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THE LONG-RUN UNDERPERFORMANCE OF INITIAL PUBLIC OFFERINGS: A METHODOLOGICAL PROBLEM?*

SUSANA ÁLVAREZ OTERO
VÍCTOR M. GONZÁLEZ MÉNDEZ
Oviedo University

El objetivo de este estudio es analizar el comportamiento a largo plazo de las OPIs realizadas en el mercado español de capitales. Dado que el método de cálculo del rendimiento influye tanto en la magnitud del rendimiento anormal, como en el tamaño y potencia de los tests estadísticos, hemos utilizado diferentes métodos, con el objeto de examinar la robustez del comportamiento a largo plazo de las OPIs con respecto a varias especificaciones del modelo. Los resultados del estudio muestran que la existencia de bajo rendimiento a largo plazo para las OPIs españolas depende de la metodología utilizada. Así, existe bajo rendimiento a largo plazo cuando se utilizan rentabilidades equiponderadas de comprar y mantener, aunque depende del test estadístico considerado, y no cuando se utilizan carteras calendario o rentabilidades de comprar y mantener ponderadas por capitalización.

Palabras clave: oferta pública inicial (OPI), rentabilidad a largo plazo, BHAR, carteras calendario.

Clasificación JEL: G10, G12 y G14.

Studies that have analysed firms going public have revealed, with more or less homogeneity, the existence of two anomalies: underpricing and long-run underperformance. This paper focuses on the second of these namely, that investors seem to obtain losses due to holding shares of the firms that have recently carried out an IPO, compared to those firms that have not done so [Ritter (1991)]. Recently, papers such as Barber and Lyon (1997), Kothari and Warner (1997), Fama (1998), Lyon *et al.* (1999) and Loughran and Ritter (2000) have argued that the method of performance measurement influences both the

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magnitude of the abnormal returns as well as the size and power of the statistical test. In consequence, the analysis of the long-run returns is directed towards a methodological approach.

IPOs are not unique in the literature on long-term returns. Tests of long-run returns have become increasingly common within the finance literature. Several papers have analyzed the long-term abnormal returns for corporate decisions such as SEOs, mergers, share repurchases, stock splits or dividend initiations or omissions [Loughran and Ritter (1995), Asquith (1983), Ikenberry *et al.* (1995), Dharan and Ikenberry (1995), and Michaely *et al.* (1995)]. These studies have documented systematic long-run abnormal returns subsequent to corporate events. Since these results imply that stock prices react with a long delay to publicly available information, they appear to be at odds with the Efficient Market Hypothesis. However, the model misspecification problem means that market efficiency cannot be rejected.

Evidence on the long-run performance of IPOs in Spain is limited and the results of the existent papers differ from each other. Ansótegui and Fabregat (1999) report the existence of long-run underperformance in the three-year period after the IPO. On the other hand, Farinós (2001) shows that IPO firms do not underperform in the period of 1 and 3 years after the IPO. The differences in the results of both papers can be explained by the different data base and also, by the different methodology followed to estimate the abnormal returns. While Ansótegui and Fabregat (1999) estimate the long-run abnormal returns as BHARs, Farinós (2001) applied the Fama and French (1993) three-factor model from the calendar portfolio's excess returns.

In this context, this paper has the aim of analysing the long-run performance of the Spanish IPOs made during the 1987-1997 period. Following the international papers mentioned above, we use two methods of estimation for the long-run returns: buy-and-hold returns (*BHARs*), and calendar-time portfolios. We also analyse the robustness of the results using different benchmarks to measure the expected return and different weighting patterns. The rest of the study is structured in the following way: in the next section we discuss the methodological questions that affect the estimation of the long-run returns. Section 2 presents the database under study and the different methodologies used to estimate the long-run returns. The results obtained for long-run performance depending on the methodology, the benchmark and the weighting pattern are presented in Section 3. The main conclusions of the study are drawn in the final section.

1. Long-run returns of the IPOs

Tests of long-run abnormal returns suffer from model misspecification [Fama (1998)]. There are two problems of bad models: first, asset pricing models do not seem to describe expected returns on stocks fully; and second, any sample period can produce systematic deviations from the model's predictions. In the studies that focus on long-run returns, the adjustment of stock prices to an event could be spread over a long period. In this context, the choice of a normal period to estimate a stock's expected return is not trivial. Due to this problem, long-run studies often avoid the estimation of out-of-sample parameters, using approaches that es-

timate abnormal returns by matching event stocks with non-event stocks similar in terms of certain characteristics.

Studies of long-term returns depend on the measurement of abnormal returns. Long-run performance measurement can be estimated using buy-and-hold abnormal returns (*BHARs*) or average monthly abnormal returns (*AARs*) or their sum (*CARs*). *BHARs* are defined as the difference between the return on a buy-and-hold investment in the sample firm and the return on a buy-and-hold investment in an asset or portfolio with an appropriate expected return. In contrast, *AARs* are obtained by averaging the average monthly abnormal returns, and *CARs* consist of the sum of the average monthly abnormal returns. Barber and Lyon (1997), Kothari and Warner (1997), Fama (1998) and Lyon *et al.* (1999), analyze the alternatives used for the measurement of abnormal returns, although there is no consensus as to the preferred method. Fama (1998) justifies the use of *AARs* or *CARs* since it would produce fewer spurious rejections of market efficiency than the use of buy-and-hold returns calculated from compounding monthly returns in a single period. There also exists a greater knowledge of the distribution properties and the statistical tests for *CARs*. However, Barber and Lyon (1997) document that *CARs* are biased predictors of *BHARs* and their magnitude does not correspond to the value of investing in the average sample firms relative to an appropriate benchmark over the horizon of interest. However, it must be taken into account that buy-and-hold returns tend to over-estimate the abnormal returns, and this problem is even greater when the time horizon is longer [Fama (1998)].

Loughran and Ritter (2000) show that the choice of the weighting method is another relevant question. If the misvaluations are more common and larger among small firms, as would be expected, abnormal returns vary according to the weighting scheme. Finally, series of long-run returns are not independent since there exists a time coincidence of the returns and this can lead to a poor specification of the statistical tests [Brav (2000)]. In turn, Fama (1998) and Lyon *et al.* (1999) state that the use of methods that take into account time series of returns eliminates the problem of cross-sectional correlation between the firms in the sample since the returns are aggregated in portfolios and produce more robust statistical tests in non-random samples.

In short, just as pointed out by Fama (1998), all the methods used for the estimation of abnormal returns are subject to problems arising from the poor specification of the models and no method is able to minimise these problems for all classes of events. Due to these methodological problems, we have estimated abnormal returns as *BHARs* and as mean monthly calendar-time abnormal returns, as described in Section 2. Furthermore, we have used value and equal weights and different benchmarks, in order to make the results more robust.

2. Data Base and Methodology

The database of our study is made up of 52 of the 54 IPOs performed on the Madrid Stock Exchange from 1987 to 1997, inclusive. We have excluded two firms, because we do not have the stock price data necessary for obtaining the post-IPO stock returns in at least one of the investment horizons –12, 36 and 60

months–. The compounding of the returns starts in January 1987 and finishes in June 2000, so the time horizon of five years is not available for IPOs made in 1997. The data used come from the IPO prospectuses drawn up by firms in order to request their listing on the Stock Exchange and have been provided by the Madrid Stock Exchange for the issues taking place between 1987 and 1989 and by the Spanish Securities and Exchange Commission (CNMV) for the years after 1989. Most of the issues are concentrated in the period 1989/1991; this is not a situation exclusive to Spain [Ritter (1984b), Loughran *et al*. (1994)].

Table 1 shows the distribution of the firms into size and book-to-market portfolios in the month following the IPO. The market value of equity is calculated using the stock price at the end of the first month after going public. The book value of equity of IPO firms corresponds to December of the year prior to going public. Data reveal that IPOs tend to be concentrated in the portfolio of smaller size and lower book-to-market ratio: a total of 24 IPOs out of the 52 that make up the sample. In particular, the firms in the sample tend to form part of the lower book-to-market ratio: 75% of the firms in the sample form part of this segment. In

Table 1: Firms Classification in Portfolios according to Size and Book-to-Market Ratio

		Book-to-Market Ratio			
		Low	Medium	High	Total
Market Value of Equity	Small	24 (46,2%)	7 (13,5%)	1 (1,9%)	32 (61,5%)
	Medium	9 (17,3%)	1 (1,9%)	1 (1,9%)	11 (21,2%)
	Big	6 (11,5%)	1 (1,9%)	2 (3,8%)	9 (17,3%)
	Total	39 (75,0%)	9 (17,3%)	4 (7,7%)	52

The table shows the distribution of firms according to size and book-to-market portfolios in the month after the IPO. The numbers in parentheses are the percentages over the total number of firms in the sample. Size is measured in June each year as the market value of common equity, computed as the number of shares outstanding multiplied by the closing price the last day of June each year. Book-to-market ratio is computed in December each year. Portfolios have been constructed by classifying firms listed on the Madrid Stock Exchange between 1987-1997 according to market value of common equity in June each year. We form tertiles according to size. In each size tertile, firms are classified according to book-to-market ratio. IPOs are assigned to each of the corresponding portfolios and their return is compared with the portfolio's return to obtain the abnormal return. IPO market value of equity is computed with the closing price at the end of the first month after the IPO. Book value of common equity for IPO firms is obtained from IPO prospectuses registered in the C.N.M.V. and these values correspond to December of the previous year to the IPO.

this context, if size and book-to-market ratio are determinants of the stock returns, the use of market indexes or portfolios formed in terms of different criteria to approximate the normal stock returns, is inappropiate [Fama and French (1992, 1993)].

There is a considerable variation in the measures of abnormal returns and the statistical tests that empirical researchers use to detect long-run abnormal stock returns. Recently, Barber and Lyon (1997), Kothari and Warner (1997), Fama (1998), Lyon *et al.* (1999), Loughran and Ritter (2000) and Brav *et al.* (2000) have shown that the method of performance measurement influences both the magnitude of the measured abnormal performance as well as the size and power of the statistical tests. Due to the fact that all the methods used present some inconveniences, in this paper we have estimated abnormal returns as *BHARs* and as mean monthly calendar-time abnormal returns and considered a wide number of benchmarks in order to examine the robustness of IPO performance with respect to various model specifications.

2.1. The expected return

We have considered different ways of calculating the expected return[1]: 1) a value-weighted market index (*IGBM*), embracing over 95% of the Madrid Stock Market and an equally-weighted market index[2]; 2) size and/or book-to-market portfolios.; and 3) size and book-to-market matched control firms.

Portfolios are constructed in terms of the size and book-to-market ratio that are reconstituted in July of each year [Lyon *et al.* (1999)]. Size is measured in June of each year as the market value of equity, calculated as the number of shares outstanding times the stock price the last day of June of each year. The book-to-market ratio is calculated in December of each year[3].

Size portfolios have been obtained by classifying the firms listed on the Madrid Stock Exchange in the period 1987-1997, according to the market value of equity in June of each year and creating size quintiles. In order to avoid the portfolios being contaminated by the same firms that form the IPO sample, we have eliminated the firms that carried out an IPO from the portfolios during the five years following going public. In July of each year the firm that has carried out an IPO in the previous five years is allocated to a size quintile, taking as A benchmark the mean return of the firms included in the corresponding quintile. The procedure followed in order to form portfolios in terms of the book-to-market ratio was similar. Later, each firm that had carried out an IPO in the previous five years was allocated to a quintile in terms of its book-to-market ratio.

In turn, for the formation of portfolios in terms of both criteria taken together we used the following procedure. First, the firms were divided according to their

(1) Although other works have controlled for the industry [Ritter (1991), Brav and Gompers (1997)], we have not done so, because the small number of firms quoted on the Madrid Stock Exchange prevents controlling jointly by sector, size and book-to-market ratio.

(2) This index has been calculated by equal-weighting the industrial indexes.

(3) The calculation of book-to-market ratios precedes their use for ranking purposes by six months to allow for delays in the reporting of financial statements by firms.

size in June of each year into tertiles[4] and within each size tertile the firms are again classified into tertiles created in terms of the book-to-market ratio in December of the previous year. Then, each firm that had carried out an IPO in the previous five years was allocated in July of each year to one of the nine portfolios formed and their returns are compared with those of the portfolio in order to obtain the abnormal return.

On the other hand, as a alternative to size and/or book-to-market portfolios we have used control firms. Barber and Lyon (1997) state that the use of control firms of similar size and book-to-market value produces well specified statistical tests in all the situations considered. Furthermore, they observe significant biases in the statistical tests when the abnormal returns are estimated using a portfolio as a benchmark, for example a market index[5].

Following similar criteria to the construction of portfolios, we have chosen a control firm for each firm in the sample (IPO). First of all, firms are placed in the appropriate size tertile based on their June market value of equity. Second, we choose the firm with the book-to-value ratio closest to that of the sample firm. This process is carried out in July of each year.

2.2. Buy-and-hold abnormal returns (BHARs)

Long-run event studies of stock returns aim to assess the value of investing in the average sample firm with respect to an appropriate benchmark over the horizon of interest. Long-term investor experience is better captured by compounding short-term returns to obtain long-term buy-and-hold returns [Barber and Lyon (1997)]. The long-run returns are calculated monthly compounding during 12, 36 and 60 months after the IPO, and they are adjusted by the normal or expected return:

$$BHAR_{iT} = \left[\prod_{t=t_i}^{T_i}(1+R_{it})-1\right]-\left[\prod_{t=t_i}^{T_i}(1+E(R_{it}))-1\right] \qquad [1]$$

Where R_{it} is the return on security i in month t adjusted for dividends and seasoned offerings, T is the number of months (12, 36 and 60 months), t_i is the date of the closing price on the first day of trading and $E(R_{it})$ is the expected return.

(4) Tertiles and not quintiles are used for the portfolio formation in order to place a minimum number of firms in each of the portfolios formed in terms of both criteria.

(5) The biases in the statistical tests are due to three reasons: new listing bias, rebalancing bias and skewness bias. The new listing bias arises since the portfolios used as a benchmark include firms that have a short trading history on the stock market and these stocks tend to present low abnormal returns [Ritter (1991)]. The rebalancing bias arises because the compounding of the returns on the portfolio assumes a periodical rebalancing of the portfolio weightings, whereas the returns of the firm that carries out an IPO are compounded without rebalancing. In this sense, Canina *et al*. (1996) show that the rebalancing bias is more marked when using daily and not monthly returns. Finally, the skewness bias refers to the fact that a skewed distribution of the abnormal returns, prompted by the presence of extreme values in the returns of the firms in the sample, cause the distribution of the Student´s t test to be skewed with a mean less than one.

To test the null hypothesis that the cross-sectional average of buy-and-hold abnormal return is equal to zero for the sample of IPO firms, we employ a conventional t-statistic, a bootstrapped skewness-adjusted t-statistic proposed by Lyon *et al.* (1999) and a nonparametric Wilcoxon signed-rank test statistic, although this test is a well-specified test of the null hypothesis that the median annual *BHAR* is zero if a control firm approach is used (Barber and Lyon, 1997). The bootstrapped application of the skewness-adjusted test statistic involves drawing b resamples of size n_b from the original sample. We draw 1.000 bootstrapped resamples of size $n_b = n/4$. In each resample, we calculate the statistic:

$$t_{sa}^{b} = \sqrt{n_b}\left(S^b + \frac{1}{3}\hat{\gamma}^b S^{b2} + \frac{1}{6n_b}\hat{\gamma}^b \right) \qquad [2]$$

where
$$S^b = \frac{\overline{BHAR}_T^b - \overline{BHAR}_T}{\sigma^b(BHAR_T)} \quad ; \quad \hat{\gamma}^b = \frac{\sum_{t=1}^{n_b}(BHAR_{iT}^b - \overline{BHAR}_T^b)^3}{n_b \sigma^b(BHAR_T)^3} \qquad [3]$$

Thus, t_{sa}^b is the bootstrapped skewness-adjusted t-statistic and $\hat{\gamma}^b$ is an estimation of the coefficient of skewness.

2.3. Calendar time portfolios

Brav (2000) emphasizes that all existing methods for drawing inferences from *BHARs* fail to correct fully for the correlation of returns across events not absorbed by the model used to adjust for expected returns. The problem is more severe in long-term *BHARs* because more firms have events within a large window than within a few days. Fama (1998) and Lyon *et al.* (1999) consider the use of calendar-time portfolios in order to solve the problem of cross-sectional correlation of returns across events.

Once the horizon in which we desire to estimate the abnormal return for each calendar month is known, we calculate the abnormal return for each security that had an event in the period –12, 36 and 60 months–. The abnormal return is calculated using the same benchmarks as in the previous case. Then, we average the abnormal returns for the calendar month across stocks to get the abnormal return for the month on the portfolio of stocks with an event in the last 12, 36 or 60 months:

$$MAR_t = \sum_{i=1}^{n_t} x_{it} AR_{it} \qquad [4]$$

Where n_t is the number of firms in the portfolio in month t, x_{it} is the weight of the stock abnormal returns which will be equal to $1/n_t$ when abnormal returns are equally weighted and $MV_{it}/\Sigma MV_{it}$, $-MV_{it}$ is the equity market value of firm i at time t– when abnormal returns are value-weighted. A grand mean monthly abnormal return is calculated:

$$MMAR = \frac{1}{T}\sum_{t=1}^{T} MAR_t \qquad [5]$$

Where *T* is the total number of calendar months. To test the null hypothesis of zero mean monthly abnormal returns, a t-statistic is calculated using the time-series standard deviation of the mean monthly abnormal returns. This approach can also be refined to allow for heteroskedasticity of the portfolio's abnormal return due to changes through time in the composition of the portfolio. The solution consists of dividing the abnormal portfolio return for each month by an estimate of its standard deviation. The overall abnormal return is then estimated by averaging the standardized monthly abnormal returns. So, we have obtained a standardized t-statistic.

3. Long-run performance of IPOs on the Spanish Capital Market

3.1. Results using buy-and-hold returns (BHAR)

Table 2 shows the results obtained when using buy-and-hold returns (*BHARs*) that capture the return obtained by an investor when purchasing the IPO stocks the day following the issue and holding them for a time horizon of 12, 36 or 60 months. As can be seen in the Table, different alternatives mentioned in the previous section have been used in the weighting patterns and in the calculation of the expected returns.

The results –when using equally weighted *BHARs*– reveal, independently of the benchmark used, the existence of abnormal returns which are not statistically significant and mostly positive, in the first year of stock trading. In consequence, these results show that, on average, the firms have not underperformed one year after going public. However, in the other two horizons considered, and when we use equally weighted returns, we observe the existence of negative abnormal returns, with values between –18.59% and –32.16% for the case of 36 months and between –1.98% and –37.05% when the horizon is 60 months. These values are statistically significant in some cases, especially if we look at the Wilcoxon test's results. It can be observed that these negative abnormal returns are not determined by a few observations, but rather that approximately three quarters of the sample present negative returns. Moreover, it must be taken into account that buy-and-hold returns tend to over-estimate the long-run underperformance of IPOs, and this problem is even greater when the time horizon is longer [Fama (1998)].

Table 2 also compiles the wealth-relative ratios which are the ratios of the mean returns of the IPO for a period and of the mean return of the respective benchmark in the same period and are calculated according to the usual expression [Ritter (1991)]. It can be seen that independently of the benchmark used, in the periods of 36 and 60 months, wealth-relative ratios are less than one. In particular, the wealth-relative ratio at 36 months using a size portfolio as a benchmark is 0.76 and 0.78 using a size and book-to-market portfolio. This result is in line with those obtained in other works. Thus, Ritter (1991) reports a wealth-relative ratio, 3 years after the IPO, of 0.831 for the 1,526 IPOs analysed for a size and industry portfolio.

Table 2: Long-run Buy and Hold Returns (BHARs) on IPOs

Panel A: 12 months

Equally Weighted	BHAR (%)	T Statistic	Lyon *et al.* Test (1999)	Wilcoxon Test	%BHAR<0	Wealth Ratio
IGBM (N=52)	6.11	0.72	0.86 (0.49)	-0.17	50.00	1.06
BM Equally Weighted Index (N=52)	8.55	1.01	1.22 (0.32)	-0.37	46.15	1.08
Size Portfolio (N=52)	1.93	0.22	0.28 (0.84)	-0.52	51.92	1.02
Book /Market Ratio Portfolio (N=52)	-0.04	-0.00	0.05 (0.97)	-0.98	53.85	1.00
Book /Market Ratio and Size Portfolio (N=52)	3.36	0.40	0.48 (0.72)	-0.68	53.85	1.03
Control Firms (N=52)	0.16	0.01	0.02 (0.98)	-0.57	57.69	1.00
Market-Value Weighted						
IGBM (N=52)	21.11	0.34	0.55 (0.27)	-0.61	50.00	1.23
BM Equally Weighted Index (N=52)	22.58	0.36	0.58 (0.25)	-0.88	46.15	1.24
Size Portfolio (N=52)	18.65	0.28	0.46 (0.37)	-0.14	51.92	1.20
Book /Market Ratio Portfolio (N=52)	21.16	0.33	0.55 (0.28)	-0.43	53.85	1.20
Book /Market Ratio and Size Portfolio (N=52)	21.45	0.34	0.55 (0.30)	-0.34	53.85	1.23
Control Firms (N=52)	40.64	0.45	0.88 (0.11)	-0.19	57.69	1.47

Panel B: 36 months

Equally Weighted	BHAR (%)	T Statistic	Lyon *et al.* Test (1999)	Wilcoxon Test	%BHAR<0	Wealth Ratio
IGBM (N=37)	-28.24	-1.69*	-1.36 (0.43)	-2.74***	78.38	0.78
BM Equally Weighted Index (N=37)	-18.59	-1.12	-0.95 (0.49)	-2.32**	78.38	0.84
Size Portfolio (N=37)	-31.62	-2.03**	-1.59 (0.56)	-2.81***	72.97	0.76
Book /Market Ratio Portfolio (N=37)	-32.16	-2.14**	-1.62 (0.39)	-2.95***	78.38	0.75
Book /Market Ratio and Size Portfolio (N=37)	-27.84	-1.68*	-1.61 (0.40)	-2.25**	75.68	0.78
Control Firms (N=37)	-24.56	-1.10	-1.10 (0.38)	-1.43	62.16	0.80

Table 2: Long-run Buy and Hold Returns (BHARs) on IPOs (continuation)

Panel B: 36 months						
Market-Value Weighted						
IGBM (N=37)	13.20	0.12	0.24 (0.72)	-2.57***	78.38	1.13
BM Equally Weighted Index (N=37)	20.85	0.19	0.37 (0.55)	-2.24**	78.38	1.19
Size Portfolio (N=37)	-2.40	-0.02	-0.05 (0.85)	-2.51***	72.97	0.98
Book /Market Ratio Portfolio (N=37)	11.87	0.12	0.23 (0.73)	-2.62***	78.38	1.11
Book /Market Ratio and Size Portfolio (N=37)	2.82	0.03	0.06 (0.92)	-2.15**	75.68	1.02
Control Firms (N=37)	10.16	0.07	0.14 (0.79)	-1.53	62.16	1.09
Panel C: 60 months						
Equally Weighted	BHAR (%)	T Statistic	Lyon *et al.* Test (1999)	Wilcoxon Test	%BHAR<0	Wealth Ratio
IGBM (N=34)	-20.98	-0.69	-0.48 (0.78)	-2.40**	79.41	0.85
BM Equally Weighted Index (N=34)	-1.98	-0.06	0.04 (0.99)	-1.99**	76.47	0.98
Size Portfolio (N=34)	-21.42	-0.72	-0.52 (0.74)	-2.64***	79.41	0.85
Book /Market Ratio Portfolio (N=34)	-37.05	-1.20	-0.80 (0.57)	-2.56***	81.82	0.75
Book /Market Ratio and Size Portfolio (N=34)	-17.76	-0.65	-0.48 (0.73)	-2.09**	76.47	0.87
Control Firms (N=34)	-24.37	-0.72	-0.55 (0.68)	-1.99**	67.65	0.83
Market-Value Weighted						
IGBM (N=34)	46.98	0.25	0.44 (0.48)	-2.04**	79.41	1.36
BM Equally Weighted Index (N=34)	61.64	0.32	0.56 (0.39)	-1.84*	76.47	1.47
Size Portfolio (N=34)	-5.94	-0.03	-0.07 (0.92)	-2.64***	79.41	0.96
Book /Market Ratio Portfolio (N=34)	18.98	0.10	0.17 (0.81)	-2.61***	81.82	1.07
Book /Market Ratio and Size Portfolio (N=34)	-0.21	0.00	0.01 (0.99)	-2.13**	76.47	0.95
Control Firms (N=34)	37.42	0.18	0.34 (0.67)	-1.87*	67.65	1.23

The table shows the results of a buy-and-hold strategy on IPOs, after 12, 36 and 60 months from the first day of trading. Long-run returns are computed monthly up to the investment horizon considered (12, 36 and 60 months). Returns are adjusted by the return considered normal, that is, alternatively, the Madrid Stock Exchange General Index (value weighted index); an equally weighted index; a size portfolio return (size is measured by market value of common equity); a book-to-market portfolio return; a size and book-to-market portfolio return and, finally, control firms return. For the market-value weighting we use the market value of equity in the month after the IPO (in pesetas of 1997). In brackets p-values are shown.
***, **, * Statistically significant at the 1%, 5% and 10% level, respectively.

The analysis of the results obtained when using market-value weighted *BHARs* to form the portfolios, reveals that the conclusions vary depending on the weighting patterns. Independently of the time-horizon considered, results reveal the existence of *BHARs* which are mostly positive but not statistically significant, except for the Wilcoxon test that shows that the percentage of abnormal returns is mostly negative and significant. This difference in the long-run return depending on the weighting pattern is coherent with the existence of more important long-run underperformance of smaller size firms. However, in spite of *BHARs's* positive sign for 36 and 60 months, there is a higher percentage of negative abnormal returns. This suggests the existence of a few large firms with high positive abnormal returns that influence the results obtained.[6]

Similar results about the effect of size on the long-run underperformance (not reported) are obtained when the sample is split according to the market value of equity of the IPO firms. So, the abnormal returns on large IPOs are not different from zero and they are negative and significant on small stocks.

3.2. Results using Calendar-time portfolios

Long-run abnormal returns have also been calculated taking into account the correlation between the returns of different firms through the formation of monthly portfolios with the firms that have made an IPO, alternatively, in the previous 12, 36 or 60 months. The results reflected in Table 3 reveal that, on average, the firms have not underperformed when performance is calculated as the return of a portfolio composed in each month by the stocks of those firms that have carried out an IPO in any of the time-horizons considered.

Thus, it can be observed that for the time-horizon of 60 months, when monthly calendar time portfolios are formed equally weighting the abnormal returns of the firms, the IPOs tend to have a lower return than that obtained by the benchmarks considered, with the exception of the equally-weighted index of the Madrid Stock Exchange. Nevertheless, only the *IGBM* reference shows an abnormal return that is statistically significant. On the other hand, when the monthly portfolios are formed weighting for the firm's market value, the abnormal returns are positive, though only significant when the *IGBM* or the equally weighted index are used as a benchmark. In particular the mean monthly calendar-time abnormal returns are 1.59% for the *IGBM* and 1.69% for the equally-weighted index. That is, not only there is no long-run underperfomance but also, for some references, there are positive abnormal returns. Moreover, the difference in the results according to the weighting pattern of the abnormal returns can also be observed in the percentage of negative abnormal returns, which is higher when the firms are equally weighted inside the portfolio.

The existence of higher positive returns when the monthly portfolios are formed weighting the firms for market value than when using a pattern of equal weighting reveals a lower long-run performance in the IPOs made by smaller firms, independently of the benchmark used. The same conclusion has been obtai-

(6) In fact there are three firms, Acesa, Repsol and Pryca, that show high positive abnormal returns for the three horizons considered, which influence the results in such a way.

Table 3: Long-Run Abnormal Returns (Calendar time) on IPOs

Panel A: 12 months				
Equally Weighted	MMAR (%)	Student T	Standarized Student T	% MMAR < 0
IGBM (N=52)	0.56	0.81	1.11	51.12
BM Equally Weighted Index (N=52)	0.73	1.12	1.38	48.12
Size Portfolio (N=52)	0.11	0.13	0.62	49.62
Book /Market Ratio Portfolio (N=52)	0.14	0.19	-0.14	52.63
Book /Market Ratio and Size Portfolio (N=52)	0.34	0.40	0.84	53.38
Control Firms (N=52)	0.30	0.31	0.07	51.13
Market-Value Weighted				
IGBM (N=52)	1.58	1.88*	2.10**	40.60
BM Equally Weighted Index (N=52)	1.63	1.94*	1.53	37.59
Size Portfolio (N=52)	1.23	1.22	0.58	42.86
Book /Market Ratio Portfolio (N=52)	1.36	1.33	1.41	45.11
Book /Market Ratio and Size Portfolio (N=52)	1.41	1.44	0.28	43.61
Control Firms (N=52)	1.72	1.57	0.10	46.62
Panel B: 36 months				
Equally Weighted	MMAR (%)	Student T	Standarized Student T	% MMAR < 0
IGBM (N=37)	-0.04	-0.07	-1.64	59.49
BM Equally Weighted Index (N=37)	0.23	0.45	-1.12	56.33
Size Portfolio (N=37)	-0.35	-0.55	-1.68	57.59
Book /Market Ratio Portfolio (N=37)	-0.28	-0.38	-1.22	54.43
Book /Market Ratio and Size Portfolio (N=37)	-0.05	-0.08	-1.25	53.80
Control Firms (N=37)	-0.35	-0.45	-0.70	56.96

Table 3: Long-Run Abnormal Returns (Calendar time) on IPOs (continuation)

Panel B: 36 months				
Market-Value Weighted				
IGBM (N=37)	1.38	1.90*	0.44	44.94
BM Equally Weighted Index (N=37)	1.50	2.00**	0.98	44.94
Size Portfolio (N=37)	1.03	1.17	0.32	43.67
Book /Market Ratio Portfolio (N=37)	1.25	1.40	0.60	44.30
Book /Market Ratio and Size Portfolio (N=37)	1.25	1.44	0.35	43.67
Control Firms (N=37)	1.58	1.62	0.01	48.10
Panel C: 60 months				
Equally Weighted	MMAR (%)	Student T	Standarized Student T	% MMAR < 0
IGBM (N=34)	-0.02	-0.04	-1.71*	60.13
BM Equally Weighted Index (N=34)	0.28	0.56	-1.06	56.96
Size Portfolio (N=34)	-0.48	-0.68	-1.53	57.59
Book /Market Ratio Portfolio (N=34)	-0.70	-0.87	-1.27	56.33
Book /Market Ratio and Size Portfolio (N=34)	-0.04	-0.06	-1.12	52.53
Control Firms (N=34)	-0.48	-0.62	-0.84	57.59
Market-Value Weighted				
IGBM (N=34)	1.59	2.12**	1.70*	41.77
BM Equally Weighted Index (N=34)	1.69	2.28**	2.12**	39.24
Size Portfolio (N=34)	0.85	0.89	1.04	41.77
Book /Market Ratio Portfolio (N=34)	0.79	0.74	0.76	42.41
Book /Market Ratio and Size Portfolio (N=34)	1.39	1.53	1.06	43.04
Control Firms (N=34)	1.72	1.67*	0.50	43.67

The table shows the calendar time portfolio returns on IPOs for the time-horizons of 12, 36 and 60 months, from the first day of trading. After setting the time horizon, the abnormal return on each IPO is computed for each month during the analysed horizon in each case. Abnormal returns are computed in relation to the market index, both market value weighted and equally-weighted market indexes, a size portfolio return (size is measured by market value of equity); a book-to-market portfolio return; a size and book-to-market portfolio return and, finally, control firms return. The following step is to compute the average of each month's abnormal return for each IPO firm in the period considered, obtaining the abnormal return for each month. After that, we calculate the average of all the monthly abnormal returns during the sample period. To test the null hypothesis of zero mean monthly abnormal returns, a t-statistic is calculated using the time-series standard deviation of the mean monthly abnormal returns. A standardized t-student statistic is also computed that considers the heteroskedasticity of the portfolio abnormal return due to changes in its composition over time.
***, **, * Statistically significant at the 1%, 5% and 10% level, respectively.

ned previously for *BHARs*. In fact, the division of the sample in large and small IPOs according to the market value of equity shows similar results (not reported). So, there are negative and significant abnormal returns on small stocks, while the abnormal returns on large IPO firms are no significantly different from zero.

Results which are very similar appear when considering periods of 36 and 12 months. Another noteworthy fact revealed by the results is that in the three periods analysed –12, 36 and 60 months– when the portfolios are formed weighting for the market value and the *IGBM* (value weighted market index) or when the equally-weighted index is used as a benchmark, the returns are positive and significant. However, this significance disappears when using any other benchmark. The fact that the sample under study is composed of small firms with a low book-to-market ratio can explain this result. If the factors of size and book-to-market ratio are determinants of the returns on the stocks then the use of an index that takes all the firms into account can over-estimate the abnormal returns.

3.3. Robustness of the results

In order to test the robustness of our results, we have also used *CARs* and the Fama-French three factor model to analyse the long-run performance of IPO firms[7]. *CARs* show the existence of negative returns that are statistically significant, for the horizons of 36 and 60 months, when an equally-weighted pattern is used. These negative abnormal returns disappear when we consider a market-value weighted pattern. The results of the Fama-French three factor model reveal the non-existence of long-run abnormal returns since, regardless of whether the dependent variable is the return weighted by value or equally weighted, the intercept takes positive although not statistically significant values.

Summing up, in line with Fama's (1998) conclusion, the existence of long-run underperformance depends on the methodology, the benchmarks and the weighting patterns. In the Spanish IPOs, long-run underperformance exists when the abnormal returns are calculated as *BHARs* on an equal-weighted basis, regardless of the benchmark used if we consider a Wilcoxon test. However, we do not obtain significant values when we use a bootstrapped skewness-adjusted t-statistic. On average, the IPO firms have not underperformed when the abnormal returns are calculated following a calendar-time approach or as *BHARs* on a value-weighted basis. Espenlaub *et al.* (2000) also find, analyzing UK IPOs, that in calendar time there is considerably less evidence of underperformance. Our results are also in line with Brav and Gompers (1997) and Brav *et al*. (2000), in that they also observe that the underperformance comes primarily from small IPOs.

4. Conclusions

The study of the long-run performance of Spanish IPOs made between 1987 and 1997, in event windows of three and five years, reveals that the magnitude of the abnormal returns depends, partly, on the methodology used and on the weigh-

(7) Results are not shown, but they can be requested from the authors.

ting method. For example, in this paper, long-run underperformance is present for the time-horizons of 36 and 60 months only when *BHARs* are used and the returns are equally weighted, although it disappears if we consider a skewness-adjusted t-statistic. However, for *BHARs,* when portfolios include market-value weighted returns, we obtain positive abnormal returns but not statistically significant, although the percentage of negative abnormal returns is still significant. On the other hand, the long-run abnormal returns are not statistically significant when we use a methodology consisting of estimating mean monthly calendar-time returns. This conclusion is similar to that contributed by Brav *et al.* (2000) who state that the use of buy-and-hold returns tends to magnify the underperformance of IPOs. Our results also help to unify the existent empirical evidence for the Spanish capital market, concluding that the existence of long-run underperformance in IPOs is a question of methodology that depends on the form of estimating the long-run abnormal returns and on the test statistics used. Moreover, the underperformance phenomenon in the Spanish case is related to the size of the IPO firm. In fact, when we consider a market-value weighting pattern, regardless of the method of estimation, the abnormal returns are higher than when we use an equally weighted pattern.

Thus, the present study adds further evidence on the sensitivity of the underperformance phenomenon with respect to the choice of the empirical method. Fama (1998) concludes that most long-term return anomalies tend to disappear with reasonable changes in technique. Our findings for Spanish IPOs add some evidence to support this conclusion. In line with the market efficiency hypothesis, our results reveal that IPOs long-term anomaly is weak, because it disappears depending on the methodology or the weighting scheme used to estimate long-term returns or the test statistics used.

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ABSTRACT

The aim of this paper is to analyse the long-run performance of IPOs in the Spanish Capital Market. Due to the fact that the method of estimation of the returns influences both the magnitude of the abnormal return as well as the size and power of the statistical tests, we have used different methods with the aim of examining the robustness of the long-run perfomance of IPOs with respect to different specifications of the model. The results of the study show that the existence of long-run underperformance of Spanish IPOs depends on the methodology, benchmarks and weighting schemes used. There is long-run underperformance when the abnormal returns are calculated as BHARs on an equal-weighted basis, although the results depend on the test statistic used, but not when we follow a calendar time approach or we use BHARs on a value-weighted basis.

Key words: initial public offering (IPO), long-run return, BHAR, calendar-time portfolios.

JEL classification: G10, G12 and G14.