Influence of IPO Characteristics on Liquidity and Trading Activity

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2011

ABSTRACT: This study examines the relationship between the characteristics that define initial public offerings (IPOs) and the post-offering liquidity of stocks outstanding. We argue that higher underpricing, relative size and retail composition of the offerings will result in higher post-listing liquidity. Based on a sample of Spanish IPOs, our results reveal that liquidity can be explained by a set of IPO characteristics. Furthermore, the results remain robust after removing the market effect and adding other IPO characteristics, such as stabilization agreements, lockup restrictions and the reputation of underwriters, insurers and auditors.

1. Introduction

Most of the literature examining initial public offerings (IPOs) focuses on the analysis of two anomalies: the initial underpricing of these offerings (see Ritter and Welch, 2002, for an overview of the evidence) and the low long-run returns that they deliver (Ritter, 1991; and Gompers and Lerner, 2003)[1]. There are nevertheless a few studies that have analysed the influence of IPO characteristics on the liquidity of shares outstanding[2], this being one of the objectives IPOs are meant to achieve.

Liquidity, among other factors, has been analysed by Miller and Reilly (1987), Hanley (1993) and Schultz and Zaman (1994). These authors observed that the most severely underpriced IPOs showed higher after-market trading turnover than overpriced IPOs, but offered no conclusive explanation for their finding. According to Booth and Chua (1996), issuers' demand for a liquid aftermarket creates underpricing incentives. In particular, they suggest that underpricing is a positive function of ownership dispersion and secondary-market liquidity. Boehmer and Fishe (2000) and Fishe (2001) develop a theory in which the issuers' need for aftermarket liquidity provides an explanation for underpricing. According to them, the underwriter encourages flipping –investors who receive allocated shares in the offering and immediately resell them– to develop after-market liquidity. Aggarwal (2003) finds that high trading activity is not just due to flipping, but also to others factors, such as buying and selling by investors who are not necessarily original buyers of the IPO or trading activity between market makers. Recently, Ellul and Pagano (2006) have developed a model incorporating investor concern for post-listing liquidity. They argue that "the less liquid the aftermarket is expected to be, and the less predictable its liquidity, the larger will be the IPO underpricing".

Although several papers have found a significant relationship between stock market

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[1] See Álvarez (2008) and Álvarez and González (2005) for underpricing and long-run performance of Spanish IPOs

[2] Something similar happens with the seasoned equity offerings (SEOs), although the special institutional features of IPOs (i.e underwriters' stabilization, lockup, among others –see Ellis et al. 2000; Cao et al., 2004–), which exist in IPO market and affect secondary market liquidity but do not exist in SEOs market, advise an independent study.

liquidity and ownership dispersion, it is not clear how the ownership structure affects liquidity and the empirical results are not conclusive[3]. It does appear obvious, however, that a less concentrated ownership structure reduces the importance of information asymmetry, which in turn reduces adverse selection costs, encourages trading activity and enhances secondary market liquidity (Bhide, 1993 and Holmström and Tirole, 1993). Thus, firms that use an IPO to obtain liquidity can be expected to underprice the share offering in order to attract small-scale uninformed investors. Pham, Kalev and Steen (2003) and Li, Zheng and Melancon (2005) conclude that greater underpricing not only increases trading turnover, but also reduces bid-ask spread. Pham et al. (2003) claim that this relationship is due to the dispersion of the ownership structure brought about by the IPO. Recently, another study focusing on the U.S. market by Zheng and Li (2008) has made findings consistent not only with the indirect effect between underpricing and market liquidity through ownership dispersion but also with the direct effect[4]. If, on the other hand, the firm's objective is to concentrate ownership in order to gain more control and reduce agency costs between shareholders and managers (Shleifer and Vishny, 1986), the issue should be less underpriced, because large-scale investors are better informed about real firm value. Therefore, some IPO-companies may forfeit liquidity for the sake of increasing their control.

The relationship between share retention (i.e. the proportion of shares retained by the pre-IPO owners) and liquidity is also unclear. Zheng, Ogden and Jen (2005) claim that, *ceteris paribus*, as the number of shares retained by the pre-IPO owners increases (i.e. the number of floating shares is reduced), liquidity decreases, therefore pre-IPO owners should underprice more in order to try to improve liquidity. However, the signalling theory suggests that share retention may lead to an increase in firm value by suggesting that the pre-IPO owners are expecting high cash flows in the future (Leland and Pyle, 1977). According to this argument, one would expect to find a positive relationship between the number of shares retained and post-IPO liquidity. The ultimate relationship

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[3] Although several studies analyze the association between ownership and liquidity of seasoned equity (Kini and Mian, 1995; Heflin and Shaw, 2000; Eckbo, Masulis and Norli, 2000), the evidence is not conclusive and the relationships for seasoned equity may not apply to IPO stocks.

[4] They also find that IPO underpricing is positively related to trading volume in the secondary market. This result is robust after controlling for ownership structure and firm characteristics.

between share retention and liquidity will depend on whether the share-floating effect dominates the signalling effect or vice versa. Consistent with signalling theory, Li et al. (2005) found pre-IPO owners' retention to be positively related to trading turnover and negatively related to bid-ask spread. They concluded that high retention rates attract more trades, provide quality assurance, and improve IPO aftermarket liquidity.

However, share retention is not the only variable that can affect liquidity. The retail composition of the offering, which influences the ownership structure in terms of the percentage of uninformed investors, may have a similar, and probably more direct, effect on liquidity than underpricing. Obviously, the first question to be addressed in IPO design is the total size of the offering, after which it is necessary to determine the size of the retail tranche relative to the total number of shares offered. This last decision may have less impact on ownership since its influence is limited to cases where the share retention rate is low and the relative size of the retail and institutional tranches can play an important role in firm control.

In this context we present our study, which investigates the determinants of after-market liquidity based on IPO characteristics[5] (underpricing, and size and retail composition of the offering) and differs from previous research in several ways. The first is that we analyse, not only the influence of underpricing and relative size of offering on liquidity but also the retail composition of the offering, as a proxy for the post-IPO ownership structure. Secondly, given that the variables analysed may be influenced by market movements during the post-listing period, together with the fact that these operations are usually undertaken during up-market states when trading volume is high[6], we isolate these variables from the market effect in our analysis. A third difference is that we include additional IPO characteristics, such as stabilization agreements, lockup restrictions and the reputation of underwriters, insurers and auditors. The fourth is our

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[5] Note that (1) relative size of offering or simply size of offering (i.e. the ratio of shares offered to shares outstanding) is the complement to unity of the share retention variable (i.e. the ratio of shares retained to shares outstanding) and (2) retail composition of offering is a measure of the ownership structure of the offering and is therefore a proxy for the post-IPO ownership structure, and thus related to ownership dispersion, which is cited by some authors (Pham et al., 2003; and Zheng et al., 2005) as a means of achieving liquidity.

[6] This is one of the patterns that led to the proposal of the "*opportunity window*" hypothesis (Ritter, 1991; and Spiess and Affleck-Graves, 1995)

research scenario, since we analyse the effect of IPOs in a small order-driven market, which may differ from large price-driven markets both in size and microstructure characteristics. Fifth and last, we provide satisfactory evidence of the influence of ownership structure (i.e. retail composition of offering) on post-listing liquidity of newly listed firms in the Spanish stock market, with the characteristic features of the French or German bank-oriented system, which differs considerably from the market-oriented Anglo-Saxon systems (Rajan & Zingales, 1995; and Saá-Requejo, 1996). In fact, continental European countries have a more concentrated ownership structure, making it easier for majority shareholders to monitor managerial performance, and thereby reduce agency costs, whereas firms listed in the Anglo-Saxon stock markets tend to have less concentrated ownership structures, which lead to greater liquidity.

The paper is structured in five sections. Section two discusses the data base. Section three analyses the effects of IPOs on the liquidity of stocks outstanding. Section four explores the role played by the IPO variables on liquidity. Some robustness checks are reported in section five and the final section summarises the main conclusions.

2. Data base

The sample consists entirely of IPOs by firms listed on the Spanish continuous market from 1993 to 2004. 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, which increases arbitrage potential. The continuous market represents approximately 98.5% of all stock market trading in Spain. There are other ways for companies to go public on the Spanish stock market, but the most usual process is through an IPO[7].

Table A1 in the appendix lists the sample companies and the main data (i.e. firm offered, year, offering shareholders, authorization date, first trading day date and number of shares sold). A total of 50 IPOs were made over the study period (1993-2004). Some of them were affected by a variety of events that, due to their impact on liquidity and share trading activity during the post-listing period (i.e. from day 0 to 135), might distort the results of the analysis. For example, variations in shares

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[7] For example, during the period 1985-1997, approximately half of the companies that were going public resorted to the IPO as mechanism of access to quotation (Álvarez and Fernández, 2003).

outstanding (i.e. new share offerings and share listings) or secondary offerings (SOs). Any IPO featuring one of these effects was eliminated from the sample. Of the 50 IPOs originally considered for the study, 43 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 were required (price, bid-ask spread, depth, and trading volume) were 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, 1998 and 1999. The fact these were, in performance terms, the best three years for the Spanish stock market over the study period (1993-2004), confirms the need to remove market performance from the analysis, as will be explained later. Panel B gives a brief overview of the main IPO variables. The first is the underpricing of the offering, which is defined as the difference between the market share price on the first trading day and the average offer price divided by the average offer price. Judging by the large number of articles on this type of operations, there is more than sufficient justification for including this variable in the study of IPOs. This variable has an average value of 14.412% and a variation ranging between -6.553%, i.e. overpricing, (European Aeronatic) and 94.979% (TPI). The second key variable is the number of shares offered, which is best handled in relative terms, relative size being the ratio of shares offered to shares outstanding. This variable shows that the average size of IPOs is 41.157% of the shares outstanding with a variation ranging between 2.620% (European Aeronautic) and 100% (Dinamia and Parques Reunidos). Note that Zheng et al. (2005) and Li et al. (2005) label this variable "share retention", given that relative size of retention is the complement to unity of the relative size of the offering and represents the ratio of shares retained to shares outstanding. The third and last variable considered is the retail composition of the offering, which measures the ratio of shares offered in the retail tranche to the number of shares offered. The importance of this variable stems from the fact that it defines the ownership structure of offerings by fixing the proportion of shares offered to small shareholders. The average value of this variable is 33.405%, although the size of the retail tranche can be anywhere from 0% (Abengoa, Barón de Ley, Dogi, Befesa, Enaco and Mecalux) to 100% (Gines Navarro and Bodegas Riojanas).

There are some institutional differences between U.S and Spanish IPOs that could affect aftermarket liquidity: a) pricing mechanisms and b) flipping. Spanish firms predominantly use a fixed pricing system, where the prices vary within a pre-established range and there can be no changes in the number of shares offered once the prospectus is filed, whereas U.S. firms use book-building, in which the offer price and the number of shares offered can be altered until the final offer price is determined. The second difference is that U.S underwriters discourage and punish investors who sell their allocated shares immediately (flipping) in the aftermarket, while investors in Spain are allowed to sell their allocated shares freely.

3. Liquidity of shares outstanding after IPOs

The variables used to measure share liquidity are bid-ask spread, relative depth, market quality index and relative trading volume. The bid-ask spread (S_{it}) is the average cost of simultaneously buying and selling one stock i on trading day t. It is defined as the average quotient obtained by dividing the price spread by its average price, as shown in expression [1]. The price spread in an order-driven market, like that of Spain, is calculated from the difference between the lowest price at which investors are willing to sell share i at time t' on trading day t ($P_{it\,t'}^{Ask}$), and the highest price at which they are willing to buy it ($P_{it\,t'}^{Bid}$).

$$S_{it} = \sum_{t'=1}^{T} \frac{\left(\dfrac{P_{it\,t'}^{Ask} - P_{it\,t'}^{Bid}}{(P_{it\,t'}^{Ask} + P_{it\,t'}^{Bid})/2} \right)}{T} \qquad [1]$$

where T is share i's number of price spreads during day t.

The relative depth (RD_{it}) represents the average number of shares i available at each side of the market at the best first level prices on trading day t relative to the number of shares outstanding[8]; and the market quality index (MQI_{it}) is the ratio between the

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[8] Note that in the study sample the number of shares outstanding may differ considerably across firms that are the object of an initial public offering. To keep the data comparable, therefore, we take relative values, dividing by the number of stocks outstanding. The trading volume is treated in the same way.

average relative depth and the bid-ask spread. This can be written as follows:

$$MQI_{it} = \frac{RD_{it} / 2}{S_{it}} \qquad [2]$$

The relative trading volume (RTV_{it}) or trading turnover is defined as the number of shares i that are traded on trading day t relative to the number of shares outstanding.

Having defined these variables to measure liquidity after IPOs, we then defined the post-listing period as running from trading day 0 to 135. Nevertheless, several authors[9] report excessively high trading activity during the first few days of trading as a result of informed trading activities that continue until the share price reaches what the market perceives as the fair value. Our analysis excludes the first ten days after the listing date to overcome this problem. Therefore, the post-listing period used in our study runs from trading day 11 to 135 and the liquidity measures of the sample firms are calculated as the average post-offering value (i.e. from day 11 to 135, which is approximately 6 months).

[Insert Table 2]

Table 2 shows the post-offering values of these variables. The data reveal that the bid-ask spread has an average value of 0.754% and a variation ranging from 0.139% to 2.212%; relative depth has an average value of 0.011% and a variation of 0.014% and, finally, the combined variable representing both, that is, the market quality index, has an average value of 0.822% and a variation ranging between 0.010% and 4.223%. The relative trading volume has an average value of 0.255% with a variation ranging from 0.011% to 0.571%.

Graphs 1 and 2 portray variations in the main variables driving these results, that is the market quality index and the relative trading volume, which, illustrate the rationale for excluding the first ten days after the listing date from the analysis, as mentioned earlier.

[Insert Graphs 1 and 2]

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[9] See, among others, Miller and Reilly (1987), Aggarwal and Rivoli (1990), Krigman, Shaw and Womack (1999), Pham et al. (2003), Corwin, Harris and Lipson (2004), Zheng et al. (2005) and Zheng and Li (2008).

4. IPO characteristics and influence on liquidity

While most of the research on IPOs has focused on explaining the underpricing phenomenon, few studies have investigated the determinants of after-market liquidity (see Pham et al. , 2003; Corwin et al. , 2004; Li et al. , 2005; Zheng et al., 2005; Ellul and Pagano, 2006; and Zheng and Li, 2008). For this reason we focus our attention on liquidity for the post-listing period. In addition, because the listing firms have no prior trading history and limited public information, the liquidity may be affected by the offer design, that is, by the IPO characteristics (underpricing, relative size and retail composition of offering) and the market conditions, including stabilization agreements, lockup restrictions and underwriter, insurer and auditor reputation. Therefore, we will analyse the ability of these factors to explain the post-listing liquidity of shares.

To examine the relationship between IPO characteristics and post-offering liquidity of shares outstanding, the following cross-sectional regression was run for the variables that measure liquidity, including control variables:

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . \text{Log } MV_i + \delta_5 . \text{Log } P_i$$
$$+ \delta_6 . \sigma_i + \varepsilon_i \qquad\qquad [3]$$

where $\overline{X}_i$ is the average post-IPO (day 11 to 135) value of the variable X for firm i; U_i is the underpricing of offering i, defined as the difference between the market price of share i on the first trading day and the average offer price divided by the average offer price; RS_i is the relative size of offering i, defined as the ratio of the number of shares i offered to the number of shares i outstanding, and RC_i is the retail composition of offering i, defined as the ratio of the number of shares i offered in the retail tranche to the number shares i offered. The regression also includes some control variables that the empirical evidence has shown to have direct effects on liquidity (see e.g., Zheng and Li, 2008). The independent variables included for every offering i are Log MV_i, which is the log of the market value of equity on the first trading day to control for firm size, Log P_i, which is the log of the average offering price to control for the share price, and σ_i, which is the standard deviation of daily returns based on closing prices during our post-

listing period (day 11 to 135) to control for the risk of shares. Although the expected signs of these control variables are not clear, previous evidence suggests that the relationship will be positive for firm size and negative for the share price and the risk of shares.

The results of these regressions are summarized in Table 3. Given the significant positive correlation between the underpricing and the risk of the offering, and the negative correlation between the size of the offering and firm size, as shown in Table A2 of the Appendix, Table 3 incorporates the auxiliary regression residuals of the risk over the underpricing and the firm size over the relative size of offering, respectively[10].

The data reveal that underpricing of the offering (U) has a significant negative relationship with the bid-ask spread and a significant positive relationship with the market quality index and the relative trading volume. A similar negative relationship between initial underpricing and the bid-ask spread was also reported by Pham et al. (2003) and Li et al. (2005). Studies such as Kligman, Shaw and Womack (1999), Pham et al. (2003), Reese (2003), Li et al. (2005), Zheng et al. (2005) and Zheng and Li, (2008) also conclude a positive relationship between underpricing and trading turnover.

[Insert Table 3]

Furthermore, relative size of offering (RS) has a significant positive relationship with relative depth, the market quality index and relative trading volume. Recall that relative size of offering and share retention are inversely correlated and therefore our results suggest that a decrease in the number of shares retained by the pre-IPO owners increases liquidity and enhances trading activity, supporting the dominance of the share-floating effect over the signalling effect. Pham et al. (2003) and Zheng et al. (2005) also conclude an inverse relationship between shares retained and trading turnover. Li et al. (2005), however, find that the pre-IPO owners' retention rate is positively related to

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[10] The maximum value of VIF for the four regressions is less than 2, suggesting no substantial collinearity. However, collinearity with low VIF values is possible as are collinearities affecting only some of the independent variables and not fully captured by VIF. In such cases, the Condition Index may be more appropriate. In the case that concerns us, the CI for the four regressions is higher than 30, indicating some level of collinearity (the minimum is 53.4 and the maximum is 57.12). Although the use of the residuals of auxiliary regressions is worth considering, it may hinder interpretation of the series. This is not a problem in our case because only the control variables are modified.

trading turnover ratio and negatively related to bid-ask spread. This may be due to the already high concentration of ownership of the firms listed in the Spanish stock market, compared to firms in the Anglo-Saxon markets, shifting their priorities towards increasing liquidity.

Finally, retail composition of offering (RC), which is a reflection of the ownership structure of the offering, since it determines the proportion of shares offered to small shareholders, shows a significant negative relationship with bid-ask spread and a significant positive relationship with relative depth and the market quality index, that is, a higher percentage of shares offered in the retail tranche leads to greater liquidity. These findings are consistent with past proposals by Demsetz (1968), Bhide (1993) and Holmström and Tirole (1993). Pham et al. (2003) find that a less concentrated ownership structure increases the level of post-listing trading activity. This again suggests that Spanish firms resorting to IPOs are motivated more by liquidity needs than by the desire to tighten control over managerial behavior and reduce agency costs due to high concentration of ownership.

We therefore provide satisfactory evidence of the influence of underpricing, stock allocation (relative size of offering) and ownership structure (retail composition of offering) on the post-listing liquidity of newly listed firms. Nevertheless, given that the evolution of these variables for each firm during the post-listing period may be linked to market movements and, as stated in the database section, the fact that these operations were concentrated into the three best-performing years of the Spanish stock market (1997, 1998 and 1999) during our sample period, we isolate the market effect on these variables in our analysis by using the market variable in the previous cross-sectional regression:

$$\overline{X}_i = \delta_0 + \delta_1 \cdot U_i + \delta_2 \cdot RS_i + \delta_3 \cdot RC_i + \delta_4 \cdot \overline{X}_M + \delta_5 \cdot \text{Log } MV_i$$
$$+ \delta_5 \cdot \text{Log } P_i + \delta_5 \cdot \sigma_i + \varepsilon_i \qquad [4]$$

where $\overline{X}_M$ is the average post-IPO value of the variable X for the remaining firms in the market and the remaining variables as defined and used in the regression of equation [3].

The results of this analysis are also presented in Table 3. The timing of the IPO (they are usually conducted during up-markets periods when liquidity and trading volume are high) highlights the importance of isolating overall market performance to avoid associating these operations with effects that are not directly due to them, but to the performance of the market itself. The data reveal that, after excluding the market effect, the IPO characteristics still have some explanatory capacity for the degree of liquidity in post-listing shares. In overall terms, the variables that were significant before inclusion of the market effect remained significant and the explanatory power of the regression, measured by the adjusted R-squared, increased significantly.

The underpricing of the offering (U) shows a significant negative relationship with bid-ask spread and a significant positive relationship with the market quality index and relative trading volume, suggesting that the more underpriced the IPO, the higher the liquidity and confirming arguments put forward by Pham et al. (2003), who claim that underpricing is the cost of the liquidity, since it is the compensation offered by the firm to attract small-scale investors that will help to generate liquidity.

We observe, furthermore, that the relative size of the offering (RS) has a significant positive relationship with relative depth, the market quality index and relative trading volume, supporting the fact that the higher the percentage of shares offered, and thereby the lower the share retention, the higher the liquidity generated by IPOs (Pham et al., 2003; and Zheng et al., 2005).

Finally, the retail composition of the offering (RC) presents a significant negative relationship with the bid-ask spread and a significant positive relationship with relative depth and market quality index, showing that a higher percentage of individual shareholders increases liquidity (Pham et al., 2003).

5. Robustness checks

Other IPO characteristics that may also have effects on liquidity include stabilization agreements with underwriters, lockup restrictions and the reputation of underwriters, insurers and auditors. Stabilization agreements can artificially enhance liquidity in post-listing shares (Ellul and Pagano, 2006). Underwriter stabilization normally lasts for one month in our stock market. To capture this aftermarket event, we add a stabilization dummy to the regression of equation [4] , as shown in the following expression:

$$\overline{X}_i = \delta_0 + \delta_1 \cdot U_i + \delta_2 \cdot RS_i + \delta_3 \cdot RC_i + \delta_4 \cdot SD_i + \delta_5 \cdot \overline{X}_M$$

$$+ \delta_6 \cdot \text{Log } MV_i + \delta_7 \cdot \text{Log } P_i + \delta_8 \cdot \sigma_i + \varepsilon_i \qquad [5]$$

where SD_i is the stabilization dummy[11], which takes a value of 1 if the offering i has a stabilization agreement mentioned in the IPO prospectus and 0 otherwise, and the rest of variables are as defined in the regression of equation [4].

The results of these regressions for the variables that measure liquidity are summarized in Table 4. The data reveal that stabilization agreements do not affect post-offering liquidity, at least in average terms, for the post-listing period used (i.e. from day 11 to 135, which is approximately 6 months). Note that the first two weeks have been removed from the computation, so the potential effect of these agreements would occur in only 2 weeks over a period of 6 months. However, the finding relevant to this study is that the stabilization agreement is not the cause of the above-observed results. In fact, the IPO characteristics explaining liquidity in post-listing shares remain the same.

[Insert Table 4]

Many IPO prospectuses include a lockup restriction, which prohibits pre-IPO owners from selling retained shares for a certain period (Zheng et al., 2005). How lockup restrictions affect liquidity is difficult to determine. On the one hand, they prevent the trading of retained shares and reduce the number of floating shares and thus liquidity. According to the signalling theory, however, they also transmit positive information about firm value, because a less diversified portfolio is more costly to maintain. In addition, lockup restrictions prevent insiders from taking advantage of outside investors by trading stock during the lockup period. Therefore, the ultimate relationship between lockup restrictions and secondary-market liquidity depends on whether the dominant effect is negative or positive. A standard lockup period lasts for six months in our stock market. To capture this aftermarket event, we add a lockup dummy to the regression of equation [4] , as shown in the following expression:

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[11] Note that no problems of collinearity emerged between the stabilization dummy, the lockup and reputation dummies added later, and the other independent variables.

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . LD_i + \delta_5 . \overline{X}_M$$

$$+ \delta_6 . \text{Log } MV_i + \delta_7 . \text{Log } P_i + \delta_8 . \sigma_i + \varepsilon_i \qquad [6]$$

where LD_i is the lockup dummy, which takes a value of 1 if offering i has a lockup restriction mentioned in the IPO prospectus and 0 otherwise, and the remaining variables are as defined in the regression of equation [4].

The results of these regressions are also shown in Table 4. The data reveal that the lockup restrictions do not have a significant effect on liquidity after IPOs. The IPO characteristics explaining liquidity in post-listing shares remain the same, as happened with the stabilization agreements.

Finally, another factor than can enhance liquidity in post-listing shares is the reputation of the underwriters, insurers and auditors (Ellul and Pagano, 2006; and Zheng and Li, 2008). According to the signalling theory, their reputation transmits positive information about firm value. To capture this aftermarket event, we add reputation dummies to the regression of equation [4] , as shown in the following expression:

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . URD_i + \delta_5 . IRD_i + \delta_6 . ARD_i$$

$$+ \delta_7 . \overline{X}_M + \delta_8 . \text{Log } MV_i + \delta_9 . \text{Log } P_i + \delta_{10} . \sigma_i + \varepsilon_i \qquad [7]$$

where URD_i is the underwriter reputation dummy, which takes a value of 1 if the main underwriter of offering i has a high reputation (i.e. he has participated significantly in the sample of IPOs analyzed) and 0 otherwise, IRD_i is the insurer reputation dummy, which takes a value of 1 if the main insurer of offering i has a high reputation (i.e. he has participated significantly in the sample of IPOs analyzed) and 0 otherwise, IRD_i is the auditor reputation dummy, which takes a the value of 1 if the main auditor of offering i has a high reputation (i.e. he has participated significantly in the sample of IPOs analyzed) and 0 otherwise. The remaining variables are as defined in the regression of equation [4].

The results of these regressions are reported in Table 5. The data reveal that underwriter, insurer and auditor reputations do not affect post-offering liquidity. The

IPO characteristics explaining liquidity in post-listing shares remain the same, as happened with the stabilization agreements and lockup restrictions.

[Insert Table 5]

In conclusion, the results for the relationship between liquidity and IPO characteristics (i.e, underpricing, relative size and retail composition of offering) remain robust even after including stabilization agreements, lockup restrictions and underwriter, insurer and auditor reputation.

6. Conclusions

In this paper we have analysed the influence of IPO characteristics on the liquidity of shares outstanding. Our findings are based on an analysis of variables measuring post-offering liquidity. According to the results obtained, three IPO characteristics, namely, underpricing, relative size and retail composition have explanatory power for the liquidity of the shares outstanding.

Given the evidence to show that these offerings take place during up-market periods when trading volume is high, our analysis isolates the market effect on these variables. Again after excluding the market effect, underpricing of offering shows a clearly negative relationship with bid-ask spread and a significant positive relationship with market quality index and relative trading volume, suggesting that a more underpriced IPO enhances liquidity. A similar negative relationship between initial underpricing and the bid-ask spread was also reported by Pham et al. (2003) and Li et al. (2005). Several studies (see Kligman, Shaw and Womack, 1999, Pham et al., 2003, Reese, 2003, Li et al., 2005, Zheng et al., 2005 and Zheng and Li, 2008) also conclude a positive relationship between underpricing and trading turnover.

Relative size of offering presents a significant positive relationship with relative depth, market quality index and relative trading volume, supporting the theory that the higher the percentage of shares offered in IPOs, the greater the subsequent liquidity. Pham et al. (2003) and Zheng et al. (2005) also conclude an inverse relationship between shares retained and trading turnover. Li et al. (2005), however, find that the pre-IPO owners' retention rate is positively related to trading turnover ratio and negatively related to bid-ask spread. Our results may be due to the already high concentration of ownership of

the firms listed in the Spanish stock market, compared to firms in the Anglo-Saxon markets, shifting their priorities towards increasing liquidity.

Retail composition of offering exhibits a significant negative relationship with bid-ask spread and a significant positive relationship with relative depth and market quality index, showing that a higher percentage of individual shareholders results in greater liquidity. These findings are consistent with past proposals by Demsetz (1968), Bhide (1993) and Holmström and Tirole (1993). These results again suggest that Spanish firms resorting to IPOs are motivated more by liquidity needs than by the desire to tighten control over managerial behavior and reduce agency costs due to high concentration of ownership.

Finally, it is important to note that these results remain robust after including other additional IPO characteristics, such as stabilization agreements, lockup restrictions and the reputation of underwriters, insurers and auditors. Thus, we provide satisfactory evidence of the influence of underpricing, stock allocation (relative size of offering) and ownership structure (retail composition of offering) on post-listing liquidity of newly listed firms in the Spanish stock market. Underpricing is therefore not the only key factor in the increase of liquidity. The relative size of the total offering and the retail tranche also play a major role. Given that all these aspects carry unavoidable costs, in terms of rate of return or other factors (loss of control on ownership, information asymmetries, etc.), firms seeking to obtain liquidity through an IPO are faced with a complex decision, for which they need to focus not only on underpricing but on all the key factors associated with this instrument.

Appendix

[Insert Table A1]

[Insert Table A2]

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Table 1.- Summary statistics for sample of IPOs in Spain (1993-2004)

Panel A: Distribution of IPOs by year

Year	Number	Proportion (%)
1993	1	2.326
1994	3	6.977
1995	0	0.000
1996	3	6.977
1997	7	16.279
1998	9	20.930
1999	9	20.930
2000	4	9.302
2001	2	4.651
2002	1	2.326
2003	1	2.326
2004	3	6.977
Total	43	100.000

Panel B: Descriptive statistics of IPO characteristics

Variable	Mean	Median	Minimum	Maximum	Standard deviation
Underpricing of offering (%)	14.412	5.000	-6.553	94.979	23.223
Number of shares offered	39,231,698	14,400,000	640,020	482,430,511	79,818,206
Relative size of offering (%)	41.157	35.000	2.620	100.000	22.093
Retail composition of offering (%)	33.405	30.326	0.000	100.000	25.119

Notes:

This table shows the results for the final sample, which is formed by 43 IPOs after excluding offerings with variations in their shares outstanding or secondary offerings for the post IPO period (i.e. from day 0 to 135). The underpricing of the offering is the difference between the market price of share i on the first trading day and the average offering price divided by the average offering price. The relative offering size is the number of shares offered relative to the number shares outstanding. In addition, the difference between unity and the relative offering size is the relative retention size. The retail composition of the offering is the ratio of shares offered in the retail tranche to total shares offered.

Table 2.- Post-IPO liquidity

Variable	Descriptive statistics				
	Mean	Median	Minimum	Maximum	Standard deviation
Bid-ask spread (%)	0.754455	0.723071	0.138589	2.211863	0.462235
Relative depth (%)	0.010537	0.005008	0.000127	0.074222	0.013923
Market quality index (%)	0.821859	0.507360	0.010028	4.223453	0.879612
Relative trading volume (%)	0.255426	0.227884	0.010934	0.571217	0.123119

Notes:

The liquidity measures for each firm in the sample are calculated as the average post-IPO value (i.e. from day 11 to 135, that is, approximately 6 months).

Table 3.- Post-IPO liquidity in relation to relative size, retail composition and underpricing of the offerings, including and excluding the market effect

Independent variables	Regressions results: Dependent variables							
	Bid-ask spread		Relative depth		Market quality index		Relative trading volume	
Constant	0.010771 (3.456)***	0.011009 (6.440)***	-0.000056 (-1.345)	-0.000022 (-0.804)	-0.002941 (-0.937)	-0.001277 (-0.606)	0.001318 (1.788)*	0.000594 (1.012)
U_i	-0.004675 (-2.236)**	-0.004453 (-3.422)***	0.000009 (0.207)	0.000030 (1.041)	0.005915 (1.735)*	0.004812 (2.294)**	0.001859 (3.069)***	0.001849 (4.015)***
RS_i	0.002057 (0.867)	0.001999 (1.430)	0.000236 (2.850)***	0.000182 (3.089)***	0.013054 (2.593)**	0.010379 (2.795)***	0.002893 (5.906)***	0.002856 (5.457)***
RC_i	-0.004642 (-1.701)*	-0.003323 (-1.788)*	0.000188 (1.994)*	0.000098 (2.203)**	0.014771 (3.209)***	0.009600 (2.937)***	-0.000091 (-0.150)	0.000231 (0.561)
$\overline{X}_M$		0.397240 (4.924)***		0.511426 (25.390)***		0.717489 (15.708)***		0.746458 (4.209)***
Log MV_i	-0.002201 (-5.574)***	-0.001864 (-5.426)***	-0.000046 (-4.377)***	-0.000055 (-7.899)***	-0.002536 (-3.031)***	-0.002767 (-5.501)***	-0.000030 (-0.221)	-0.000144 (-1.345)
Log P_i	-0.000717 (-0.991)	-0.000984 (-2.188)**	0.000017 (0.665)	0.000029 (1.275)	-0.0020038 (-0.017)	0.000323 (0.266)	-0.000075 (-0.365)	0.000171 (1.072)
σ_i	0.276730 (3.186)***	0.235918 (3.931)***	0.002770 (1.066)	0.001069 (0.662)	-0.171373 (-0.861)	-0.189822 (1.904)*	-0.005894 (-0.236)	-0.015083 (-0.676)
Adj. R^2	54.570	74.934	29.242	83.690	35.122	76.207	30.344	55.634

Notes:

The following cross-sectional regression was run for each liquidity variable in the sample:

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . \text{Log } MV_i + \delta_5 . \text{Log } P_i + \delta_6 . \sigma_i + \varepsilon_i \qquad [3]$$

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . \overline{X}_M + \delta_5 . \text{Log } MV_i + \delta_6 . \text{Log } P_i + \delta_7 . \sigma_i + \varepsilon_i \qquad [4]$$

where $\overline{X}_i$ is the average post-IPO value of the variable X for firm i (i.e. from day 11 to 135, that is, approximately 6 months), U_i is the underpricing of offering i, defined as the difference between the market price of share i on the first trading day and the average offering price divided by the average offering price; RS_i is the relative size of offering i, defined as the ratio of the number of shares i offered to the number of shares i outstanding; RC_i is the retail composition of offering i, defined as the ratio of the number of shares i offered in the retail tranche to the total number of shares i offered, and $\overline{X}_M$ is the average post-IPO value of the variable X for the remaining firms in the market. The control variables included for every offering i are $\text{Log } MV_i$, which is log of market value of equity on the first trading day, $\text{Log } P_i$, which is the log of average offering price, and σ_i, which is the standard deviation of daily returns based on closing prices during the post-listing period used in our study (i.e. from day 11 to 135). White (1980) standard errors are used and t-statistics are reported in parentheses.

*** Significance at the 1% level
** Significance at the 5% level
* Significance at the 10% level

Table 4.- Post-IPO liquidity in relation to relative size, retail composition and underpricing of the offerings, including stabilization and lockup

Independent variables	Regressions results: Dependent variables							
	Bid-ask spread		Relative depth		Market quality index		Relative trading volume	
Constant	0.010995 (5.647)***	0.009984 (4.436)***	0.000000 (0.007)	-0.000019 (-0.672)	0.000709 (0.250)	-0.000278 (-0.135)	0.001098 (1.524)	0.001020 (1.519)
U_i	-0.004452 (-3.421)***	-0.004076 (-3.065)***	0.000026 (0.872)	0.000028 (0.890)	0.004531 (1.696)*	0.004150 (1.749)*	0.001794 (3.143)***	0.001680 (2.910)***
RS_i	0.002002 (1.480)	0.002292 (1.527)	0.000175 (3.124)***	0.000180 (3.104)***	0.009774 (2.918)***	0.009877 (2.927)***	0.002756 (4.915)***	0.002724 (4.750)***
RC_i	-0.003321 (-1.788)*	-0.003184 (-1.697)*	0.000096 (2.120)**	0.000097 (2.182)**	0.009454 (2.345)**	0.009388 (2.539)**	0.000177 (0.374)	0.000173 (0.392)
SD_i	0.000008 (0.010)		-0.000025 (-0.904)		-0.002212 (-1.224)		-0.000304 (-0.862)	
LD_i		0.000653 (0.682)		-0.000004 (-0.195)		-0.001192 (-0.750)		-0.000290 (-0.964)
$\overline{X}_M$	0.397187 (4.800)***	0.391038 (4.889)***	0.514222 (25.442)***	0.512363 (25.134)***	0.716630 (15.250)***	0.723645 (16.966)***	0.760536 (4.063)***	0.775933 (4.171)***
$\text{Log } MV_i$	-0.001864 (-5.240)***	-0.001918 (-5.237)***	-0.000054 (-7.822)***	-0.000054 (-7.567)***	-0.002700 (-4.766)***	-0.002674 (-4.762)***	-0.000139 (-1.400)	-0.000127 (-1.259)
$\text{Log } P_i$	-0.000981 (-1.929)*	-0.000807 (-1.577)	0.000019 (0.771)	0.000028 (1.102)	-0.000572 (-0.428)	-0.000064 (-0.047)	0.000090 (0.554)	0.000104 (0.620)
σ_i	0.235746 (3.670)***	0.227594 (3.640)***	0.001722 (0.856)	0.001132 (0.682)	-0.136021 (-1.101)	-0.171794 (1.507)	-0.008703 (-0.357)	-0.011464 (-0.513)
Adj. R^2	74.197	74.630	83.630	83.227	76.105	75.904	55.377	55.509

Notes:

The following cross-sectional regression was run for each liquidity variable in the sample:

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . SD_i + \delta_5 . \overline{X}_M + \delta_6 . \text{Log } MV_i + \delta_7 . \text{Log } P_i + \delta_8 . \sigma_i + \varepsilon_i \qquad [5]$$

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . LD_i + \delta_5 . \overline{X}_M + \delta_6 . \text{Log } MV_i + \delta_7 . \text{Log } P_i + \delta_8 . \sigma_i + \varepsilon_i \qquad [6]$$

where $\overline{X}_i$ is the average post-IPO value of the variable X for firm i (i.e. from day 11 to 135, that is, approximately 6 months), U_i is the underpricing of offering i, defined as the difference between the market price of share i on the first trading day and the average offering price divided by the average offering price; RS_i is the relative size of offering i, defined as the ratio of the number of shares i offered to the number of shares i outstanding; RC_i is the retail composition of offering i, defined as the ratio of the number of shares i offered in the retail tranche to the total number of shares i offered; SD_i is the stabilization dummy, which takes a value of 1 if the offering i has a stabilization agreement mentioned in the IPO prospectus and 0 otherwise; LD_i is the lockup dummy, which takes a value of 1 if the offering i has a lockup restriction mentioned in the IPO prospectus and 0 otherwise, and $\overline{X}_M$ is the average post-IPO value of the variable X for the remaining firms in the market. The control variables included for every offering i are $\text{Log } MV_i$, which is the log of market value of equity on the first trading day, $\text{Log } P_i$, which is the log of the average offering price, and σ_i, which is the standard deviation of daily returns based on closing prices during the post-listing period used in our study (i.e. from day 11 to 135). White (1980) standard errors are used and t-statistics are reported in parentheses.

*** Significance at the 1% level
** Significance at the 5% level
* Significance at the 10% level

Table 5.- Post-IPO liquidity in relation to relative size, retail composition and underpricing of the offerings, including underwriter, insurance and auditor reputation

Independent variables	Regressions results: Dependent variables			
	Bid-ask spread	Relative depth	Market quality index	Relative trading volume
Constant	0.011966 (6.375)***	0.000031 (0.749)	0.000986 (0.378)	0.000807 (1.110)
U_i	-0.005062 (-3.673)***	0.000031 (0.902)	0.004695 (1.867)*	0.002108 (3.842)***
RS_i	0.002295 (1.542)	0.000172 (3.464)***	0.009475 (2.820)***	0.002741 (5.128)***
RC_i	-0.003739 (-2.021)*	0.000073 (1.760)*	0.008703 (2.621)**	0.000126 (0.245)
URD_i	-0.001212 (-1.269)	-0.000033 (-1.579)	-0.001413 (-1.155)	0.000180 (0.554)
IRD_i	0.000670 (0.869)	-0.000024 (-1.434)	-0.001536 (-0.980)	-0.000423 (-1.424)
ARD_i	-0.000029 (-0.044)	-0.000024 (-1.142)	-0.000172 (-0.113)	-0.000337 (-1.202)
$\overline{X}_M$	0.367471 (4.642)***	0.525678 (25.909)***	0.715291 (14.129)***	0.680079 (2.874)***
Log MV_i	-0.001751 (-4.359)***	-0.000048 (-7.114)***	-0.002523 (-5.113)***	-0.000120 (-1.000)
Log P_i	-0.001117 (-2.307)**	0.000031 (1.480)	0.000310 (0.244)	0.000185 (1.047)
σ_i	0.241759 (4.050)***	0.001039 (0.707)	-0.183009 (-1.857)*	-0.014950 (-0.685)
Adj. R^2	74.002	83.134	75.910	55.275

Notes:

The following cross-sectional regression was run for each liquidity variable in the sample:

$$\overline{X}_i = \delta_0 + \delta_1 . U_i + \delta_2 . RS_i + \delta_3 . RC_i + \delta_4 . URD_i + \delta_5 . IRD_i + \delta_6 . ARD_i + \delta_7 . \overline{X}_M$$

$$+ \delta_8 . \text{Log } MV_i + \delta_9 . \text{Log } P_i + \delta_{10} . \sigma_i + \varepsilon_i \qquad [7]$$

where $\overline{X}_i$ is the average post-IPO value of the variable X for firm i (i.e. from day 11 to 135, that is, approximately 6 months), U_i is the underpricing of offering i, defined as the difference between the market price of share i on the first trading day and the average offering price divided by the average offering price; RS_i is the relative size of offering i, defined as the ratio of the number of shares i offered to the number of shares i outstanding; RC_i is the retail composition of offering i, defined as the ratio of the number of shares i offered in the retail tranche to the total number of shares i offered; URD_i is the dummy variable of underwriter reputation, which takes a value of 1 if the main underwriter of the offering i has a high reputation (i.e. has participated significantly in the sample of IPOs analyzed) and 0 otherwise; IRD_i is the dummy variable of insurer reputation, which takes a value of 1 if the main insurer of the offering i has a high reputation (i.e. has participated significantly in the sample of IPOs analyzed) and 0 otherwise; IRD_i is the dummy variable of auditor reputation, which takes a value of 1 if the main auditor of the offering i has a high reputation (i.e. has participated significantly in the sample of IPOs analyzed) and 0 otherwise, and $\overline{X}_M$ is the average post-IPO value of the variable X for the remaining firms in the market. The control variables included for every offering i are Log MV_i, which is the log of market value of equity on the first trading day, Log P_i, which is the log of average offering price, and σ_i, which is the standard deviation of daily returns based on closing prices during the post-listing period used in our study (i.e. from day 11 to 135). White (1980) standard errors are used and t-statistics 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 (1993-2004)

Share offered	Year	Offering shareholder	Authorization date	First trading day date	Number of shares sold
Argentaria	1993	Soc. Est. de Patrimonio I	12/4/1993	12/5/1993	31,362,450
Continente	1994	Several	24/2/1994	17/3/1994	14,400,000
Cortefiel	1994	Several	16/6/1994	8/7/1994	4,911,534
Gines Navarro	1994	Corporación Financiera Alba	20/10/1994	17/11/1994	1,316,736
Mapfre Vida (1)	1994	Corporación Mapfre	22/11/1994	23/12/1994	1,200,000
E. e I. Aragonesas (1)	1995	Uralita	7/2/1995	20/2/1995	20,000,000
Sol Meliá	1996	Sol Meliá	4/6/1996	2/7/1996	14,190,000
Tele Pizza	1996	Several	25/10/1996	13/11/1996	4,829,816
Abengoa	1996	Several	12/11/1996	29/11/1996	1,972,633
Miquel y Costas (1)	1996	Several	15/11/1996	27/11/1996	2,034,162
Adolfo Domínguez	1997	Several	28/2/1997	18/3/1997	5,976,240
Barón de Ley	1997	Several	1/7/1997	16/7/1997	5,407,860
Cvne	1997	Several	4/7/1997	17/7/1997	640,020
Bodegas Riojanas	1997	Several	12/9/1997	30/9/1997	2,158,055
Aldeasa	1997	Soc. Est. de Partic. Patrimoniales	12/9/1997	1/10/1997	15,000,000
Iberpapel	1997	Iberpapel Gestión	14/11/1997	28/11/1997	3,872,629
Aceralia (1)	1997	Soc. Est. de Partic. Indust. (Sepi)	21/11/1997	10/12/1997	71,256,154
Dinamia	1997	Dinamia	27/11/1997	15/12/1997	9,000,000
Dogi	1998	Several	15/1/1998	21/1/1998	3,639,200
Fastibex	1998	Fatibex	26/3/1998	6/4/1998	825,000
Meliá Inversiones	1998	Meliá Inversiones	27/3/1998	8/4/1998	4,151,319
Superdiplo	1998	Superdiplo	29/4/1998	14/5/1998	14,315,764
Befesa	1998	Befesa	16/6/1998	1/7/1998	6,907,280
Europa&C	1998	Ardagan and Settsu Europe	26/6/1998	10/7/1998	12,571,578
Federico Paternina	1998	Marcos Eguizabal and B. Barón	4/9/1998	16/9/1998	1,842,836
Enaco	1998	Several	24/11/1998	11/12/1998	6,590,400
Funespaña	1998	Several	01/12/1998	09/12/1998	3,449,084
Transportes Azkar	1999	Azkar and others	21/1/1999	3/2/1999	14,576,000
Indra Sistemas	1999	Soc. Est. de Partic. Indust. (Sepi)	5/3/1999	23/3/1999	48,877,483
Grupo Ferrovial	1999	Grupo Ferrovial and others	15/4/1999	5/5/1999	48,117,540
Mecalux	1999	Several	16/4/1999	6/5/1999	8,820,300
Parques Reunidos	1999	Parques Reunidos	14/5/1999	26/5/1999	21,274,344
Tpi	1999	Telefónica	4/6/1999	23/6/1999	42,912,275
Red Eléctrica de España	1999	Soc. Est. de Partic. Indust. (Sepi)	18/6/1999	7/7/1999	47,344,500
Sogecable	1999	Sogecable and others	30/6/1999	21/7/1999	24,255,940
Amadeus (1)	1999	Several	1/10/1999	19/10/1999	147,500,000
Inmobiliaria Colonial	1999	La Caixa	8/10/1999	27/10/1999	32,000,000
Terra Networks (1)	1999	Terra Networks	29/10/1999	17/11/1999	66,076,415
Prisa	2000	Several	7/6/2000	28/6/2000	43,762,500
European Aeronautic	2000	Several	22/6/2000	10/7/2000	20,836,737
Recoletos	2000	Recoletos and Pearsons Overseas H.	3/10/2000	25/10/2000	25,475,000
Gamesa	2000	Several	11/10/2000	31/10/2000	24,329,990
Telefónica Móviles (1)	2000	Telefónica Móviles	2/11/2000	22/11/2000	345,000,000
Iberia	2001	Soc. Est. de Partic. Indust. (Sepi)	16/3/2001	3/4/2001	482,430,511
Inditex	2001	Several	27/4/2001	23/5/2001	162,645,600
Enagas	2002	Gas Natural	10/6/2002	26/6/2002	141,091,948
Antena 3 TV	2003	Telefónica	17/10/2003	29/10/2003	16,666,800
Fadesa Inmoviliaria	2004	Fadesa Inmoviliaria	13/4/2004	30/4/2004	40,425,863
Telecinco	2004	Telecinco and others	8/6/2004	24/6/2004	85,313,421
Cintra	2004	Cintra and Milsa	8/10/2004	27/10/2004	186,475,841

Notes:

(1) Denotes that the offering was dropped from the sample. Although original sample included 50 IPOs over the period 1993-2004, the final sample numbered 43 IPOs free of any problems with liquidity and trading activity of shares during the post-listing period (from day 0 to 135) that might distort the results of analysis. In particular, the offerings that were dropped from the initial sample presented variations in their shares outstanding (i.e. new share offerings and listing shares) or secondary offerings.

Table A2.- Matrix of the covariance between the independent variables of equations [3]

| Pearson coefficients	U_i	RS_i	RC_i	Log MV_i	Log P_i	σ_i
U_i	1	0.003	-0.121	0.005	0.085	0.330**
RS_i	0.003	1	-0.172	-0.412***	-0.050	-0.024
RC_i	-0.121	-0.172	1	0.046	-0.027	-0.221
Log MV_i	0.005	-0.412***	0.046	1	0.055	0.125
Log P_i	0.085	-0.050	-0.027	0.055	1	0.029
σ_i	0.330**	-0.024	-0.221	0.125	0.209	1

Notes:

U_i is the underpricing of offering, RS_i is the relative size of offering, RC_i is the retail composition of offering, Log MV_i is the log of market value of equity on the first trading day, Log P_i is the log of offering average price and σ_i, which is the standard deviation of daily returns based on closing prices during the post-listing period.

***   Significance at the 1% level

**   Significance at the 5% level

*   Significance at the 10% level

Graph 1.- Post-IPO market quality index
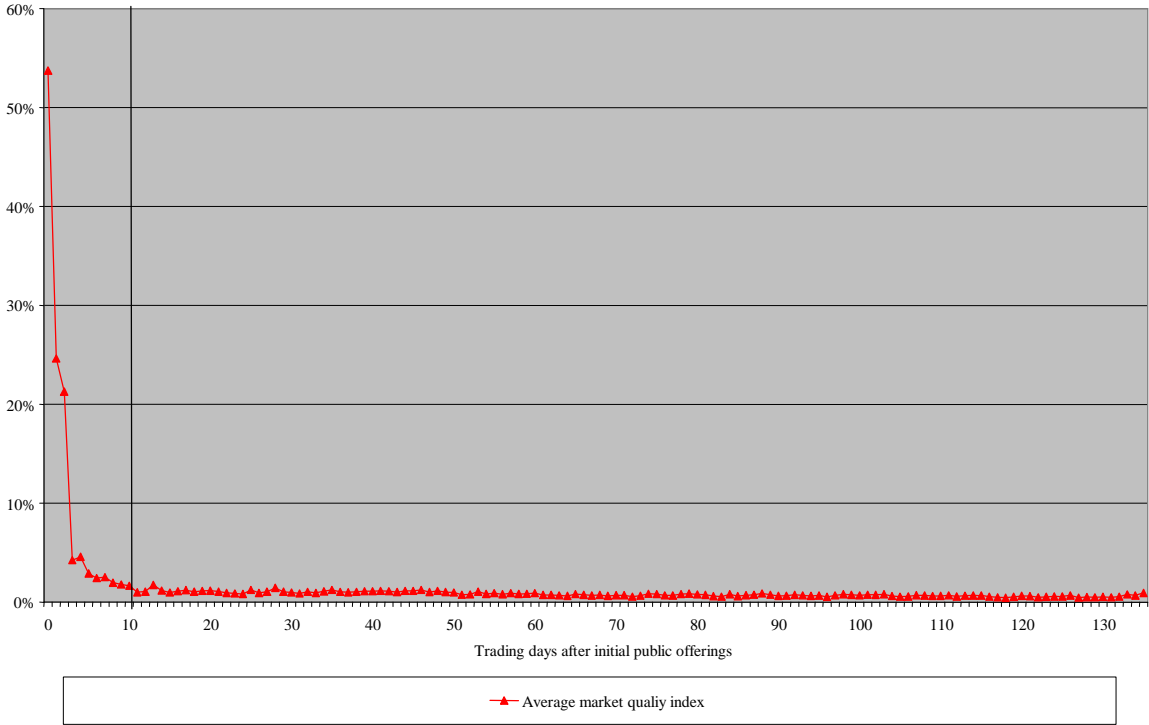
Graph 2.- Post-IPO relative trading volume