the following relationship:

H<sub>6</sub>: “A *positive relationship is expected between retained proportion and offer-to-open return*”

Lowry et al. (2010) posit that there is a positive relationship between the difficulty of valuing a firm (for example, small, young and tech firms) and the underpricing. Therefore, among the firm-specific characteristics that could influence the offer-to-open return, we include the offering size, age and high-tech industry, which are the same variables used by Bradley et al. (2009).

Less information tends to be available about smaller IPOs, suggesting that investors will have more difficulty valuing such issues (Lowry et al., 2010). Firm size may also influence the offer-to-open return, since small firms are difficult to price due to a greater information asymmetry (Bradley et al., 2009). Therefore, we propose the following relationship:

H<sub>7</sub>: “*An inverse relationship is expected between the offering size and offer-to-open return*”

Furthermore, older companies present lower information asymmetry. There is likely to be more uncertainty regarding the pricing of the stocks of young firms (Bradley et al., 2009; Lowry et al., 2010). Thus, we predict the following relationship:

H<sub>8</sub>: “*An inverse relationship is expected between firm age and offer-to-open return*”

The value of technology firms tends to be much harder to estimate precisely because it depends on growth options (Bradley et al., 2009; and Lowry et al., 2010). Thus, we include the following hypothesis:

H<sub>9</sub>: “*A positive relationship is expected between tech firms and offer-to-open return*”

### **3. Data and descriptive statistic**

The sample consists entirely of IPOs by firms listed on the Spanish continuous market from 1993 to 2008. The reason for the selection of the SIBE (Spanish Stock Market Interlinking System), or continuous market, was to avoid problems with different trading systems. Another important reason is the greater liquidity of the stocks traded, since the continuous market represents approximately 99% of all stock market trading in Spain.

Table A1 in the appendix lists the sample companies and the main data. That is, offered firm, type of operation (i.e. N new share offering and/or S secondary share offering), year, main offering shareholder, initiation or registration date, first trading day date and number of shares allocated. A total of 71 IPOs were made over the study period (1993-2008). Some of them were affected by other events very close to the IPO that might distort the results of the analysis. For example, new share offerings or share listings. Any IPO featuring one of these effects was eliminated from the sample. Of the 71 IPOs originally considered for the study, 67 were found to be entirely free of any such effects.

All data relative to IPO characteristics and conditions were obtained from the records

of the *Comisión Nacional del Mercado de Valores* (National Stock Exchange Commission) and Madrid Stock Exchange price bulletins. The remaining daily stock market data that was required was provided by the *Sociedad de Bolsas* (Stock Exchanges Company).

[Insert Table 1]

Table 1 shows the year by year distribution of IPOs and the descriptive statistics of the main IPO characteristics. The year by year distribution (panel A) shows a high level of IPO activity during 1997-1999 and 2006-2007 periods. Panel B gives a brief overview of the main IPO variables. The first two variables, the offered and allocated number of shares, point out that there has been a slight overallocation of shares in the IPOs, confirmed by its mean and median values. The same can be said for the price, since the price of the allotted shares exceeds the price of the offered shares. The size of allocated offering reveals very different mean and median values (i.e. a mean value of 549,134 thousand € and a median value 243,697 thousand €) with a variation ranging between 15,002 and 4,070,463 thousand €. The retail proportion, which is the number of shares allocated in the retail tranche relative to the total shares allocated, reflects mean and median values very closely with a variation ranging between 0% and 100%. The importance of this variable stems from the fact that it defines the ownership structure of allocated offerings by fixing the proportion of shares allocated to small shareholders. The subscription proportion, which measures the ratio of new shares subscribed relative to the total shares allocated, presents very different mean and median values with a variation ranging between 0% and 100%. Finally, the retained proportion, which is the number of shares retained by the pre-IPO owners relative to the number of outstanding shares, shows a median value lightly higher than the mean value with a variation ranging 0% and 92.5%.

#### **4. Empirical evidence**

We are interested in analysing the primary underpricing experienced by Spanish IPOs. So, we study the primary returns of IPOs, computed from the offering price to the opening price in the first trading day. Table 2 presents the offer-to-open returns of IPOs and shows that the mean and median values are positive and statistically significant, as is confirmed by the statistical test of the mean and median. Furthermore, we have observed that there is a positive asymmetry in the distribution of primary (offer-to-open) return.

[Insert Table 2]

To try to explain what factors are behind the primary price formation process, we propose the following regression model:

Offer-to-open return  $_i = \beta_0 + \beta_1 \cdot$  Previous market return  $_i + \beta_2 \cdot$  Market return during the execution period  $_i + \beta_3 \cdot$  Market return from the execution day to the opening day  $_i + \beta_4 \cdot$  Price adjustment  $_i + \beta_5 \cdot$  Share adjustment  $_i + \beta_6 \cdot$  Log price  $_i + \beta_7 \cdot$  Retail proportion  $_i + \beta_8 \cdot$  Subscription proportion  $_i + \beta_9 \cdot$  Retained proportion  $_i + \beta_{10} \cdot$  Log size  $_i + \beta_{11} \cdot$  Age  $_i + \beta_{12} \cdot$  Tech  $_i + \varepsilon_i$

This model incorporates variables related to the climate of the stock market (i.e. previous market return, market return during the execution period and market return from the execution day to the opening day), the offer-specific characteristics (i.e. price adjustment, share adjustment, log price, retail proportion, subscription proportion and retained proportion) and/or the firm-specific characteristics (i.e. log size, age and tech), as proxies of asymmetric information. The second column of Table 3 shows the results of this regression. These results reveal that the signs of the regression coefficients of the significant variables are those expected, and confirm the a-first, second, fifth and seventh hypotheses. However, an analysis of the regression residuals shows the existence of two outliers in the regression analysis (i.e. Adolfo Dominguez y Gamesa) that justify the low degree of explanation of the model (see R-squared and Adjusted R-squared).

[Insert Table 3]

To try to solve this problem, we may choose to incorporate two dummy variables that capture the singularity of these two IPOs or to remove these two IPOs. Both options are shown in Table 3 (see third and fourth columns). The results show a significant increase in the degree of explanation of both models. Furthermore, two variables that were not significant in the previous analysis, namely, the market return during execution period and the retained proportion, are now significant and a third variable, namely, the log price, is at the limit of being significant.

The previous market return is the cumulative market return during the three months prior to the initiation or registration date of the offering, the market return during the execution period is the cumulative market return from the initiation or registration date of the offering to the execution date of the offering, while the market return from the execution day

to the opening day is the cumulative market return from the execution date to the opening price on the first trading day. Bradley et al. (2009) find a positive relationship between the cumulative market return for the fifteen days prior to the IPO date and the offer-to-open (primary) return. We also find a significant positive relationship with the previous cumulative market return and the market return during execution period but not with the market return from the execution date to the opening price on the first trading day because its positive relationship is not significant. Therefore, our findings support a- and b-first hypothesis but not c-first hypothesis.

The price adjustment is the offering price relative to the middle of the original range of the offering price in the prospectus, while the share adjustment is the number of shares allocated relative to the original number of shares offered in the prospectus, ignoring the overallotment option. Hanley (1993) finds empirical evidence that IPOs that are adjusted upward in price and shares offered experience greater underpricing than other offers. Barry and Jennings (1993) indicate that investors revealing favourable private information in the registration period about their private demand are not penalized by the issuer/underwriter with a revised offering price that eliminates the value of the information. They also find that the information contained in the offering price adjustment process is fully reflected in the opening price. Indeed, we expect a large underpricing in the primary market (offer-to-open return) because the return represents the payment for participating in the presale market revealing information (Benveniste and Spindt, 1989). In particular, we find that price adjustment and shares adjustment have a significantly positive relationship with the primary underpricing and, therefore, our evidence supports the second hypothesis. These results are consistent with Benveniste and Spindt (1989) arguments and with the empirical evidence of Barry and Jennings (1993) and Bradley et al. (2009) in relation to price adjustment.

The log price is the log of offering price adjusted by inflation. We expect the offering price will have a negative impact on the offer-to-open (primary) return since the higher the offering price the less room for further price appreciation. In addition, higher offering prices would exclude some investors with less capital. Our findings point in this direction but the significance level is at the limit, since the model with Adolfo Dominguez and Gamesa dummies shows a significance level slightly above 10%. Therefore, the support for the third hypothesis is not as obvious as in the other hypotheses.

The retail proportion is the number of shares allocated in the retail tranche relative to the total shares allocated. This variable defines the ownership structure of offerings by fixing the proportion of shares offered to small shareholders. Therefore, a higher underpricing is expected when retail proportion is higher. In particular, uninformed small investors must incur some additional cost in order to collect information and therefore they will not be induced to participate unless a higher degree of price reduction is offered (O'Hara, 1995). Furthermore, Bradley et al. (2009) indicate that the sentiments of the retail investors that are not justified by the facts but by an overoptimistic view about the operation pushes the prices and return upwards. We find a positive but not significant relationship. Therefore, our findings do not confirm the fourth hypothesis.

The subscription proportion is the number of new shares subscribed relative to the total allocated shares. Habib and Ljungqvist (2001) argue that owners care about underpricing to the extent that they stand to lose from it and that any such losses (i.e. dilution losses on retained shares) are proportional to the number of primary (new) shares being sold. They show that returns are lower the greater the increase in shares outstanding as a result of the issuance of primary shares. Ljungqvist and Wilhelm (2003) suggest and find empirical evidence that underpricing is more severe when current shareholders have less at stake in the level of the offer price and return or when the number of primary shares sold is lower. Therefore, there should be a negative relationship between the proportion of shares subscribed (new issue or primary shares) and the level of underpricing. In accordance with this argument, we find a significant negative relationship between the subscription proportion and the primary (offer-to-open) underpricing, which supports the fifth hypothesis.

The retained proportion is the number of shares retained by the pre-IPO owners relative to the number of outstanding shares. In IPO companies do not sell all their outstanding shares but usually only a portion of them. Only the shares actually sold to the public are undervalued. But the unsold shares (retained shares) are not under-valued, they are valued at market prices. Thus, for a given degree of underpricing, the economic cost (the dilution of value to the issuer due to the underpricing) per retained share declines as share retention rises (Bradley and Jordan, 2002). This negative relationship between retained proportion and the cost of underpricing to the issuer suggests that companies with greater share retention will have greater underpricing (Barry, 1989; and Bradley and Jordan, 2002). The empirical evidence shows that market participants experience higher underpricing the

higher the share retention variable is (Bradley and Jordan, 2002). In particular, Bradley et al. (2009) also find that primary underpricing is positively related to the share retention variable. Our results also confirm this relationship and support the sixth hypothesis.

The log size is the log of offering size adjusted by inflation. Small firms are difficult to price due to greater information asymmetry (Bradley et al. 2009). Therefore, less information tends to be available about smaller IPOs, suggesting that underwriters will have more difficulty valuing such issues (Lowry et al., 2010). The empirical evidence shows that offer size is negatively related to primary (offer-to-close) return (Bradley et al., 2009). We also find a significant negative relationship between offering size and primary underpricing, supporting the seventh hypothesis.

The age is the age of the firm in years from its creation date to the offering date. Like the preceding variable, young firms are difficult to price due to greater information asymmetry. Old companies present lower information asymmetry. There is likely to be more uncertainty regarding the pricing of the stocks of young firms (Lowry et al., 2010). The empirical evidence shows that market participants experience lower underpricing the higher the firm age (Lowry et al., 2010). Bradley et al. (2009) also find lower primary (offer-to-close) return the higher the firm age. In our study we find a negative but not significant relationship. Therefore, our findings do not support the eighth hypothesis.

The tech variable is a binary variable equal to one if the offering firm's business is in a high-tech industry and zero otherwise. The value of technology firms tends to be much harder to estimate precisely because it depends on growth options (Lowry et al., 2010). The empirical evidence shows that high-tech firms are more significantly underpriced than their non-tech counterparts (Bradley and Jordan 2002; Bradley et al., 2009; and Lowry et al., 2010). Bradley et al. (2009) also find this relationship with primary underpricing. We find a positive but not significant relationship. That is, our findings do not support the ninth hypothesis.

In order to provide robustness, we have repeated the analysis excluding those variables that were not significant. The results, summarized in Table 4, again support our previous results mentioned above and confirm a- and b-first, second, fifth, sixth and seventh hypotheses, while the third hypothesis is at the limit of confirmation. Besides, the variance inflation factor (VIF) reveals that there are no problems of multicollinearity among the independent variables. That is, the results from the multivariate analysis provide evidence that

primary returns of IPOs are positively related to previous market return, market return during execution period, price adjustment, share adjustment and retained proportion, and negatively related to subscription proportion and offering size. Furthermore, these results are near the limit of confirming the negative relationship of the primary return with the offering price.

[Insert Table 4]

Finally, given the limited number of observations and to increase the robustness of our findings, these same analyses were repeated using bootstrap procedures. In particular, we use the bootstrap technique to obtain the average values of the regression coefficients and the simulated p-values. The actual procedure was to perform 1,000 OLS regressions with 67 and 65 observations per regression extracted with replacement. The p-values were obtained using the standard bootstrap percentile test procedure, which retains the essentially non-parametric nature of the bootstrap approach without imposing parametric assumptions on the distribution. The results, included in Table 5, clearly allow us to support our previous results mentioned above and confirm the significance of the offering price variable, although the significance level is again at the limit when Adolfo Dominguez and Gamesa IPOs are excluded (see third column of Table 5).

[Insert Table 5]

In summary, the results from the multivariate analysis provide evidence that the primary returns of IPOs are positively related to previous market return, market return during execution period, price adjustment, share adjustment and retained proportion, and negatively related to offering price, subscription proportion and offering size.

## **5. Conclusion**

In this paper, we investigate the primary price formation process for a sample of 67 IPOs placed in the Spanish stock market from January 1993 to December 2008, in order to contribute to broadening the international scope of empirical research on IPO underpricing in the primary market. In particular, we are interested in analysing the underpricing of IPOs in the primary market because an important part of the movements of share prices on the first trading day on the Spanish stock market are determined by the reaction of investors (including underwriters) to the opening prices through the price support of underwriters and the cascade effect (see Acedo and Ruiz-Cabestre, 2014). That is, we do not want contamination of IPO underpricing by movements and reactions of the secondary market on the first trading day to

the primary market. More specifically, we want to know which variables are behind the primary underpricing and, to this end, we include in our model variables related to the climate of the stock market (i.e. previous market return, market return during the execution period and market return from the execution day to the opening day), the offer-specific characteristics (i.e. price adjustment, share adjustment, log price, retail proportion, subscription proportion and retained proportion) and/or the firm-specific characteristics (i.e. log size, age and tech), as proxies of asymmetric information.

Our results, after solving the impact of two outliers, show that two of the variables that represent the climate of the stock market (i.e. previous market return and market return during the execution period) have a positive relationship with the underpricing of IPOs in the primary market. Furthermore, we find that price adjustment and shares adjustment have a positive relationship with the primary return, which is consistent with the argument that this return represents the payment for revealing information in the presale market. The offering price has a negative impact on the primary underpricing, although this argument is not as obvious as other arguments. We also confirm a negative relationship between the subscription proportion (new share issues or primary share) and the primary underpricing because the dilution losses are proportional to the number of new/primary shares being sold. Retained proportion is positively related to the primary underpricing and suggests that firms with greater share retention will have greater primary return because their cost of underpricing is lower. Finally, the offering size shows a negative relationship with primary underpricing, which is consistent with the view that large firms, having less information asymmetries, have lower underpricing.

Furthermore, the results obtained, after removing the insignificant variables, with or without bootstrap procedures, provide robustness and confirm our previous findings.

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## Appendix

[Insert Table A1]

**Table 1.- Summary statistics for sample of IPOs in Spain (1993-2008)**

Panel A: Distribution of IPOs by year		
Year	Number	Proportion (%)
1993	1	1.493
1994	4	5.970
1995	0	0.000
1996	3	4.478
1997	7	10.448
1998	9	13.433
1999	10	14.925
2000	5	7.463
2001	2	2.985
2002	1	1.493
2003	1	1.493
2004	3	4.478
2005	1	1.493
2006	10	14.925
2007	10	14.925
2008	0	0.000
Total	67	100.000

Panel B: Descriptive statistics of IPO characteristics					
Variable	Mean	Median	Min.	Max.	Standard deviation
Number of shares offered (thousands)	60,384	16,157	640	768,012	135,504
Number of shares allocated (thousands)	64,856	16,667	640	768,012	143,348
Price of shares offered (€)	15.07	13.46	1.93	55.59	8.89
Price of shares allocated (€)	15.22	13.64	1.19	61.62	9.49
Size of allocated offering (thousands of €)	549,134	243,697	15,002	4,070,463	870,098
Retail proportion of allocated offering (%)	28.693	28.497	0.000	100.000	24.951
Subscription proportion of allocated offering (%)	24.081	0.000	0.000	100.000	34.213
Retained proportion of allocated offering (%)	62.355	65.427	0.000	92.500	19.089

This table contains the summary statistics for the final sample of IPOs, which is made up of 67 IPOs after excluding offerings which presented other operations very close to the IPO (i.e. new share offerings and listing shares). The relative size is the number of shares allocated relative to the number shares outstanding. The retail proportion is the number of shares allocated in the retail tranche relative to total shares allocated. The subscription proportion is the number of new shares subscribed relative to total shares allocated. The retained proportion is the number of shares retained by the pre-IPO owners relative to number of outstanding shares.

**Table 2.- Offer-to-open (primary) return of IPOs**

Statistic	Mean	1 <sup>st</sup> quartile	Median	3 <sup>rd</sup> quartile	Positive returns	t-statistic <sup>(1)</sup>	Chi-squared <sup>(2)</sup>
Offer-to-open return	8.025%	-1.009%	3.212%	14.039%	64.179%	3.478***	5.388***

This table contains the offer-to-open (primary) return. The offer-to-open (primary) return for every IPO is the return from the offering price to the opening price. (1) The null hypothesis is that the mean is equal to zero. (2) The null hypothesis is that the median is equal to zero. \*\*\* Significance at the 1% level.

**Table 3.- Analysis of offer-to-open return: IPO underpricing in the primary market**

Independent variables	Regression results of offer-to-open return variable			
	All IPOs (N = 67)	With dummy variables for Adolfo Dominguez and Gamesa IPOs (N = 67)	Without Adolfo Dominguez and Gamesa IPOs (N =65)	Hypothesis / Support
Constant	-0.547964 (0.065)*	-0.508749 (0.047)**	-0.508749 (0.044)**	--- / ---
Previous market return	0.408315 (0.013)**	0.311999 (0.001)**	0.311999 (0.001)**	H1a (+) / Yes
Market return during the execution period	0.413798 (0.194)	0.500681 (0.042)**	0.500681 (0.039)**	H1b (+) / Yes
Market return from the execution day to the opening day	0.85268 (0.572)	0.516741 (0.626)	0.516741 (0.621)	H1c (+) / No
Price adjustment	0.496397 (0.003)**	0.430192 (0.002)**	0.430192 (0.002)**	H2a (+) / Yes
Share adjustment	0.624987 (0.010)**	0.473975 (0.001)**	0.473975 (0.001)**	H2b (+) / Yes
Log price	-0.031352 (0.208)	-0.031855 (0.101)	-0.031855 (0.096)*	H3 (-) / ?
Retail proportion	0.107878 (0.192)	0.058570 (0.195)	0.058570 (0.188)	H4 (+) / No
Subscription proportion	-0.132567 (0.082)*	-0.065085 (0.084)*	-0.065085 (0.080)*	H5 (-) / Yes
Retained proportion	0.015139 (0.926)	0.125263 (0.023)**	0.125263 (0.021)**	H6 (+) / Yes
Log size	-0.025063 (0.060)*	-0.020860 (0.050)**	-0.020860 (0.046)**	H7 (-) / Yes
Age	-0.000952 (0.394)	-0.000042 (0.934)	-0.000042 (0.933)	H8 (-) / No
Tech	0.016388 (0.736)	0.010146 (0.758)	0.010146 (0.755)	H9 (-) / No
Adolfo Dominguez dummy		1.161504 (0.000)**		
Gamesa dummy		0.338837 (0.000)**		
R-squared (%)	28.517	84.621	51.841	
Adjusted R-squared (%)	12.632	80.481	40.727	

This table presents the regression results of offer-to-open return variable. Offer-to-open (primary) return is the return from the offering price to the opening price on the first trading day. Previous market return is the cumulative market return during the three months prior to the initiation or registration date of the offering. Market return during the execution period is the cumulative market return from the initiation or registration date of the offering to the execution date of the offering. Market return from the execution day to the opening day is the cumulative market return from the execution date to the opening price on the first trading day. Price adjustment is the offering price relative to the middle of the original range of the offering price in the prospectus. Share adjustment is the number of shares allocated relative to the original number of shares offered in the prospectus, ignoring the overallotment option. Log price is the log of offering price adjusted by inflation (i.e. expressed in monetary units of 1993). Retail proportion is the number of shares allocated in the retail tranche relative to total shares allocated. Subscription proportion is the number of new shares subscribed relative to total shares allocated. Retained proportion is the number of shares retained by the pre-IPO owners relative to the number of outstanding shares. Log size is the log of offering size adjusted by inflation (i.e. expressed in monetary units of 1993). Age is the age of the firm in years from its creation date to the offering date. Tech is a binary variable equal to one if the offering firm's business is in a high-tech industry and zero otherwise. White (1980) heteroskedasticity-consistent standard errors are used and p-values are reported in parentheses. \*\*\* significance at the 1% level. \*\* significance at the 5% level. \* significance at the 10% level.

**Table 4.- Analysis of offer-to-open return for significant independent variables**

Independent variables	Regression results of offer-to-open return variable				
	With dummy variables for Adolfo Dominguez and Gamesa IPOs (N = 67)	Variance inflation factor (VIF)	Without Adolfo Dominguez and Gamesa IPOs (N = 65)	Variance inflation factor (VIF)	Hypothesis / Support
Constant	-0.505842 (0.023)**	---	-0.505842 (0.021)**	---	--- / ---
Previous market return	0.305580 (0.001)***	1.525	0.305580 (0.001)***	1.500	H1a (+) / Yes
Market return during the execution period	0.482796 (0.044)**	1.126	0.482796 (0.041)**	1.109	H1b (+) / Yes
Price adjustment	0.411247 (0.001)***	1.430	0.411247 (0.001)***	1.404	H2a (+) / Yes
Share adjustment	0.505401 (0.000)***	1.363	0.505401 (0.000)***	1.352	H2b (+) / Yes
Log price	-0.028560 (0.110)	1.449	-0.028560 (0.105)	1.437	H3 (-) / ?
Subscription proportion	-0.061125 (0.051)*	1.123	-0.061125 (0.048)**	1.106	H5 (-) / Yes
Retained proportion	0.134097 (0.003)***	1.198	0.134097 (0.002)***	1.143	H6 (+) / Yes
Log size	-0.021591 (0.020)**	1.381	-0.021591 (0.018)**	1.375	H7 (-) / Yes
Adolfo Dominguez dummy	1.167139 (0.000)***	1.067			
Gamesa dummy	0.338202 (0.000)***	1.044			
R-squared (%)	84.027		49.981		
Adjusted R-squared (%)	81.175		42.835		

This table presents the regression results of offer-to-open return variable. Offer-to-open (primary) return is the return from the offering price to the opening price on the first trading day. Previous market return is the cumulative market return during the three months prior to the initiation or registration date of the offering. Market return during the execution period is the cumulative market return from the initiation or registration date to the execution date of the offering. Price adjustment is the offering price relative to the middle of the original range of the offering price in the prospectus. Share adjustment is the number of shares allocated relative to the original number of shares offered in the prospectus, ignoring the overallocation option. Log price is the log of offering price adjusted by inflation (i.e. expressed in monetary units of 1993). Subscription proportion is the number of new shares subscribed relative to total shares allocated. Retained proportion is the number of shares retained by the pre-IPO owners relative to the number of outstanding shares. Log size is the log of offering size adjusted by inflation (i.e. expressed in monetary units of 1993). White (1980) heteroskedasticity-consistent standard errors are used and p-values are reported in parentheses. \*\*\* significance at the 1% level. \*\* significance at the 5% level. \* significance at the 10% level.

**Table 5.- Analysis of offer-to-open return for significant independent variables and 1,000 bootstrap OLS regressions**

Independent variables	Regression results of offer-to-open return variable		
	With dummy variables for Adolfo Dominguez and Gamesa IPOs (N = 67)	Without Adolfo Dominguez and Gamesa IPOs (N = 65)	Hypothesis / Support
Constant	-0.509037 (0.006)***	-0.505286 (0.017)**	--- / ---
Previous market return	0.298247 (0.002)***	0.291599 (0.007)***	H1a (+) / Yes
Market return during the execution period	0.495967 (0.012)**	0.503275 (0.021)**	H1b (+) / Yes
Price adjustment	0.411588 (0.001)***	0.413164 (0.001)***	H2a (+) / Yes
Share adjustment	0.509436 (0.002)***	0.503855 (0.001)***	H2b (+) / Yes
Log price	-0.026489 (0.077)*	-0.026286 (0.099)*	H3 (-) / Yes
Subscription proportion	-0.058223 (0.040)**	-0.060680 (0.031)**	H5 (-) / Yes
Retained proportion	0.121055 (0.029)**	0.121351 (0.019)***	H6 (+) / Yes
Log size	-0.021535 (0.008)***	-0.021495 (0.015)**	H7 (-) / Yes
Adolfo Dominguez dummy	1.172312 (0.000)***		
Gamesa dummy	0.343286 (0.000)***		

This table presents the regression results of offer-to-open return variable. Offer-to-open (primary) return is the return from the offering price to the opening price on the first trading day. Previous market return is the cumulative market return during the three months prior to the initiation or registration date of the offering. Market return during the execution period is the cumulative market return from the initiation or registration date to the execution date of the offering. Price adjustment is the offering price relative to the middle of the original range of the offering price in the prospectus. Share adjustment is the number of shares allocated relative to the original number of shares offered in the prospectus, ignoring the overallotment option. Log price is the log of offering price adjusted by inflation (i.e. expressed in monetary units of 1993). Subscription proportion is the number of new shares subscribed relative to total shares allocated. Retained proportion is the number of shares retained by the pre-IPO owners relative to the number of outstanding shares. Log size is the log of offering size adjusted by inflation (i.e. expressed in monetary units of 1993). The coefficients are the average values of the coefficients of 1,000 bootstrap OLS regressions and simulated p-values are reported in parentheses. \*\*\* significance at the 1% level. \*\* significance at the 5% level. \* significance at the 10% level.

**Table A1.- Sample of IPOs in Spain (1993-2008)**

Share offered	Type of operation	Year	Main offering shareholder	Initiation date	First trading day date	Shares allocated
Argentaria	S	1993	Soc. Est. de Patrimonio I	12/04/93	12/05/93	31,362,450
Continente	S	1994	Several	24/02/94	17/03/94	14,400,000
Cortefiel	S	1994	Several	16/06/94	08/07/94	4,911,534
Gines Navarro	S	1994	Corp. Financiera Alba	20/10/94	17/11/94	2,445,000
Mapfre Vida	S	1994	Corporación Mapfre	22/11/94	23/12/94	1,200,000
E. e I. Aragonesas <sup>(1)</sup>	S	1995	Uralita	07/02/95	20/02/95	20,000,000
Sol Meliá	N	1996	Sol Meliá	04/06/96	02/07/96	14,190,000
Tele Pizza	S	1996	Several	25/10/96	13/11/96	4,829,816
Abengoa	S	1996	Several	12/11/96	29/11/96	1,972,633
Miquel y Costas <sup>(1)</sup>	N and S	1996	Several	15/11/96	27/11/96	2,034,162
Adolfo Domínguez	S	1997	Several	28/02/97	18/03/97	5,976,240
Barón de Ley	S	1997	Several	01/07/97	16/07/97	5,407,860
Cvne	N and S	1997	Several	04/07/97	17/07/97	640,020
Bodegas Riojanas	S	1997	Several	12/09/97	30/09/97	2,158,055
Aldeasa	S	1997	Soc. Est. de Partic. Patrim. (Seppa)	12/09/97	01/10/97	15,000,000
Iberpapel	N and S	1997	Iberpapel Gestión	14/11/97	28/11/97	3,872,629
Aceralia <sup>(1)</sup>	S	1997	Soc. Est. de Partic. Indust. (Sepi)	21/11/97	10/12/97	71,256,154
Dinamia	N and S	1997	Dinamia	27/11/97	15/12/97	9,000,000
Dogi	S	1998	Several	15/01/98	21/01/98	3,639,200
Fastibex	N	1998	Fatibex	26/03/98	06/04/98	825,000
Meliá Inversiones	N and S	1998	Meliá Inversiones	27/03/98	08/04/98	4,151,319
Superdiplo	N and S	1998	Superdiplo	29/04/98	14/05/98	14,315,764
Befesa	S	1998	Befesa	16/06/98	01/07/98	6,907,280
Europa&C	S	1998	Ardagan and Settsu Europe	26/06/98	10/07/98	12,571,578
Federico Paternina	S	1998	Marcos Eguizabal and B. Barón	04/09/98	16/09/98	1,842,836
Enaco	S	1998	Several	24/11/98	11/12/98	6,590,400
Funespaña	N and S	1998	Several	01/12/98	11/12/98	3,449,084
Transportes Azkar	S	1999	Azkar and others	21/01/99	03/02/99	14,576,000
Indra Sistemas	S	1999	Soc. Est. de Partic. Indust. (Sepi)	05/03/99	23/03/99	48,877,483
Grupo Ferrovial	N and S	1999	Grupo Ferrovial and others	15/04/99	05/05/99	48,117,540
Mecalux	N and S	1999	Several	16/04/99	06/05/99	8,820,300
Parques Reunidos	N and S	1999	Parques Reunidos	14/05/99	26/05/99	21,274,344
Tpi	S	1999	Telefónica	04/06/99	23/06/99	42,912,275
Red Eléctrica de Esp.	S	1999	Soc. Est. de Partic. Indust. (Sepi)	18/06/99	07/07/99	47,344,500
Sogetecable	N and S	1999	Sogetecable and others	30/06/99	21/07/99	24,255,940
Amadeus	N and S	1999	Several	01/10/99	19/10/99	147,500,000
Inmobiliaria Colonial	S	1999	La Caixa	08/10/99	27/10/99	32,000,000
Terra Networks <sup>(1)</sup>	S	1999	Terra Networks	29/10/99	17/11/99	66,076,415
Prisa	S	2000	Several	07/06/00	28/06/00	43,762,500
European Aeronautic	N and S	2000	Several	22/06/00	10/07/00	144,807,407
Recoletos	N and S	2000	Recoletos and Pearsons Overseas H.	03/10/00	25/10/00	25,475,000
Gamesa	S	2000	Several	11/10/00	31/10/00	24,329,990
Telefónica Móviles	N	2000	Telefónica Móviles	02/11/00	22/11/00	345,000,000
Iberia	S	2001	Soc. Est. de Partic. Indust. (Sepi)	16/03/01	03/04/01	482,430,511
Inditex	S	2001	Several	27/04/01	23/05/01	162,645,600
Enagas	S	2002	Gas Natural	10/06/02	26/06/02	141,091,948
Antena 3 TV	S	2003	Telefónica	17/10/03	29/10/03	16,666,800
Fadesa Inmobiliaria	S	2004	Fadesa Inmobiliaria	13/04/04	30/04/04	40,425,863
Telecinco	S	2004	Telecinco and others	08/06/04	24/06/04	85,313,421
Cintra	N and S	2004	Cintra and Milsa	08/10/04	27/10/04	186,475,841
Corp. Dermoestética	S	2005	Corp. Dermoestética	28/06/05	13/07/05	17,265,992
Renta Corp.	N and S	2006	Renta Corp.	16/03/06	05/04/06	8,280,000
Parquesol Inmobiliaria	N and S	2006	Parquesol Inmobiliaria	19/04/06	05/05/06	12,381,543
Grifols	N	2006	Grifols	26/04/06	17/05/06	78,000,000
Astroc Mediterraneo	S	2006	CV Capital	12/05/06	24/05/06	30,297,500
Gam	N and S	2006	Gral. de Aquiler de Maquinaria	25/05/06	13/06/06	13,750,000
Técnicas Reunidas	S	2006	Técnicas Reunidas	02/06/06	21/06/06	21,284,962
Bme	S	2006	Bolsas and Mercados Españoles	29/06/06	14/07/06	25,139,996
Riofisa	S	2006	Riofisa	05/07/06	19/07/06	13,538,717
Vocento	S	2006	Vocento	20/10/06	08/11/06	22,231,563
Vueling Airlines	N and S	2006	Vueling Airlines	16/11/06	01/12/06	7,009,148
Clínica Baviera	S	2007	Clínica Baviera	15/03/07	03/04/07	6,739,187
Realia Business	S	2007	Realia Business	18/05/07	06/06/07	120,494,148
Solaria Energía	N	2007	Solaria Energía	31/05/07	19/06/07	26,894,667
Laboratorios Almirall	N and S	2007	Laboratorios Almirall	31/05/07	20/06/07	49,829,583
Criteria CaixaCorp	N	2007	Criteria CaixaCorp	20/09/07	10/10/07	733,019,037
Codere	N and S	2007	Codere	04/10/07	19/10/07	11,236,291
Fluidra	S	2007	Fluidra	11/10/07	31/10/07	45,949,779
Renta 4	N and S	2007	Renta 4	25/10/07	14/11/07	9,821,918
Labrat. Farm. Rovi	S	2007	Laboratorios Farm. Rovi	15/11/07	05/12/07	18,381,943
Iberdrola Renovables	N	2007	Iberdrola Renovables	22/11/07	13/12/07	768,011,800

Notes: (1) Denotes that the offering was dropped from the sample. Although the original sample included 71 IPOs over the period 1993-2008, the final sample numbered 67 IPOs free of any other operation very close to the IPO that might distort the results of analysis (i.e. new share offerings and listing shares). N indicates that the IPO only contains new shares (subscription). S indicates that the IPO only contain secondary shares (sale). N and S indicate that the IPO contains new and secondary shares.