An empirical investigation of underpricing in Greek IPO's: 1990-2003

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Abstract

This paper discusses evidence on the initial underpricing of Initial Public Offerings in the Athens Stock Exchange, during the period 1990-2003. Differences in average initial returns are analyzed in terms of differential IPO characteristics. The findings suggest that in the Athens Stock Exchange there exists a relatively high degree of information asymmetry. The findings are similar to those, which have been observed in the majority of the emerging markets.

I.   Introduction

The empirical evidence accumulated in recent years is unanimous in its conclusion that large one-day IPO returns[1] were observed on the offer date. This phenomenon has been intensively studied, in an attempt to provide a rationale for underpricing. The suggested explanations are based primarily on theories of asymmetric information (Ritter and Welch, 2002). Loughran,

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[1] Price change measured from the offering price to the market price at the end of the first trading day.

Ritter and Rydqvist (2003) provide an international perspective on IPO underpricing utilizing data from 38 countries. They reported that underpricing was present in all the stock markets under study. Moreover, it varies very strongly from market to market (from a 5,4% in Denmark, to a 256,90% in China[2]). In addition, Ibbotson and Jaffe (1975) have noted the existence of certain periods ("hot issue markets") in which a greater underpricing was observed. In spite of a number of plausible explanations that have been offered to account for this phenomenon, there is still considerable uncertainty about its determinants. The main purpose of this paper is to test the validity of certain (testable) hypotheses regarding the IPO stocks in the Athens Stock Exchange.

The rest of the paper proceeds as follows: In Section II, previous literature on underpricing is discussed. In Section III, the utilized data and the employed methodology are described. The results of the study as well as their interpretation are reported in Section IV. Conclusions appear in Section V.

II. Literature Review

Previous IPO literature has suggested a number of possible explanations for IPO underpricing. Most of the rational expectation models suggest that information asymmetry among various participants is responsible for IPO underpricing[3].

Rock (1986) views this situation as a ***"winner's curse"*** problem. He asserts that there exist two groups of investors, those possessing superior information ("informed investors"), thus being able to select underpriced new issues and the "uninformed" ones who usually buy the overvalued IPO's. If this is the case, the uninformed investors would loose their interest for the IPO's market, in the long term. To prevent such a reaction, underwriters and issuers try to secure satisfactory returns, for those investors, through the underpricing of the new issues. In order to find empirical evidence in support of the "winner's curse" hypothesis, Beatty and Ritter (1986) introduced the testable variable of "ex-ante uncertainty". They suggest that there exists a positive correlation between the expected underpricing and the lack of information, which may be tested through the examination of the relationship among

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[2] For the list of average initial returns across the 38 countries, the time periods observed and their respective sources see Table 1 in Loughran, Ritter and Rydqvist (2003).

[3] There are also other alternative explanations, such as hot issue markets (Ritter, 1984), industry effects (Ibbotson and Jaffe, 1975; Ritter, 1984), legal insurance (Tinic, 1988), monopoly power (Welch, 1992) and presale information gathering (Benveniste and Spindt, 1989).

certain proxies, such as the firm's age, its size, the percentage of the equity capital maintained by the initial shareholders after the IPO (free float), the (ex-post) bid-ask spread and the price volatility.

The presence of information asymmetry also leads to underpricing through a *"signaling equilibrium"* where firms demonstrate their quality by "leaving more money on the table", that is by undervaluing the new issues. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) have shown that this strategy may be optimal for firms that plan to do seasoned equity offerings (secondary offerings) following the IPO.

Another group of researchers (Affleck-Graves, 1993) have formed the hypothesis that investors demand lower returns for IPO's listed in the markets, which meet higher trading standards. Thus, high underpricing levels imply markets with low standards (*"certification" hypothesis*).

Benveniste and Spindt (1989) and Benveniste, Busaba and Wilhelm (1996) explain underpricing as a consequence of the pre-selling process (road show). Investors are less likely to truthfully reveal their demand for an IPO if this *"indication of interest"* is only likely to push up the offer price. Underpricing is the reward for truth telling and therefore, should be higher for offers where there is strong demand. The relevant empirical tests use the oversubscription rate as a proxy for information revelation and find that underpricing is greater for IPO's that are strongly over -subscribed (Hanley, 1993).

Finally, a debate is going on, about *"optimal selling procedures"* in IPO's (fixed price offer versus book building). A number of researchers (Benveniste and Spindt, 1989; Camp, 2000; Arosio, Giudice and Paleari, 2000) have suggested that the book building procedure is efficient since it induces ex-ante uncertainty (contrary to the fixed price offer).

III.   Data, sources and methodology

The Bank Reforming Law of 1988 can be characterized as the fundamental stone on which the development of the Greek Financial System was based, mainly because it seriously lowered the restrictions under which the affected companies were operating before. After an adjustment period of 1-2 years, they restructured their banking and stock exchange activity, incorporating the new – more favorable – legislation in force.

Especially for the ASE, that period was very crucial, given the fact that we had the introduction of stockbroking firms, while the Securities and Exchange Commission was essentially enforced. As a result, the activity in the primary and secondary stock exchange markets were quite higher in subsequent years, enabling the mining of more extensive and effective data for the researchers. In general, the ASE data referred to time periods started from 1990 can be considered as belonging to its "new age" and they are hardly

comparable to corresponding data of earlier periods. This is the reason for selecting the 1990-2003 as the sampling period of the present study.

The sample, (258 companies) comprises of all new listings between January 1990 and December 2003, including subsequently delisted companies but excluding the merged ones, the companies of the financial sector and those not accompanied by an offer of equity. The necessary data for each particular new issue were derived from the "Greek Stock Exchange Annual Statistical Bulletin", which is an official issue of the ASE, while daily share prices were obtained from ASE computer records. Finally, daily prices were properly adjusted for rights issues, stock splits and reverse splits. For each IPO considered, two measures were computed to estimate the magnitude of underpricing: (1) The *"simple" underpricing*, defined as the percentage change in price from the offering price to the close at the first day of trading and (2) The *"adjusted" underpricing*, defined as the difference between the percentage change of the issue price on the first day and the corresponding change in the market index[4], is calculated by the following equation:

$$MAR_{it} = \frac{P_{i1} - P_{i0}}{P_{i0}} - \frac{I_0 - I_1}{I_0} \qquad (1)$$

MAR_{it} = the market-adjusted return
P_{i0} = the initial offering price
P_{i1} = the first day closing price
I_0 = the value of the ASE General Index on the date of the offering
I_1 = the value of the ASE General Index on the first trading day

The implicit assumption of the above abnormal return calculation process is that the systematic risk of the IPO's is the same to the index[5] (Ritter, 1991). Assuming that the risk level of the new listings is higher than average, this methodology is expected to produce upwards biased estimations. However, there is no evidence that the assumption is not valid. Besides, its adoption enables the comparability of the results, given that it was used by almost all the preceding studies.

In order to evaluate the statistical significance of the average market adjusted return, we use cross sectional t-statistics[6], according to the following formula:

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[4] The composite price index (ATHEX), comprises the 60 most highly capitalized shares of the main market and reflects the trend of the whole market.
[5] That is the betas of the IPO's average to one.
[6] The t-test implies a normal distribution of the stochastic variable.

$$t - test = \frac{MAR_{i,t}}{\left(S.D._t \middle/ \sqrt{n} \right)} \qquad (2)$$

Where: n is the number of firms in the sample and S.D. the standard deviation of market-adjusted returns. Due to the presence of significant heteroscedasticity the White (1980) heteroscedasticity-consistent t-tests were also computed.

The mean cross-sectional market-adjusted return (IPO's portfolio return) is calculated by the following equation:

$$MAR_t = \frac{1}{n} \sum_{i=1}^{n} MAR_{it} \qquad (3)$$

Finally, the below stated variables are regressed, through a linear multivariate model (Model 1), against first-day returns, in order to identify their impact on the underpricing of the IPO's:

- **Company's listing delay (DEL):** The number of days between oversubscription period and first trading day. High prices of the DEL-variable suggest that the investors can be better informed about the value of the company, thus the perceived risk is smaller.
- **Company's operating history (AGE):** The number of years between the listing time and the foundation year. New companies are considered more risky than the older ones.
- **Issue size (GRP):** The natural logarithm of the gross proceeds (in thousand euros). The size is assumed to be negatively correlated to the risk inherent in the new issue.
- **Reissue (REI):** This dummy variable takes the price of 1 in the case of a reissue within the next 2 years and that of 0 otherwise.
- **Market segmentation (SEG):** This dummy variable is equal to 0 if the IPO is listed in the Main Market (higher listing standard) and 1 otherwise.
- **Oversubscription level (OVE)** is defined as the ratio between total demand and supply.
- **Offering strategy (OFS):** This dummy variable is equal to 0 for bookbuilding IPO's and 1 otherwise).

The utilization of the above mentioned parameters to test the hypotheses, which consist the subject of this study, is as follows:

According to the *winner's curse hypothesis - Model 2*, the more the ex-ante uncertainty, the greater the perceived risk from the part of the non-

informed investors. So, a negative relationship is expected between the ex-ante risk proxies (*listing delay, company's age and issue size*) and the new issue's underpricing.

If <u>the signalling hypothesis – Model 3</u> holds, a positive correlation be-tween (adjusted) the underpricing and further seasoned offering (reissue) should be observed.

<u>The certification hypothesis – Model 5 is tested by</u> comparing the under-pricing in the main and the parallel market which has lower trading stan-dards.

The validity of the <u>indication of interest hypothesis – Model 4</u> is tested by regressing the IPO's performance with the variable representing the de-mand of the new issue (oversubscription level). It is expected that the higher the demand the higher the performance, given that the non-satisfied demand of the pre-listing period will be expressed on the first trading day(s).

In accordance with the <u>optimal selling procedure hypothesis – Model 6</u>, we expect the underpricing to be lower in IPO's with book building, being coherent with the literature review.

Table 1 summarizes the variables which are tested within the framework of the present study, as well their expected positive/negative relationship to the underpricing of the IPO's.

IV. Empirical results

Table 2 presents "simple" and "adjusted" underpricing for the whole pe-riod 1990-2003. The mean value and the number of firms are also reported; t-tests have been conducted in order to determine the statistical significance of the underpricing. The results confirm that the underpricing of IPO's, which was observed in many foreign markets, is observed in ASE also. The mean underpricing of the 258 firms of the sample, is equal to 41,53% (adjusted 41,03%) and it is statistically significant in 9 out of the 14 years. The large disparity from the median suggests the presence of positive skewness in the distribution[7]. The observed underpricing was clearly higher than the ob-served[8] one in Australia (12,10%: Lee, Taylor and Walter; Woo), Austria (6,30%: Aussenegg), Belgium (14,60%: Rogiers, Manigart and Ooghe; Manigart), Canada (6,30%: Jog and Riding; Jog and Srivastava and Rakita), Finland (10,10%: Keloharju; Westerholm), France (11,60%: Husson and Jacquillat; Leleux and Muzyka; Paliard and Belletante; Derrien and

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[7] Due to the positive skewness, the reported t-statistic (for the null hypothesis of no underpricing) is biased upwards and hence it must be interpreted with some caution. However, its high value suggests significant differences from zero.

[8] See Table 1 in Loughran, Ritter and Rydqvist (2003).

Womack; Chahine) and Germany (27,70%: Ljungqvist). However, it was smaller than the underpricing which was observed in China (256,90%: Datar and Mao; Gu and Qin), Brazil (78,50%: Aggarwal, Leal and Hernandez), Korea (74,30%: Dhatt, Kim and Lim; Ihm; Choi and Heo) and Malaysia (104,1%: Isa; Isa and Yong). It is worth noting that Kazantzis and Dylan (1996) have found an even higher rate of underpricing (50,89%) for the Athens Stock Exchange, but it must be stressed that their sample covered the period 1987-1994, that is, it included the sub-period 1987-1990 during which the underwriter guaranteed the offered price for six months. It can be assumed, therefore, that underwriters were highly motivated to undervalue the issues, thus protecting their interests. This assumption seems to be reasonable, given that 1990 exhibits the second higher underpricing in the present study (six months guarantee of the offer price was ceased at 17/12/1990).

Table 3 (Panel A) presents the characteristics of the IPO's in the sample. It is obvious that the number of new listings varies strongly from year to year (mean 18,43 / standard deviation 12,98). The same happens to the new issue size (mean €18.316,77 / standard deviation 44.661,60) and to the company size as measured by the market capitalization value (mean €127.356,70 / standard deviation 437.929,85). It should be noted, also that the majority of new issues took place during the bull market sub-periods or immediately after those sub-periods. More precisely, 50% of the new issues, which raised 48,24% of the funds and accounted for 41,89% of their market capitalization value, were introduced in 3 of the 14 years (21,42%).

Many researchers focused on the "lost" money from the side of the primary owners of the issuing firms, as measured by the difference between the first day closing price and the offering price, multiplied by the number of the offered shares (Ritter, 2000; Arosio, Giudice and Paleari, 2000). The calculated amount is called in the literature "money-left-on-the-table". In the present study, the "lost money" was on average €1.840 per issue, which accounts approximately for the 10% of the issue size. Moreover, like in the US (Ritter, 2000) and in Italy (Arosio, Giudice and Paleari, 2000), more money was "left-on-the-table" in the late 90'.

Regarding the different types of stock markets, it was found that 121 firms went public through the Main Market (they raised €3,8 mil., that is almost 80% of the total funds which were invested in IPO's), while 137 firms were listed in the Parallel Market (they raised approximately €0,98 mil.)

As far as the offering strategy is concerned, 216 out of 258 companies adopted the fix price procedure and only 42 the solution of book building. It must be stressed that the Greek companies are on average listed at a higher age (19 years) than in USA but they are younger than their European counterparts at the listing time. For example Habib and Ljungqvist (2001) have reported an average age of 14 years for USA, while Vandemaele (1999)

found 44 years for the France, Roosenboom, Goot and Mertens (2003) about 35 years for Netherlands, Holmen and Hogfeldt (1999) more than 30 years for Sweden etc.

The determinants of the underpricing

The adjusted underpricing values were regressed against the previously mentioned variables (see Table 1) in order to identify the determinants of the IPO's underpricing phenomenon. Dummy variables were introduced to count for non-quantitative factors, such as signaling, certification and placing methods. The main results of the performed regression analyses are reported in Table 4. Oversubscription level (OVE) is clearly the strongest explanatory variable (0,162/t-test 5,930), while statistically significant are also the issue delay (DEL), the issue size (GRP) and the reissue of stock (REI). Company age (AGE) is insignificantly[9] correlated with the dependent variable, although the expected sign is confirmed. In contrast, the sign of the market segmentation (SEG) and offering strategy (OFS) were unexpected and both variables were statistically insignificant. The results indicate also that the previously identified seven explanatory variables, put together, explain 25,60% of the variation in the initial premium of the Greek IPO's. This is close to the estimates of 26,46% by Arosio, Giudici and Palerai for Italian IPO's and of 25% by Loughran and Ritter for US IPO's, while are much higher to the estimates of 8,70% by Aussenegg (2000) and to the estimates of 23% by Kiymaz (2000).

Regarding the models 2 – 6, which have been formed to test the validity of certain hypothesis the findings have as follows:

1. In **Model 2**, which has been formed to test the joint hypotheses that there is a positive relationship between ex-ante risks and the degree of IPO underpricing (winner's curse hypothesis), the variable "issue size" (GRP) reflects the maintained hypothesis that on average smaller offerings are more speculative, than larger offerings (Beatty and Ritter, 1986). This variable is significant at conventional levels and it has the expected sign. Similar results were suggested by other researchers for the Athens Stock Exchange market (Kazantzis and Levis, 1995; Kouroupakis, 2002). The coefficient for listing delay (DEL) is also significant and has the expected sign, while the coefficient estimate for company's operating history (AGE) is insignificant. In summary, it was found that there is a positive relationship between the used proxies of ex-ante uncertainty and expected underpricing. The empirical results offer strong support to the winner's curse hypothesis. Barry and Jennings (1993), Aggarwal, Leal and Hernandez (1993) and Huang (1999)

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[9] Their statistical significance is marginally rejected at the 90% confidence level.

support this hypothesis, by providing evidence from the US, Latin America and Taiwanese markets, respectively. In contrast to the above evidence, Lam and Yap (1998) and Lim and Ng (1999) reject this hypothesis based on their findings from the Singapore IPO market.

2. The findings for the signaling model (**Model 3**), are consistent with the Leyland-Pyle (1977) since the probability of a seasoned offering is positively related to underpricing (0,365/t-test 3,925). Our empirical results suggest that underpricing has a strong signaling effect of stock reissuance. Su and Fleisher (1997) and Hammed and Lim (1998) provided also supporting evidence to this hypothesis from the Chinese and Singapore IPO markets, while Gale and Stiglitz (1989), Garfinkel (1993) and Espenlaub and Tonks (1998) reached the reverse conclusion.

3. The findings also support the certification hypothesis, which asserts that the lower underpricing of the Main Market is attributable to high listing standards (**Model 4**). Similarly, Bruton and Prasad (1997), Shaffer (1999), Tan, Eng and Khoo (1999) argue that high listing requirements leading to low underpricing.

4. Yet, the oversubscription level (**Model 5**) explains partially the IPO underpricing (adjusted $R^2 = 0,156$, the bigger one for all the calculated regressions). So, Ritter's (1988) conclusion (i.e. the higher the oversubscription level, the higher the underpricing in order to compensate investors for truthfully reveals their expectations) is supported by the results of the present study.

5. Finally, offering strategy (**Model 6**) influences the IPO underpricing: If book building precedes the offering, the underpricing is significantly lower, as in Hanley (1993) and Arosio, Giudici and Paleari (2000). Indeed, during book building the underwriter is able to reduce information asymmetry through information spreading.

V. Conclusions

The IPO's underpricing phenomenon, which has attracted the interest of the financial community during the last two decades, has stimulated a considerable volume of empirical research worldwide. The relevant studies have suggested several variables as responsible for the IPO's underpricing and, moreover, they formed certain hypotheses to explain this phenomenon.

Within this context, the present study is aimed to test the validity of the above suggestions, by utilizing the data of 258 IPO's of the Athens Stock Exchange, for the period 1990-2003.

The results support the validity of "winner's curse", "signaling" "certification", "indication of interest" and "selling procedure" hypotheses, implying that certain characteristics of the issue (i.e. oversubscription level, issue

size, listing delay) are responsible for the IPO's underpricing phenomenon in the Greek Stock Market. The findings are in the line with the results obtained by a great number of similar studies in the ASE as well as in numerous other stock markets.

APPENDIX

Table 1
Explanatory Variables of IPO's Underpricing

Variable	Definition	Hypothesis Tested	Excepted Sign
Company's listing delay (DEL)	The number of days between oversubscription period and first trading day	Winner's Curse	-
Company's operating history (AGE)	The number of years between the listing time and the foundation year		
Issue size (GRP)	The natural logarithm of the gross proceeds (in thousand euros)		
Reissue (REI)	Dummy variable (1=yes, 0=no)	Signaling	+
Market segmentation (SEG)	Dummy variable (0= main, 1=parallel)	Certification	+
Oversubscription level (OVE)	Ratio between total demand and supply	Indication of interest	+
Offering strategy (OFS)	Dummy variable (0= book building, 1=fixed price)	Optimal selling procedure	+

Table 2									
First-day returns for the 258 IPO's of the sample - Period 1990-2003									
			"Simple" Underpricing				"Adjusted" Underpricing		
Year	Sample Size		Mean	t	Median		Mean	t	Median
1990	20		81.37%	5.91	82.78%		80.18%	5.87	82.74%
1991	12		15.78%	2.12	14.03%		15.86%	2.10	13.77%
1992	2		14.60%	0.36	14.60%		14.46%	0.35	14.46%
1993	6		1.94%	0.33	7.86%		1.26%	0.21	6.56%
1994	41		5.94%	8.36	7.95%		7.53%	5.02	8.13%
1995	17		5.07%	3.69	7.95%		3.88%	1.86	6.22%
1996	17		5.68%	5.18	7.95%		5.53%	5.31	7.00%
1997	10		40.07%	3.45	36.80%		41.98%	3.81	36.31%
1998	21		59.40%	7.42	62.23%		53.57%	6.15	36.70%
1999	32		105.55%	7.55	98.93%		102.70%	7.26	96.80%
2000	48		60.18%	4.26	22.24%		60.54%	4.28	23.77%
2001	16		28.78%	2.21	1.92%		30.53%	2.27	7.14%
2002	5		0.23%	0.03	0.00%		4.50%	0.54	1.81%
2003	11		5.09%	0.62	8.95%		3.46%	0.51	4.68%
Total	258		41.53%	9.99	8.72%		41.03%	9.91	15.90%

Table 3
Characteristics of the Sample of IPO's

Panel A: Characteristics of the New Issues

Year	Number of IPO's	*Thousand of euros*		
		"Lost money"	Issue size	Market Capitalization
1990	20	5.734,89	61.181,61	370.440,89
1991	12	12.265,13	118.127,36	317.942,14
1992	2	3.523,66	24.804,67	113.213,10
1993	6	12.248,23	59.210,28	239.037,96
1994	41	44.142,63	250.479,52	1.114.424,32
1995	17	12.355,05	53.722,71	256.365,47
1996	17	33.888,79	325.509,57	5.208.498,77
1997	10	5.572,66	31.339,75	191.892,48
1998	21	48.588,48	427.550,65	2.702.679,72
1999	32	37.182,89	650.908,10	3.583.032,37
2000	48	95.574,00	1.389.385,54	11.205.665,30
2001	16	126.456,08	1.050.853,67	7.062.803,33
2002	5	6.131,38	27.476,47	133.567,62
2003	11	32.851,92	273.493,79	485.822,43
Total	258	476.515,80	4.744.043,68	32.985.385,91
Mean	*18,43*	*1.839,83*	*18.316,77*	*127.356,70*

Panel B: Descriptive Statistics of the Tested Variables

	Mean	Median	St. Deviation	Range
Issue size (thousand of euros)	18.316,77	5.740,52	44.661,60	459.443,25
Company's operating history (years)	18,93	18,00	11,52	75,00
Company's listing delay (days)	28,57	31,00	16,78	88,00
Oversubscription level (% of the issue)	89,20	25,00	138,68	760,00

Note: The rest tested variables are dummy variables

Panel C: Statistics of Underpricing

	Unadjusted underpricing	Market index adjusted underpricing
Mean	41,53%	41,03%
t-statistic	9,99	9,91
Median	8,72%	15,90%

Panel D: Statistics for Different Methods of Pricing and Different Trading Standards

	Number of IPO's	Market index adjusted underpricing	F-statistic	p-value
Main Market	121	31,93%	5,138	0,0242
Parallel Market	137	49,25%		
Bookbuilding	43	14,42%	12,439	0,0004
Fixed Price	216	44,86%		

Table 4
Coefficient Estimates for the Explanatory Variables (Models 1-6)

	Constant	DEL	AGE	GRP	REI	SEG	OVE	OFS	adj R^2	St. Error
Model 1 (main model)	1,046	-0,011	-0,061	-0,063	0,239	-0,101	0,162	-0,097	0,256	0,573
t-test	*2,928*	*-4,953*	*-1,153*	*-2,243*	*3,249*	*-1,310*	*5,930*	*-1,030*		
Model 2 (winner's curse)	1,194	-0,003	-0,088	-0,048					0,015	0,660
t-test	*4,425*	*-1,977*	*-1,400*	*-2,204*						
Model 3 (signaling)	0,269				0,365				0,068	0,642
t-test	*7,288*				*3,925*					
Model 4 (certification)	0,317					0,175			0,013	0,660
t-test	*6,754*					*2,176*				

Model 5 (indication of interest)	0,042	0,126	0,156	0,611
t-test	*0,659*	*5,091*		
Model 6 (optimal selling procedure)	0,141	0,322	0,029	0,655
t-test	*2,401*	*4,270*		

Table 5
Correlation Matrix of the Tested Variables

	DEL	AGE	GRP	REI	SEG	OVE	OFS
DEL	1						
AGE	-0,117	1					
GRP	-0,039	0,060	1				
REI	0,041	0,026	-0,039	1			
SEG	0,245	-0,097	-0,306	0,118	1		
OVE	0,418	-0,127	-0,033	0,237	0,406	1	
OFS	-0,010	-0,070	-0,392	0,224	-0,065	0,254	1

References

Affleck-Graves, J., 1993, "The effect of the trading system on the underpricing of initial public offerings", Journal of Financial Management

Aggarwal R., R. Leal and L. Hernandez, 1993, "The aftermarket performance of Initial Public Offerings in Latin America", Journal of Financial Management 22, 42-53

Allen F. and G. R. Faulhaber, 1989, "Signaling by underpricing in the IPO market", Unpublished paper, University of Pennsylvania

Arosio R., G. Giudici and S. Paleari, 2000, "Underpricing and Money "left on the table" in Italian IPO's", Unpublished paper, USI Finance Seminar, Institute of Finance, University of Svizzera

Athens Stock Exchange (1990-2003), Greek Stock Exchange Annual Statistical Bulletin

Aussenegg W., 2000, "Privatization versus private sector initial public offerings in Poland", Journal of Multinational Finance 4, 69-99

Barry C. and R.H. Jennings, 1993, "The opening price performance of IPO's of common stock", Financial Management 22, 54-63

Beatty R. P. and J. R. Ritter, 1986, "Investment banking, reputation and the underpricing of initial public offerings", Journal of Financial Economics 15, 213-232

Benveniste L.M. and P.A. Spindt, 1989, "How investment bankers determine the offer price and allocation of new issues", Journal of Financial Economics 24, 343-361

Benveniste L.M., W.Y. Busaba and W. Wilhelm, 1996, "Price stabilization as bonding mechanism in new equity issues", Journal of Financial Economics 42, 223-255

Bruton G.D. and D. Prasad, 1997, "Strategy and IPO market selection: Implications for the entrepreneurial firm", Journal of Small Business Management 35, 1-10

Camp G., 2000, "Underpricing of IPO's in New Zealand: A comparison of the fixed price and book building methods", Center of Financial Studies, University of Melbourne

Espenlaub S. and I. Tonks, 1998, "Post-IPO directors, sales and reissuing activity: An empirical test of IPO signaling models", Journal of Business Finance and Accounding 25, 1037-1054

Gale I. and J. Stiglitz, 1989, "The information content of IPO's", Journal of Finance 44, 469-477

Garfinkel J.A., 1993, "IPO underpricing, insider selling and subsequent equity offerings: Is underpricing a signal of quality", Financial Management 22, 74-83

Grinblatt M and C. Y. Hwang, 1989, "Signaling and the pricing of new issues", Journal of Finance 44, 393-420

Habib M.A. and A.P. Ljungqvist, 2001, "Underpricing and entrepreneurial wealth losses in IPO' s: Theory and evidence", The Review of Financial Studies 14, 433-458

Hammed A. and G.H. Lim, 1998, "Underpricing and firm quality in initial public offerings: Evidence from Singapore", Journal of Business Finance and Accounting 25, 455-463

Hanley K.W., 1993, "Underpricing of initial public offerings and the partial adjustment phenomenon", Journal of Financial Economics 34, 231-250

Holmen M. and P. Hogfeldt, 1999, "Motives, underpricing and ownership structure in Swedish IPO's", European Finance Association Conference, 25-28 August, Helsinki

Huang Y., 1999, "The price behavior of IPO's in the Taiwan Stock Exchange", Applied Financial Economics 9, 201-208

Ibbotson R. G. and J. F. Jaffe, 1975, "Hot issue markets", Journal of Finance 30, 1027-1042

Kazantzis C. and M. Levis, 1995, "Price support and initial public offerings: Evidence from the Athens Stock Exchange", Research in International Business and Finance 12

Kazantzis C. and T. C. Dylan, 1996, "The IPO puzzle and institutional constraints: Evidence from the Athens Stock Market" (Elsevier, Amsterdam)

Kiymaz H., 2000, "The initial and aftermarket performance of IPO's in an emerging market: Evidence from Istanbul stock exchange", Journal of Multinational Finance Management 10, 213-217

Kouroupakis M., 2002, "Initial Public Offering: Fixed price vs. Bookbuilding method", Unpublished paper, University of Piraeus

Lam S. and W. Yap, 1998, "Pricing system and the IPO's market: A case of Singapore", International Review of Economics and Finance 7, 297-313

Leland H.E. and K.H. Pyle, 1977, "Information asymmetries, financial structure and financial intermediation", Journal of Finance 32, 371-387

Lim K. and E.H.K. Ng, 1999, "A theory of IPO pricing with tender prices", Applied Financial Economics 9, 433-442

Loughran T., J. Ritter and K. Rydqvist, 2003, "Initial Public Offerings: International Insights", Pacific-Basin Finance Journal

Ritter J.R. and I. Welch, 2002, "A review of IPO activity, pricing and allocations", The Journal of Finance 57, 1795-1828

Ritter J.R., 1984, "The "Hot issue" market of 1980", Journal of Business 57, 215-240

Ritter J.R., 1988, "Initial Public Offerings", Contemporary Finance Digest, 5-30

Ritter J.R., 1991, "The long run performance of initial public offerings", Journal of Finance 46, 3-27

Ritter J.R., 2000, "IPO's in 1999", Unpublished paper

Rock K., 1986, "Why new issuers are underpriced", Journal of Financial Economics 15, 187-212

Roosenboom P., T. Goot and G. Mertens, 2003, "Earnings management and initial public offerings: Evidence from the Netherlands", The International Journal of Accounting 38, 243-266

Shaffer R.A., 1999, "Why investment Banks don't need to worry about online IPO's yet", Fortune 139, 176

Su D. and B.M. Fleisher, 1997, "An empirical investigation of underpricing in Chinese IPO's", American Economics Association, New Orleans

Tan R.S.K., L.L. Eng and A. Khoo, 1999, "The effects of offering method and trading location on the pricing of IPO's in Singapore", Applied Financial Economics 9, 491-499

Tinic S.M., 1988, "Anatomy of IPO's of common Stock", Journal of Finance 33, 789-822

Vandemaele S., 1999, "IPO mechanisms, information asymmetries and institutional details: The French Second Marche", ITEO Research Paper Series 99, Limburg University

Welch I., 1989, "Seasoned offerings, imitation costs and the underpricing of initial public offerings", Journal of Finance 34, 421-449

Welch I., 1992, "Sequential sales, learning and cascades", Journal of Finance 47, 695-732

White H., 1980, "A heteroscedasticity – consistent matrix estimator and a direct test for heteroscedasticity", Econometrica 48, 817-838.