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Influence of Secondary Offerings on the Liquidity and Trading Activity of Stocks Outstanding *

Miguel A. ACEDO – University of La Rioja
Fco. Javier RUIZ – University of La Rioja
Rafael SANTAMARÍA – Public University of Navarra (rafael@unavarra.es)
(corresponding author)

Abstract
This paper examines the influence of secondary offerings (SOs) on the liquidity and trading activity of stocks outstanding. The results reveal that liquidity and trading activity increase after the execution of SOs. We observe that the offering discount is explained by the size of the offering and its retail composition. We have also shown that changes in liquidity and trading activity are explained by the retail composition of the offering, such that the choice of ownership structure is decisive in the level of liquidity afforded by SOs. The offering discount is one of the chosen methods of attracting small-scale investors and promoting share liquidity following these operations.

1. Introduction

A large number of studies have analyzed the impact of certain operations on share liquidity and trading activity in the stock market. To mention some of the key contributions, Eckbo, Masulis, and Norli (2000) examine seasoned equity offerings; Brockman and Chung (2001) repurchase tender offers; Dennis and Strickland (2003) and Menéndez and Gómez-Ansón (2003) stock splits; and Menyah and Paudyal (1996) and Farinós and Fernández (1999) takeovers.[1] Among the main references on the subject of initial public offerings (IPOs) we can mention Pham, Kalev, and Steen (2003), Eckbo and Norli (2005), and Ellul and Pagano (2006).

One of the main purposes of IPOs is to increase share liquidity. By meeting this objective it is possible to obtain better terms for ensuring the issue of new capital and thereby increase the efficiency of future placings. However, the liquidity obtained is not entirely independent of the decisions taken by firms when designing IPOs. In regard to this, both Pham et al. (2003) and Ellul and Pagano (2006) relate the liquidity obtained to the degree of underpricing of IPOs. Pham et al. (2003) actually 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. Thus, prior ownership structures and decisions affecting the variables or defining characteristics of IPOs may play a decisive role in determining the nature of the relationship between liquidity and underpricing.

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[1] Except for (Farinós, Fernández, 1999), the rest of the literature on takeovers focuses on the announcement rather than the execution of the operation.

The results for IPOs could be extended to secondary offerings (SOs). A secondary offering, also called a secondary public offering, is the public sale of a large block of outstanding shares in which one or more of a firm's stockholders sell all or a large portion of their holding. As in the case of IPOs, sellers have to present a prospectus in the stock market showing the structure of the offering (retail and institutional tranches, offer price, offer period, etc.). At close of the offer period, prospective buyers are notified of the outcome of their bids.[2] It is important to note that this kind of offering does not increase the number of stocks outstanding on the market, because no new shares are released. This is the original meaning of the term. However, the name SO is also used to refer to follow-on offerings of new shares from a firm that has already made its IPO. In this paper, we will use the term secondary offering in its original sense only. That is, we will work with offerings representing sales of stock by shareholders who wish to decrease their positions in a firm. These are offerings in the secondary market, as opposed to those made by firms to raise capital, which are aimed at the primary market.

The main difference between IPOs and SOs is that prior to the IPO there are no outstanding shares. Since this can constitute a major difference, there is no reason why the effects deriving from IPOs and SOs should be identical. In fact, in an SO the previous shares outstanding in the market may affect ex post liquidity and trading activity following the execution of the offering. Despite these considerations, as far as we are aware, there have been no previous analyses of the possible influence of SOs on the liquidity and trading activity of stocks outstanding.[3]

This paper therefore aims to analyze some of the issues relating to the effects of SOs on stock liquidity and trading activity. Although operations of this type do not change the number of shares outstanding, they should encourage market trading of the firm's shares and increase liquidity, since they have the opposite effect of a takeover in that they put a large block of shares on the market that were formerly held by only one or a small number of stockholders.[4] In this context, the first issue to be addressed is whether SOs affect liquidity and trading activity in shares outstanding and whether the effects are what might be expected from such operations. In particular, taking into account the arguments of the information-based hypothesis, the increment in the number of investors and analyst coverage of the stock, as a consequence of the increment of the shares traded, will produce an increase in the amount of information that is made public, reducing the level of informed trading and the level of asymmetric information (see (Li, McInish, Wongchoti, 2005)) and thus narrowing the bid-ask spread. Furthermore, although there is no variation in the number of outstanding shares, the free float increases as shares previously held by major investors come into the market. This increase in the free float may induce an increase in the optimal portfolio weights if the correlation structure remains unchanged, leading to an increment in trading volume by liquidity investors.[5]

[2] These features constitute the distinction between an SO and a block trade. Block trading, usually between institutional investors, takes place in a special market segment to prevent major price effects.

[3] The only existing studies check for abnormal negative returns following this type of operation (Farinós, 2001), and (Clarke, Dunbar, Kahle, 2004).

[4] Farinós and Fernández (1999) find that takeovers reduce liquidity and trading activity.

[5] We are grateful to the referee for helpful suggestions with respect to these issues.

The second issue we aim to analyze is whether the liquidity and trading activity levels following SOs are linked to the variables or characteristics that define them (relative size and retail composition). Note that the second of these variables (retail composition) is related to ownership dispersion, which is cited by some authors (Pham et al., 2003) as a means of achieving liquidity. We therefore analyze the role played by the offering discount in achieving liquidity, since, in an adverse selection environment, this could be the cost entailed in attracting uninformed investors and providing liquidity.[6]

The article is structured into five sections. Section two is devoted to a description of the database. Section three analyses the effects of SOs on the liquidity and trading activity of stocks outstanding. Section four explores the role played by the SO-defining variables on changes in liquidity and trading activity, and the final section presents the main conclusions of the analysis.

2. Data Base

The sample consists entirely of secondary offerings by firms listed on the Spanish continuous market from 1993 to 2005. The SIBE (Spanish Stock Market Interlinking System), or continuous market, is chosen in order to avoid problems with different trading systems. Another important reason for this choice is the greater liquidity of stock trading on this market, which provides more opportunity for arbitrage. The continuous market represents approximately 98.5 % of all stock market trading in Spain.

Table A1 in the *Appendix* lists the firms that make up the study sample and gives the main characteristics of the data. A total of 32 SOs were made over the study period (1993–2005). However, these SOs were marked by a variety of events affecting liquidity and trading activity of shares for the pre and post secondary offering periods that might distort the results of the analysis, for example, stocks that were not listed on the continuous market at any point in the observation window, offerings that were the object of splits, variations in shares outstanding (new share offerings, listings of previously offered shares, capital reductions), company mergers, etc. Any secondary offering featuring one of these circumstances was eliminated from the sample. Of the 32 offerings originally considered for the study, 16 were found to be entirely free of any such circumstances.

All data relating to SO 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).

3. SOs and Their Effects on the Liquidity and Trading Activity of Shares Outstanding

In this section we test the effects of SOs on the liquidity and trading activity of shares outstanding. The variables used to measure share liquidity are the bid-ask

[6] Several explanations for offering underpricing are based on the theory of information asymmetries. In particular, uninformed investors must incur some additional cost to collect information and therefore will not be induced to participate unless a higher degree of discount is offered. See (O'Hara, 1995) for an overview of the theoretical framework.

spread, the relative depth, and the market quality index.[7] 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 value of the quotient obtained by dividing the price spread by its middle 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 (the price that investors would have to pay for one share, $P^{Ask}_{it\,t'}$), and the highest price at which they are willing to buy it (the price that investors would charge for one unit of this asset, $P^{Bid}_{it\,t'}$).

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

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

The relative depth (RD_{it}) represents the average number of shares i available on each side of the market at the best first level prices on trading day t relative to the number of stocks outstanding;[8] and the market quality index (MQI_{it}) is the ratio between the middle relative depth and the bid-ask spread. This can be written as follows:

$$MQI_{it} = \frac{RD_{it}/2}{S_{it}} \qquad (2)$$

Liquidity is certain to be enhanced when the bid-ask spread narrows and the relative depth increases or when the market quality index increases.

Given the nature of SOs, which flood the market with stock formerly held by only one or a few stockholders for corporate control purposes, it is reasonable to expect an increase in share liquidity following the execution of such operations. Portfolio selection considerations relative to the number of shares outstanding, investors, and dispersion of ownership structure point towards this relationship.[9] The bid-ask spread can be expected to decrease while the relative depth and market quality index increase, as can be predicted by using the information-based hypothesis.

For the same reasons given above, a positive effect on trading activity is also likely. The measures used in this paper to analyze this question are relative trading

[7] The nature of the data for this study obliged us to use the usual liquidity measures. Intraday data, however, would allow the use of more sophisticated liquidity measures (see (Frey, Grammig, 2006)).

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

[9] Note that, although, theoretically, the number of stocks outstanding on the market after the offering is not increased, because no new shares are released, in reality there will be a higher number of stocks on the market that could be bought or sold (the free float increases), as well as a higher number of investors and a more dispersed ownership structure.

volume or turnover, relative number of transactions, and relative trading volume or turnover per transaction.

The relative trading volume (RTV_{it}) or turnover reflects the number of shares i that are traded on trading day t relative to the number of shares outstanding. The relative number of transactions (RNT_{it}) represents how many times shares i are traded on trading day t relative to the number of shares outstanding, and the relative trading volume per transaction ($RTVT_{it}$), also named the relative size or turnover per transaction, quantifies the average number of shares i that are traded in each transaction on trading day t relative to the number of stocks outstanding.

In addition to the above variables, we also consider two that are linked to price variations: return and volatility. The return (R_{it}) reflects the price variations of share i on trading day t, and volatility (V_{it}) measures the rank maximum of the price variation of share i on trading day t, as shown in expression (3).

$$V_{it} = \frac{P_{it}^{Max} - P_{it}^{Min}}{(P_{it}^{Max} + P_{it}^{Min})/2} \tag{3}$$

where P_{it}^{Max} and P_{it}^{Max} are the maximum and minimum prices of share i on trading day t.

The "*opportunity window*" hypothesis (Ritter, 1991), (Spiess, Affleck-Graves, 1995) and the increase in shares offered on the market, with the subsequent price pressure, the "*price pressure*" hypothesis, (Loderer, Cooney, Van Drunen, 1991), and (Corwin, 2003), give reason to predict a reduction in price variation following the execution of SOs.

This study bases the analysis of these issues on the variables that measure liquidity, trading activity, and price variations before and after offerings, focusing specifically on the pre secondary offering period, which is the 125 trading days preceding the authorization of the offering (from day –135 to day –11, that is, approximately 6 months before the secondary offering), and the post secondary offering period, which is the 125 trading days following the execution of the offering (from day 11 to day 135, that is, approximately 6 months after the secondary offering). By comparing these two periods we should be able to measure the effect of offerings on the variables under analysis. The purpose of the exclusion period, that is, the 10 trading days prior to the authorization and the 10 trading days following the execution of the offering, is to prevent contamination of the pre and post offering periods by effects solely due to the authorization and execution of the offering.[10]

To measure the impact of SOs on the variables in our analysis we use the following system of equations:

$$X_{it} = \beta_{i0} + \beta_{i1} \,.\, PSOD_t + \varepsilon_{it} \qquad i = 1, \ldots, 16 \tag{4}$$

where X_{it} is the variable X for firm i on day t and $PSOD_t$ is the dummy variable for the post secondary offering period (from day 11 to 135).

The regression coefficient β_{i1} of the dummy variable for the post secondary offering period represents the average variation of the variable X for firm i after

[10] See (Miller, Reilly, 1987), (Aggarwal, Rivoli, 1990), (Krigman, Shaw, Womack, 1999), (Pham et al., 2003), (Corwin, Harris, Lipson, 2004), and (Zheng, Ogden, Jen, 2005) in the case of IPOs.

TABLE 1 Changes in Liquidity, Trading Activity, and Price Variations after the Execution of Secondary Offerings

Dependent variable	**Regression coefficients**		
	β_{i0}	β_{i1}	
	Average value (*p*-value)	**Average value (*p*-value)**	**(*p*-v2)**
	Liquidity		
Bid-ask spread	0.00464 (0.000)	-0.00091 (0.000)	(0.000)
Relative depth	5.59E-05 (0.000)	5.49E-06 (0.000)	(0.000)
Market quality index	0.01053 (0.000)	0.00230 (0.000)	(0.000)
	Trading activity		
Relative trading volume	0.00206 (0.000)	0.00058 (0.000)	(0.000)
Relative number of transactions	2.69E-06 (0.000)	8.30E-07 (0.000)	(0.000)
Relative trading volume per transaction	8.66E-06 (0.000)	1.59E-06 (0.001)	(0.000)
	Price variations		
Return	0.00126 (0.000)	-0.00107 (0.077)	(0.505)
Volatility	0.02134 (0.000)	-0.00108 (0.031)	(0.000)

Notes: For each variable an equation system is estimated using the Generalized Method of Moments (GMM):

$$X_{it} = \beta_{i\,0} + \beta_{i\,1} \,.\, PSOD_t + \varepsilon_{it} \qquad i = 1, \ldots, 16 \tag{4}$$

where X_{it} is the variable X for firm i on day t and $PSOD_t$ is the dummy variable for the post secondary offering period (from day 11 to 135). The regression coefficient β_{i1} of the dummy variable for the post secondary offering period represents the average variation of the variable X for firm i after the execution of the secondary offering and therefore measures the impact of the offering on this variable.

The coefficients shown in the table are the average values of the coefficients of the 16 regressions, as well as the *p*-values of the Wald test of the null hypothesis that the average value is equal to zero, that is, H_0: $\left(\frac{1}{16}\,.\,\sum_{i=1}^{16}\beta_{ik}\right)=0$, for K = 0 and 1, respectively. *P-v2* are the *p*-values of the Wald test of the null hypothesis that all β_{i1} are jointly zero. The sample is composed of 16 firms that made a secondary offering over the period 1993–2005.

the execution of the secondary offering and therefore measures the impact of the offering on this variable. We use the Generalized Method of Moments (GMM) as the system estimation method. GMM is a robust estimator in that it does not require information on the exact distribution of the disturbances and can be made robust to heteroscedasticity and/or autocorrelation of unknown form. Since we are interested in knowing the average effect of SOs on liquidity and trading activity, the null hypothesis is that the means of β_{i1} are equal to zero, that is, H_0: $\left(\frac{1}{16}\,.\,\sum_{i=1}^{16}\beta_{i1}\right)=0$. We have also tested the null hypothesis that all β_{i1} are jointly zero.[11]

[11] We thank the referee for this suggestion.

GRAPH 1 Market Quality Index around Secondary Offerings

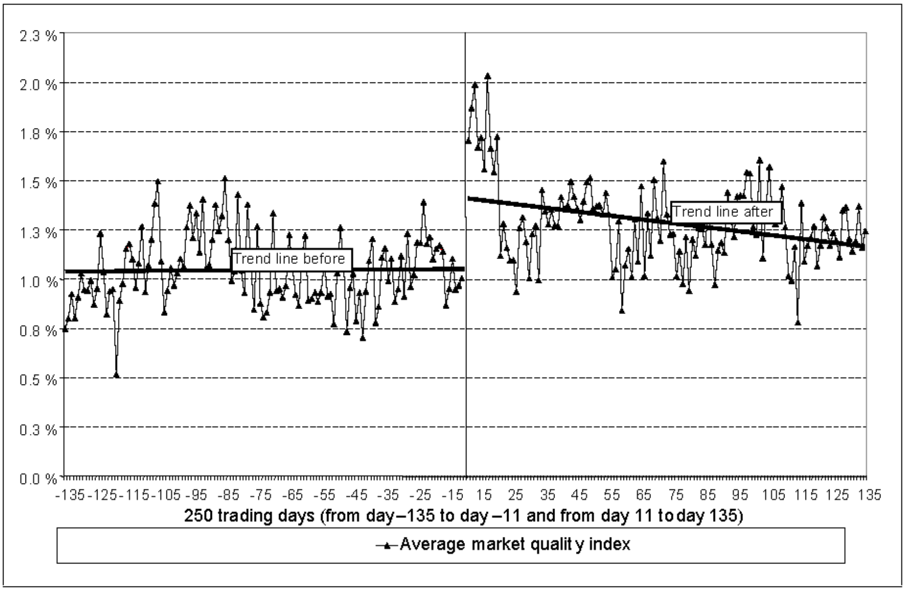
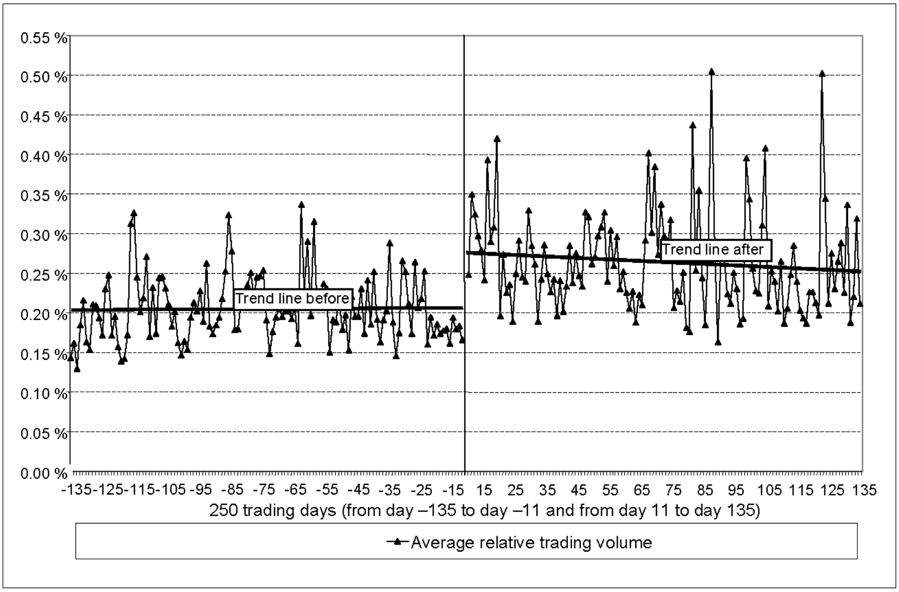


Table 1 presents the results of the equations system and shows the average values of the estimated coefficients β_{i0} and β_{i1}, as well as the *p*-values of the Wald test of the null hypothesis that the average value is equal to zero and the *p*-values (*p-v*2) for the null hypothesis that all β_{i1} are jointly zero. Turning to the analysis of the average value of the coefficient β_{i1}, the data reveal that all the changes in these variables after the execution of the offerings have the expected signs. A significant increase in liquidity is shown by the narrowing of the bid-ask spread and the increase in the relative depth and also in the market quality index. The results reveal the liquidity injected into the market by these operations. A significant increase in trading activity is also shown by the relative number of transactions and the relative trading volume per transaction, and, as a consequence, an increase in the relative trading volume ratio, which confirms the fact that these SOs stimulate trading activity in this market. Finally, when it comes to price variations, the data reveal a significant decrease in returns and volatility, which is consistent with the "*opportunity window*" (Ritter, 1991), (Spiess, Affleck-Graves, 1995) and "*price pressure*" hypotheses[12] (Loderer, Cooney, Van Drunen, 1991), (Corwin, 2003). *Graphs 1, 2,* and *3* show the impact of these operations on the main variables driving these results, that is, the market quality index, the relative trading volume and the return. The trend lines before and after the operations clearly reveal the increase in liquidity and trading activity and the decrease in returns.

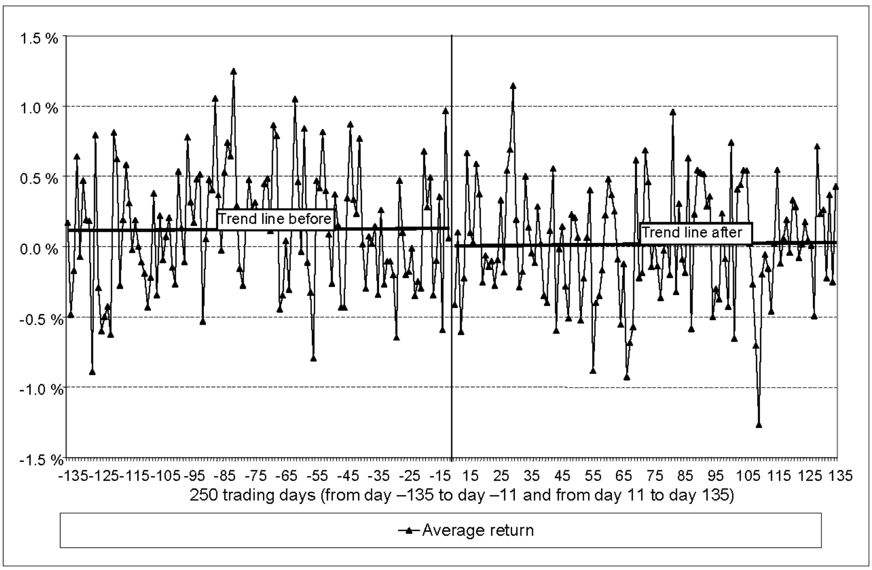
Nevertheless, given that the evolution of these variables for each firm during the pre and post offering periods may be linked to the market trend, we isolate

[12] Similar conclusions can be drawn from the results of the test to determine whether all the β_{i1} are jointly equal to zero, except for the return variable, for which the null hypothesis cannot be rejected at standard levels of significance. Despite the negative sign of the majority of the coefficients, high individual variance precludes both their individual and joint significance.

GRAPH 2 Relative Trading Volume around Secondary Offerings



GRAPH 3 Return around Secondary Offerings



the market effect on these variables in our analysis by using the following system of equations:

$$X_{it} = \beta_{i0} + \beta_{i1} \,.\, PSOD_t + \beta_{i2} \,.\, \overline{X}_t + \varepsilon_{it} \qquad i = 1, \dots, 16 \qquad (5)$$

where X_{it} is the variable X for firm i on day t, $PSOD_t$ is the dummy variable for the post

TABLE 2 Changes in Liquidity, Trading Activity, and Price Variations after the Execution of Secondary Offerings Excluding the Market Effect

Dependent variable	**Regression coefficients**		
	β_{i0}	β_{i1}	β_{i2}
	Average value (*p*-value)	**Average value (*p*-value) (*p*-*v*2)**	**Average value (*p*-value)**
		Liquidity	
Bid-ask spread	0.00237 (0.000)	-0.00092 (0.000) (0.000)	0.16905 (0.000)
Relative depth	3.72E-05 (0.000)	-1.14E-06 (0.522) (0.000)	1.87826 (0.000)
Market quality index	0.00635 (0.000)	0.00060 (0.090) (0.000)	9.82539 (0.000)
		Trading activity	
Relative trading volume	0.00114 (0.000)	0.00048 (0.000) (0.000)	1.66043 (0.000)
Relative number of transactions	-4.66E-08 (0.785)	5.04E-07 (0.000) (0.000)	4.62166 (0.000)
Relative trading volume per transaction	7.70E-06 (0.000)	1.45E-06 (0.000) (0.000)	0.08454 (0.000)
		Price variations	
Return	0.00052 (0.198)	-0.00138 (0.008) (0.245)	1.09894 (0.000)
Volatility	-0.00102 (0.391)	0.00101 (0.116) (0.000)	0.92485 (0.000)

Notes: For each variable an equation system is estimated using the Generalized Method of Moments (GMM):

$$X_{it} = \beta_{i0} + \beta_{i1} \,.\, PSOD_t + \beta_{i2} \,.\, \overline{X}_t + \varepsilon_{it} \qquad i = 1, \dots , 16 \qquad (5)$$

where X_{it} is the variable X for firm i on day t, $PSOD_t$ is the dummy variable for the post secondary offering period (from day 11 to 135), and $\overline{X}_t$ is the average value of the variable X on day t for the remainder of the firms in the market. The regression coefficient β_{i1} of the dummy variable for the post secondary offering period represents the average variation of the variable X for firm i after the execution of the secondary offering without the market effect and therefore measures the impact of the offering on this variable excluding the market effect.

The coefficients shown in the table are the average values of the coefficients of the 16 regressions, as well as the *p*-values of the Wald test of the null hypothesis that the average value is equal to zero, that is, H_0: $\left(\frac{1}{16} \cdot \sum_{i=1}^{16} \beta_{ik}\right) = 0$, for K = 0, 1 and 2, respectively. *P-v2* are the *p*-values of the Wald test of the null hypothesis that all β_{i1} are jointly zero. The sample is composed of 16 firms that made a secondary offering over the period 1993–2005.

secondary offering period (from day 11 to 135), and $\overline{X}_t$ is the average value of the variable X on day t for the rest of the firms that form the market.

The regression coefficient β_{i1} of the dummy variable for the post secondary offering period represents the average variation of the variable X for firm i after the execution of the secondary offering without the market effect and therefore measures the impact of the offering on this variable excluding the market effect. We also use the Generalized Method of Moments (GMM) as the system estimation method.

Table 2 presents the results of the system of equations. In particular, we show the averages of the estimated coefficients β_{i0}, β_{i1}, and β_{i2}, as well as the *p*-values of the Wald tests for the null hypothesis that any of these averages is equal to zero and the *p*-values (*p-v*2) for the null hypothesis that all β_{i1} are jointly zero. As can be seen, all the variables present a significantly positive relationship with the market, clearly demonstrating the need to eliminate this effect in order to determine whether the observed findings are caused by the SOs themselves or by the market state in which the latter tend to take place. Focusing on the analysis of the mean value of coefficient β_{i1}, the data again reveal a significant increase in liquidity shown in the narrowing of the bid-ask spread, as well an increase in the market quality index (although significant only at the 10% level). The above observed increase in relative depth, however, appears to be due more to market conditions than to the impact of the operations themselves. The trading activity, furthermore, shows a significant increase, which is reflected in the relative number of transactions, the relative trading volume per transaction, and the relative trading volume. These results provide evidence to support the argument that SOs produce an increase in share liquidity and trading activity that is directly attributable to these operations. A final observation is that there are no significant changes in volatility but, as expected, there is a significant decrease in return.[13]

To increase the robustness of the findings, the same analysis was repeated using pre and post secondary offering periods of 60 trading days, instead of the 125 used in the analysis described above, with basically the same results[14], that is, a narrowing of the bid-ask spread and an increase in the market quality index. In this case, it was also possible to observe a significant increase in the relative depth. Since this effect was not observed for longer pre and post secondary offering periods, it can be assumed to be an exclusively short-term effect that later fades. The effect on the trading volume was also very similar. In particular, not only the relative number of transactions, but also the relative trading volume per transaction and the relative trading volume show a significant increase. Finally, as for the full sample period, it was possible to observe a significant decrease in return and no effect on volatility.

4. Characteristics of SOs and the Liquidity and Trading Activity of Shares Outstanding

The analysis presented in the above section focused on the overall effects of SOs. Arguably, however, the effects of these operations on liquidity and trading activity in shares outstanding will differ as a function of their size and their distribution structure (retail and institutional tranches).[15] The relative size argument seems plausible, in view of the fact that if these operations have an impact on liquidity and trading activity in shares outstanding, the larger the operation the greater the impact to be expected. Ne-

[13] The effects on liquidity and trading activity show up clearly in the Wald tests for the null hypothesis that all β_{i1} are jointly zero, but the results regarding the effect on return and volatility are not so clear. Although 14 of the 16 return coefficients are negative, significance at the standard levels cannot be shown due to high variance. The opposite applies for volatility. Overall, the individual values are individually significant, but the 9 positive and 7 negative values result in a positive average value that does not prove significant at the conventional levels. Nevertheless, although it can be conclusively rejected that the coefficients are jointly equal to zero, their effect is far from homogeneous, as shown by the result for the average value test.

[14] These results are available from the authors upon request.

[15] Note that in this type of operation the issuer of the SO defines the ownership structure of the offering through the percentage of shares offered to the retail (small investors) and institutional (institutional investors) tranches.

vertheless, arguments based on the distribution structure, while less direct, appear just as convincing. Amihud and Mendelson (1986) contribute to the debate by demonstrating the existence of an inverse relationship between bid-ask spread and concentration of ownership, while, more specifically, Bhide (1993) and Holmstrom y Tirole (1993) show that a more disperse ownership structure can provide greater liquidity, which can be achieved with a larger retail composition of the offering. Pham et al. (2003) also show that liquidity is directly linked to dispersion of ownership. According to these authors, liquidity is crucial to ensure future share offerings. If the initial owners keep a large part of a firm's shares, they should improve liquidity by increasing the percentage of individual investors and thereby creating a more disperse structure. This also helps to prevent potential hostile takeovers (Shleifer, Wishny, 1986).

As noted earlier, however, both Pham et al. (2003) and Ellul and Pagano (2006) relate achieved liquidity to the degree of underpricing. Pham et al. (2003) link the degree of underpricing to the cost of creating incentives to attract small-scale investors in order to increase the liquidity of the stock. We therefore aim to introduce the offering discount variable as a measure of underpricing in order to explain variations in liquidity and trading activity following SOs.

The first step of this approach was to run a regression to examine relative size and retail composition, that is, the variables that define the offering, for their explanatory capacity for the offering discount, as shown in the following (cross-section) specification:

$$D_i = \lambda_0 + \lambda_1 \,.\, RS_i + \lambda_2 \,.\, RC_i + \varepsilon_i \qquad (6)$$

where D_i is the discount of offering i and reflects the difference between the market average price of share i on the days the operation is authorized and executed and the average price of the offering relative to the market average price of share i on the days the operation is authorized and executed, RS_i is the relative size of offering i and represents the number of shares i offered relative to the number of shares i outstanding, and RC_i is the retail composition of offering i and reflects the number of shares i offered in the retail tranche relative to the number of shares i offered.

Given the limited number of observations, the bootstrap procedure was used to obtain the average values of the coefficients and the simulated p-values. The actual procedure was to perform 1,000 OLS regressions with 16 observations per regression drawn with replacement. The critical 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 (see *Table 3*) clearly allow us to conclude that the selected discount level in SOs has both characteristics. Logically, the larger the operation, the higher the discount offered to ensure its success. Moreover, in line with the arguments put forward by Pham et al. (2003), a higher discount is more likely in SOs when the retail composition of the offering for individual shareholders is bigger, in order to compensate them for the higher adverse selection costs they face and to increase the appeal of the shares. This appears to be direct evidence that raising the percentage of individual shareholders in order to increase share liquidity entails an explicit cost linked to the designated percentage discount for the offering.

TABLE 3 Offering Discount: Relation to Relative Size and Retail Composition of the Offerings

Dependent variable	Regression coefficients		
	λ_0	λ_1	λ_2
	Average value (*p*-value)	**Average value (*p*-value)**	**Average value (*p*-value)**
Offering discount	-0.01317 (0.158)	0.16564 (0.004)	0.04287 (0.002)

Notes: Average results from the 1,000 cross-sectional regressions:

$$D_i = \lambda_0 + \lambda_1 \,.\, RS_i + \lambda_2 \,.\, RC_i + \varepsilon_i \qquad (6)$$

where D_i is the discount of the offering *i,* defined as the ratio of the difference between the market average price of share *i* on the days of the authorization and market operation and the offering average price to the market average price of share *i* on the days of the authorization and market operation, RS_i is the relative size of the offering *i*, defined as the ratio of the numbers of shares *i* offered to the number of shares *i* outstanding, and RC_i is the retail composition of the offering *i*, defined as the ratio of the number of shares *i* offered in the retail tranche to the number of shares *i* offered.

The coefficients shown in the table are the average values of the coefficients of 1,000 bootstrap OLS regressions with 16 observations per regression extracted with replacement, as well as the simulated *p*-values of the 1,000 bootstrap regressions. The sample is composed of 16 secondary offerings over the period 1993–2005.

Given the high level of correlation observed between the discount of the offer, D_i, and the defining characteristics of the operation, RS_i and RC_i, the residual of the regression, RD_i, will be used to proceed towards the analysis of the explanatory capacity provided by these variables for variations in liquidity and trading activity following SOs. Formally, we propose the (cross-section) specification, also estimated using the bootstrap method with 1,000 OLS regressions of 16 observations each.

$$\beta_{i1} = \delta_0 + \delta_1 \,.\, RS_i + \delta_2 \,.\, RC_i + \delta_3 \,.\, RD_i + \varepsilon_i \qquad (7)$$

where β_{i1} is the regression coefficient of equation (5), which represents the average variation of the variable X for firm *i* after the execution of the secondary offering without the market effect, and RS_i and RC_i are the variables defined and used in the regression of equation (6) and RD_i is the residual also obtained from equation (6).

These results are summarized in *Table 4*. The data reveal that, in overall terms, retail composition (*RC*), is the variable that provides higher explanatory capacity to explain variations in liquidity and trading activity following SOs, although the effect is less noticeable than suggested by other studies on IPOs. Probably, the effort to achieve liquidity to maximize the success of future placings is greater in IPOs than in SOs. As noted earlier, the variable with higher impact is *RC*, and even then not for all the variables relating to these measures. As far as liquidity is concerned, the effect on the bid-ask spread, despite showing the expected sign, does not prove significant, while the effect on relative depth is more noteworthy. As a result, we are able to observe the expected significant effects on the market quality index variable. In terms of trading activity, while it is possible to observe a significant increase in the relative number of transactions, this is offset by a reduction in the relative trading volume per transaction, due to the increase in the percentage of individual holdings. Thus, the overall effect on the relative trading volume is not significant at the standard levels.

TABLE 4 Changes in Liquidity and Trading Activity after the Execution of Secondary Offerings: Relation to Relative Size, Retail Composition, and Residual Discount of the Offerings

Dependent variable	**Regression coefficients**			
	δ_0	δ_1	δ_2	δ_3
	Average value (*p*-value)	**Average value (*p*-value)**	**Average value (*p*-value)**	**Average value (*p*-value)**
	Liquidity			
Bid-ask spread	0.00222 (0.486)	-0.01463 (0.278)	-0.00172 (0.578)	-0.02075 (0.680)
Relative depth	-2.42E-06 (0.022)	6.90E-05 (0.118)	3.52E-05 (0.006)	0.00019 (0.306)
Market quality index	-0.00298 (0.182)	0.01060 (0.120)	0.00548 (0.072)	0.05091 (0.342)
	Trading activity			
Relative volume	0.00011 (0.826)	0.00075 (0.720)	0.00055 (0.538)	-0.00357 (0.750)
Relative number of transactions	-2.01E-07 (-0.716)	4.92E-06 (0.670)	1.91E-06 (0.062)	2.52E-05 (0.040)
Relative trading volume per transaction	-6.00E-07 (-0.696)	2.41E-05 (0.070)	-6.64E-06 (0.224)	-3.60E-05 (0.814)

Notes: Average results from the 1,000 cross-sectional regressions for each variable:

$$\beta_{i1} = \delta_0 + \delta_1 \,.\, RS_i + \delta_2 \,.\, RC_i + \delta_3 \,.\, RD_i + \varepsilon_i \qquad (7)$$

where β_{i1} is the regression coefficient of equation (5) in *Table 2*, which represents the average variation of the variable *X* for firm *i* after secondary offering execution without the market effect, 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 number of shares *i* offered, and RD_i is the residual discount of offering *i*, defined as the residual from the regression of the offering discount variable using RS_i and RC_i as explanatory variables.

The coefficients shown in the table are the average values of the coefficients of 1,000 bootstrap OLS regressions with 16 observations per regression extracted with replacement, as well as the simulated *p*-values of the 1,000 bootstrap regressions. The sample is composed of 16 firms that made a secondary offering over the period 1993–2005.

The relative size of the offering (*RS*) does not appear to show any explanatory capacity for the changes in the variables relating to share liquidity and trading activity shares following SOs, with the exception of an increase in the relative trading volume per transaction. This is a significant finding since it suggests that the effects on liquidity and trading activity are due not so much to the percentage of shares offered as to the way they are distributed. This is in quite close keeping with recent findings for IPOs, underpricing, ownership structure, and liquidity. Moreover, apart from its effect in attracting small-scale investors, which is observed in a significant increase in the relative number of transactions, the explanatory capacity of the discount level (*RD*) is merely testimonial. This further justifies the stress laid earlier on the fact that the role played by the discount is basically only as the cost required to attract small-scale investors and thereby increase liquidity.

5. Conclusions

In this paper we have analyzed the influence of SOs on the liquidity and trading activity of shares outstanding, which, given the lack of previous studies on the topic, constitutes a novel aspect of this field of research. Our findings are based on an analysis of the variations in the variables that measure the liquidity, trading activity, and price variations before and after offerings.

According to the results obtained, SOs cause an increase in the liquidity and trading activity of the shares being offered, while bringing about a decrease in price variations. A narrowing of the bid-ask spread, a reduction in returns, and an increase in the market quality index, relative trading volume, relative number of transactions, and relative trading volume per transaction all help to confirm this finding.

In addition, the discount to SOs has been found to be explained by the offering strategy in terms of relative size and retail composition.

The fact that the discount is found to be directly linked to the size of the offering is hardly surprising, since its purpose is to maximize the success of the operation. Moreover, it is also directly linked to the percentage of individual shareholders (retail shareholders), a finding clearly consistent with the conclusions presented by authors such as Pham et al. (2003), who relate underpricing with the cost of obtaining liquidity to create incentives to attract small-scale investors.

Finally, the variations in liquidity and trading activity observed after SOs are found to bear some relation to the specific characteristics of the operations, particularly the type of ownership structure. This may lend some support, albeit less than in the case of IPOs, to the arguments put forward in recent research on SOs, which show that the liquidity following these operations is basically achieved by attracting small-scale investors, who are quick to respond to underpricing. Surprisingly, the size of the offering contributes little further explanatory capacity for the changes in liquidity observed after SOs, despite the fact that it might be reasonable to link the percentage of ownership offered with the ex post level of liquidity. The part of the discount that remains unexplained by the size of the offering and the percentage of retail shareholders also lacks any significant capacity to explain these variations in liquidity and trading activity.

APPENDIX

TABLE A1 Sample of Secondary Offerings in Spain (1993–2005)

Offered share	Year	Offered shareholder	Authorization date	Market operation date	Number of sale shares
Repsol	1993	Instituto Nacional de Hidrocarburos	03/10/93	03/31/93	40,000,000
Argentaria	1993	Soc. Est. de Patrimonio I	10/22/93	11/17/93	29,945,455
Aumar	1994	Bco. Central Hispanoamericano	03/10/94	03/28/94	8,250,000
Fcc	1994	Several	03/15/94	03/30/94	3,000,000
Endesa	1994	Teneo	05/03/94	06/01/94	22,609,183
Asturiana del Zinc (1)	1994	Corp. Industrial y Financiera Banesto	12/13/94	12/19/94	8,911,047
Mapfre Vida (1)	1995	Corp. Mapfre	01/19/95	02/09/95	1,715,200
Repsol	1995	Instituto Nacional de Hidrocarburos	03/17/95	04/11/95	57,000,000
Gines Navarro (1)	1995	Several	06/20/95	07/10/95	5,600,000
Telefónica	1995	Soc. Est. de Patrimonio II	09/07/95	10/03/95	112,085,400
Repsol	1996	Soc. Est. de Partic. Industriales (Sepi)	01/16/96	02/06/96	33,000,000
Argentaria	1996	Soc. Est. de Patrimonio I	02/23/96	03/26/96	28,670,422
Global Stell Wire (1)	1996	Socten Auxiliar	11/12/96	11/28/96	10,708,531
Gas Natural SDG	1996	Soc. Est. de Partic. Industriales (Sepi)	11/21/96	12/03/96	1,423,520
Telefónica (1)	1997	Soc. Est. de Partic. Patrimoniales (Seppa)	01/17/97	02/18/97	191,019,467
Repsol	1997	Soc. Est. de Partic. Industriales (Sepi)	04/04/97	04/29/97	30,002,859
Catalana de Occidente (1)	1997	Catalana de Occidente	04/07/97	04/22/97	2,637,257
Faes (1)	1997	Several	07/10/97	07/23/97	2,400,149
Endesa (1)	1997	Soc. Est. de Partic. Industriales (Sepi)	09/23/97	10/21/97	260,005,599
Argentaria (1)	1998	Soc. Est. de Partic. Patrimoniales (Seppa)	01/23/98	02/17/98	35,764,129
Vidriera Leonesa (1)	1998	Vista Desarroyo and RBS Trus Bank	02/19/98	02/25/98	1,211,903
Tabacalera (1)	1998	Soc. Est. de Partic. Patrimoniales (Seppa)	04/08/98	04/28/98	96,188,092
Koipe (1)	1998	Several	04/30/98	05/07/98	1,828,758
Endesa (1)	1998	Soc. Est. de Partic. Industriales (Sepi)	05/14/98	06/09/98	332,200,112
Bodegas y Bebidas	1999	Corp. de Alimentación y Bebidas	03/18/99	03/26/99	4,445,631
Tele Pizza (1)	1999	Transeuropean Research Traders	10/25/99	10/26/99	53,354,089
Amadeus (1)	2000	Several	05/19/00	05/24/00	75,000,000
Logista	2000	Several	06/30/00	07/18/00	16,556,403
Grupo Empresarial Ence	2001	Soc. Est. de Partic. Industriales (Sepi)	06/29/01	07/10/01	8,152,949
Zeltia (1)	2002	Zeltia	05/10/02	05/21/02	72,665
Zeltia	2003	Zeltia	03/06/03	03/20/03	136,225
Red Eléctrica Española	2003	Endesa and others	06/18/03	06/18/03	37,875,600

Notes: (1) denotes that the offering was eliminated from the study. Although the original sample comprised 32 SOs over the period 1993–2005, the final sample is formed by 16 SOs that were free of any problems relating to the liquidity and trading activity of shares during the pre and post secondary offering periods that might distort the results of the analysis.

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