

Is the IPO Anomaly in Poland Only Apparent or Real?

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Abstract Market anomalies have absorbed many academics and investors. Uncovering puzzling results is still an attractive research task. Anomalies are perceived as empirical findings inconsistent with accepted asset pricing models. Many of them were found illusory, and appeared to be not robust to the methodology, sample or period choice. Some anomalies weakened substantially, reversed themselves, disappeared or even reappeared after some time. There have been anomalies that have fascinated economists from all over the world. One of these was the short-term underpricing and long-term underperformance phenomenon observed after initial public offerings (IPOs). Are IPOs really offering investors an unfailing opportunity to earn money at the moment of going public, resulting in a huge amount of money being left on the table by the issuing firms? Is investing in IPO firms in the long run an easy way to lose money? Are the short- and long-term abnormal returns robust enough to become recognised as statistically and economically significant? The research aimed to answer the questions using a broad set of benchmarks and empirical approaches. The study comprised of all of the non-financial firms that made their initial public offering on the Warsaw Stock Exchange between 1995 and 2013.

Keywords Initial public offerings • IPO • Warsaw Stock Exchange • Benchmark • Underpricing • Underperformance

1 Introduction

Uncovering market anomalies and challenging the efficient market hypothesis (Fama 1970) has been a quite attractive issue for researchers. The issue was also an area of huge interest to market participants, eager to find an unfailing way to earn money. Soft- and hardware capabilities, together with numerous databases make it possible to calculate almost everything for the whole world.

Anomalies can be defined as empirical findings inconsistent with the predictions of accepted asset pricing models. The discussion around anomalies covered

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overlapping issues such as the efficient market hypothesis, market rationality, complete knowledge of the economic structure, stock price determination models or behavioural evidence of investor decisions.

The most famous anomalies that have been uncovered so far were connected with equity public offerings (Ritter 1991, or Loughran and Ritter 1995), earnings announcements (such as in Foster et al. 1984), seasonal regularities (e.g. Cross 1973; Lakonishok and Smidt 1988) or referred to small capitalization firms (Fama and French 1992), book-to-market levels (Basu 1977), or accruals (Sloan 1996), just to mention some of the more prominent examples. The triggering price behaviour after initial public offerings (IPOs) was observed both for the short as well as over the long run. It was so puzzling and persistent that it was re-challenged many times for the US exchanges. For a long time, it has also fascinated economists who have tried to check its relevance for capital markets all over the world. Previous studies have generally shown positive abnormal returns on the first day after going public, which was called IPO underpricing. Most of the previous research documented negative abnormal returns in the long-run, up to three and sometimes even 5 years after issuing. This second phenomenon was called IPO underperformance. However, there are opinions that these anomalous results were just a consequence of method deficiencies. Fama still advocates the efficient market hypothesis (1998, 2010). He questioned the relevancy of anomaly-detecting methods, especially over the long run.

There have been relatively few studies that have examined this issue in emerging markets, which are supposed to have different risk and return characteristics than developed markets. Empirical evidence of IPO underpricing for the Polish stock market is not so wide as for developed markets.

Although the reasons for short-term IPO underpricing are still puzzling, there has generally been agreement that the first day close price is on average significantly higher than the offer price. Recent years have been times of sudden changes on capital markets. The years up to 2007 were mostly a bull market period. Then, huge market turbulences appeared with sudden falls in equity prices. After 2009, market indexes started to rise along with an increase in optimistic investor behaviour. But the question arises: are investors still as optimistic in pricing Polish IPOs during the first day of trading following the huge market declines in recent years?

Most studies concluded that IPOs underperform in the long run. However, there is no general agreement that abnormal long-run returns are significantly different from zero. Besides, it has become apparent that results are very sensitive to the reference portfolio choice (Brav and Gompers 1997; Stehle et al. 2000; Schuster 2001; Drobetz et al. 2005). Many methods of abnormal performance detection have appeared in the long-term event study literature, but there has been no general and unified approach to estimation methods. The most widely applied market return did not seem to be a good benchmark for IPO securities' returns, due to the higher risk characteristics of IPO companies (Loughran and Ritter 2000). Is anomalous price behaviour still observed in Poland, even after employing a broader set of empirical methods?

The present research aimed to observe the IPO short- and long-term returns on the Warsaw Stock Exchange using a variety of different methods. Nine benchmarks were employed in order to estimate underpricing and 3- and 5-year long-term buy-and-hold and cumulative abnormal returns, along with parametric and non-parametric tests. This was to lend more robustness to the results. The fresh evidence for Polish equity issuance is presented with a sample covering IPOs from 1995 to 2013. As far as the authors are aware it is the first study for the Polish market estimating IPO performance up to the fifth year following the day of going public. The research also contributes to the debate on the importance of the benchmark construction.

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The rest of the chapter is structured in the following way. In the next section the existing literature and results of prior studies on the existence of both short- and long-term IPO anomalies are commented on. Section 3 describes the dataset, methodology and presents descriptive statistics. In Sect. 4 estimates of short- and long-term abnormal returns are discussed. Section 5 states the conclusions.

2 Previous Literature

Abnormal returns following initial public offerings have been broadly discussed with evidence from all over the world (Ritter 2003, among many others). The issue was also present in research done for the Warsaw Stock Exchange.

The early studies on the short-term price behaviour for Polish IPOs revealed median abnormal WIG-adjusted underpricing of 16.0 % for 1991–1999 (Aussenegg 2000), 28.1 % for 1991–1998 (Lyn and Zychowicz 2003), and 14.4 % during 1991–1999 (Jelic and Briston 2003). Later studies also confirmed positive median WIG-adjusted initial returns: 6.5 % for the period of 1998–2008 (Jewartowski and Lizińska 2012), 15.7 % (mean) for 2005–2009 (Cornanic and Novak 2013), for 2004–2009 it was estimated to be 6.9 % (Czapiewski and Lizińska 2014), and 34.1 % for 1991–2000 in comparison to 13.5 % for the later period of 2001–2011 (Czapiewski et al. 2013).

There were also some studies concerning the long-term performance of Polish initial public offerings. The first results were published by Aussenegg (2000) for the 1991–1999 period, revealing median WIG-adjusted 3-year buy-and-hold returns equal to –61.1 %. An interesting result was the positive mean BHAR of 11.5. Lyn and Zychowicz, for the years from 1991 to 1998 (2003) did not find significant evidence of underperformance for the third year after going public. Jelic and Briston (2003) examined IPOs for the period from 1991 to 1999 and documented mean cumulative abnormal return of –37.8 % and mean abnormal buy-and-hold return for the 3-year period of –26.5 %. Jewartowski and Lizińska (2012) worked with a sample of WSE offerings from 1998 to 2008 and reported median 3-year buy-and-hold abnormal returns of –44.5. Czapiewski and Lizińska (2014) for the

sample of 2004–2009 revealed median buy-and-hold abnormal returns at the third IPO anniversary at the level of -24.9% .

It would be very hard, if not impossible in the limited space of a single article to present the results of all the studies on short- and long-term price behaviour of IPO firms covering all markets worldwide. It has become one of the most widely discussed anomalies, interesting both for researchers and investors. The evidence on underpricing is mostly concluded with revealing positive initial abnormal returns. However, the results have been strongly dominated by market index-adjusting.

The worldwide evidence on long run post-IPO performance can be seen as controversial, as different research projects have often reported contrasting results. This is not rare even within the same stock exchange. For example, contradictory results were reported for the Australian Stock Exchange. Lee et al. (1996) observed severe underperformance in the long run whereas Da Silva Rosa et al. (2003) found no evidence of underperformance in the subsequent years. For Spanish IPOs, Farinos (2001) revealed no underperformance up to the third year after the IPO. Ansotegui and Fabregat (1999) reported that IPO firms listed in Spain did experience negative 3-year returns after the IPO date using the market index and an industrial index as benchmarks.

Some studies showed that conclusions of the long-term event study analysis for IPO were very benchmark-sensitive (Brav and Gompers 1997; Stehle et al. 2000; Schuster 2001; Drobetz et al. 2005). Market indexes have been the most commonly chosen benchmarks. However, this could result in underperformance underestimation as stressed by Loughran and Ritter (2000). There were also arguments that benchmarks should be designed to also include firm characteristics such as size or book-to-market ratio (Brav and Gompers 1997). Stehle et al. (2000) showed that such benchmarks appeared to give more reliable results for long-term event analysis. Ritter (1991) and Loughran and Ritter (1995) analysed US IPOs and reported negative returns up to the fifth year after the offering. In a more recent study, Gompers and Lerner (2003) found that long-term IPO performance was very sensitive to the method of normal return estimation. They found some evidence for negative long-term returns for value-weighted event-time buy-and-hold abnormal returns. However, they also revealed that underperformance disappeared after application of equally-weighted event-time cumulated and buy-and-hold abnormal returns.

3 Data Sources, Methodology and Descriptive Statistics

The research was conducted for equity securities quoted on the Warsaw Stock Exchange (WSE) in Poland. The source of data was Ceduła, Notoria Serwis, the official site of the WSE (<http://www.gpw.pl>) and www.gpwinfostrefa.pl. In the first step, it was essential to prepare the authors' own database covering daily close prices and financial statements. The existing sources did not have satisfactory data

quality. In consequence, the database for the research also included delisted firms and close prices with the necessary adjustments (dividends, splits and preemptive rights).

The original sample consisted of 405 non-financial IPOs offered from 1995 to 2013 on the Polish main stock market, the Warsaw Stock Exchange (WSE). The sample included only such initial offerings that were connected with a new common stock issuance, without prior trading history on alternative markets. As the long-run returns were estimated up to the 5-year event window, the sample was limited to cover the period of 1995–2008 with 345 IPOs to make the estimation possible for all of the IPOs. Here, the sample period ended in 2008 and the quoting data ended in 2013. The necessary data were not always complete, so some reductions were made in the later research steps.

Table 1 provides a few main IPO firm characteristics. It contains the average level of leverage expressed by total debt divided by total assets for the period before the IPO date (D/A), return on assets expressed by net income divided by total assets for the period before the IPO date (ROA) and market value of equity for the first day in the aftermarket (MV).

The performance was examined using different time periods. First, it was observed in the first day in the aftermarket. The returns were calculated with daily close prices. The raw initial return for security i was calculated by:

$$IR_{i,t} = \frac{IP_i}{PO_i} - 1 \quad (1)$$

where IP_i was the first aftermarket price for IPO i and PO_i was the offer price for IPO i .

Then, initial adjusted returns were obtained by subtracting the benchmark returns from stock returns:

Table 1 Descriptive statistics for Polish IPOs

	D/A	ROA	MV
<i>Panel A: 1995–2013</i>			
Mean	43.18 %	6.32 %	819.5 mln
Median	45.37 %	4.63 %	104.4 mln
Kurtosis	−0.13	2.56	8.39
Skewness	−1.13	20.25	79.98
N	343	395	405
<i>Panel B: 1995–2008</i>			
Mean	42.36 %	6.19 %	576.4 mln
Median	45.37 %	4.70 %	98.6 mln
Kurtosis	−0.08	2.74	8.81
Skewness	−1.24	22.70	84.92
N	287	335	345

$$IAR_{i,t} = IR_{i,t} - IR_{i,t}^B, \quad (2)$$

where $IR_{i,t}^B$ was the daily return on the benchmark portfolio in the IPO.

Next, buy-and-hold abnormal returns (BHARs) were calculated to observe the long-term IPO price behaviour up to the fifth year after the offering.

The buy-and-hold return for IPO i for selected event windows was defined as:

$$BHR_{i,T}^1 = \prod_{t=1}^T (1 + R_{i,t}) - 1 \quad (3)$$

where $R_{i,t}$ was the daily return in trading day t , and T was the aftermarket trading session number with 1 assigned to the first day after going public. It was assumed that a year was equivalent to 252 trading days. The buy-and-hold return for the corresponding reference portfolio for IPO i ($BHR_{i,T}^B$) was defined as:

$$BHR_{i,T}^{1,B} = \prod_{t=1}^T (1 + R_{i,t}^B) - 1 \quad (4)$$

where $R_{i,t}^B$ was the daily return on the benchmark portfolio in trading day t for IPO i .

The buy-and-hold abnormal return for each IPO i and the given benchmark and the selected event window ($BHAR_{i,T}^{1,B}$) was given by:

$$BHAR_{i,T}^{1,B} = BHR_{i,T}^1 - BHR_{i,T}^{1,B} \quad (5)$$

The cumulative abnormal return (CAR) was employed as an alternative performance measure. The general formula for abnormal market adjusted return ($AR_{i,t}$) for each IPO i for t session was expressed as:

$$AR_{i,t} = R_{i,t} - R_{i,t}^B \quad (6)$$

The abnormal returns ($AR_{i,t}$) were cumulated to get cumulative abnormal returns ($CAR_{i,T}$) for different event windows up to the 5 year.

Detecting long-run abnormal stock returns is usually disputable. Barber and Lyon (1997) reported that many of the commonly used methods of calculating long-run returns in event studies suffer from flaws or biases. They recommended using buy-and-hold abnormal returns. On the other hand, Mitchell and Stafford (2000) and Brav (2000) concluded that the buy-and-hold approach would be more sensitive to the cross-sectional dependence problem among firms. The buy-and-hold approach has usually been recommended to simulate a real investing situation with buying securities at the IPO date, holding it for a specified period of time and selling it afterwards.

IPO returns are supposed to be very volatile during the first period after going public. There are some studies where the first period in the aftermarket was excluded from the analysis. Here, the first starting point for the long-term event

window was the first day close price, as described above. It resulted in an abnormal buy-and-hold ($BHAR_{i,T}^{1,B}$) and cumulative ($CAR_{i,T}^{1,B}$) return estimation. Two alternative ways of detecting long-term IPO underperformance, were applied. The second starting point for the event window was the closing price after the first quarter in the market (63 trading days). The assumption here was: let us give investors time to gather information about the new firms and then observe the relative IPO performance. Long-term IPO performance was measured here from the fourth trading month (where 1 month was defined as 21 trading days) to avoid possible noise. In consequence, buy-and-hold ($BHAR_{i,T}^{64,B}$) and cumulative ($CAR_{i,T}^{64,B}$) returns were obtained. The third starting point for observing the price behaviour was based on the assumption that IPOs tend to cluster in time, to benefit from highly optimistic investor valuations. Then, the sentiment-influenced around-issue closing price is not supposed to be a good comparison for the future price in long-term event studies. In consequence, the future close price was compared with the offer price (PO_i). Hence, buy-and-hold ($BHAR_{i,T}^{offer,B}$) and cumulative ($CAR_{i,T}^{offer,B}$) returns were achieved.

Several previous studies have shown that long-term performance measures are very benchmark-sensitive (Brav and Gompers 1997; Stehle et al. 2000; Schuster 2001; Drobetz et al. 2005). Existing market indexes were the most commonly chosen benchmark for estimating abnormal price behaviour, as it is quite an easy and convenient way to adjust raw returns. The problem that arises is whether the market index is able to check the risk level correctly. The market-adjusted returns could also be a consequence of systematic return patterns of a group of companies, unrelated to the fact of going public (Ahern 2009). Many previous papers concluded that IPO firms tended to underperform the market in the long run. However, such a reference portfolio also contains issuing firms. Loughran and Ritter (2000) pointed out that this might result in underestimating the level of underperformance. On the other hand, eliminating IPO firms without time limits once and for all was questionable because of the limited number of firms on the WSE. A kind of a trade-off was employed, and each IPO firm was eliminated from possible reference portfolios during the first year after its IPO date.

Some authors argued that benchmark portfolios should be designed on the basis of characteristics of the firms, such as size or book-to-market ratio (Brav and Gompers 1997 or Brav 2000). Stehle et al. (2000) showed that such benchmarks appeared to give more reliable results for long-term event analysis. This research included the application of nine reference portfolios to observe the IPO anomaly in a broad context. The first benchmark was the existing market index for the Warsaw Stock Exchange, mainly the WIG index. Eight alternatives were adopted to measure IPO firm performance against similar firms. Such a benchmark could be as well one control firm as a portfolio of securities (Ang and Zhang 2002). The research was conducted for the sample of WSE listed companies, where it could be very difficult to find one very similar neighbour to adjust the performance properly in the

case of some IPOs. For this reason, portfolio-matching was adopted here. That makes it possible to then match the portfolios according to only one feature or according to many dimensions simultaneously. The second approach is expected to result in a better matching, but it can sometimes cause problems with the size of benchmark portfolios, especially for smaller exchanges. Single and multi-dimensional matching was adopted in the research. The number of characteristics is usually limited to no more than two or three. As it is usually applied on small or even medium exchanges, the construction of benchmarks was designed on the basis of two characteristics of the firms: company size and book-to-market ratio. Size was measured as the market value of common equity on the IPO day. Size portfolios were obtained by a classification of firms listed on the Warsaw Stock Exchange according to the market value of equity for all WSE firms on the IPO day in order to obtain size quartiles. Book-to-market ratio was calculated using capitalisation of the IPO firm during the first day of trading and book value of equity from the last year before the IPO. Then, each IPO was assigned to the relevant quartile and its benchmark was constituted by firms belonging to the same size quartile. Next, book-to-market portfolios were obtained by a classification of all firms listed on the Warsaw Stock Exchange according to book-to-market on the IPO day of a particular offering in order to obtain book-to-market quartiles. Then, each IPO was assigned to the relevant quartile and its benchmark was constituted by firms belonging to the same book-to-market quartile. A similar procedure was used for the formation of two-dimensional portfolios. The WSE was divided by company size into quartiles, and simultaneously into four groups using book-to-market ratios for the most recent data of a particular IPO. Following this, 4×4 groups were created and each IPO was compared to the results of one of 16 portfolios.

The return on the benchmark portfolio on trading day t designed for IPO i ($R_{i,t}^B$) was estimated as the mean of estimated returns for similar companies. The reference portfolio performance was aggregated into an overall measure on an equal- or value-weighted basis.

According to the above procedures for the formation of portfolios, the relevant benchmarks were:

WIG	The existing main WSE index
ALL_ew	The equally-weighted mean return for all WSE companies
ALL_vw	The value-weighted mean return for all WSE companies; value weighting was done daily
MV_ew	The equally-weighted mean return for the WSE companies in the size quartile; the breakpoints for those portfolios were calculated for each IPO on the basis of the market capitalisation from the IPO date
MV_vw	The value-weighted mean return for the WSE companies in the size quartile; the breakpoints for those portfolios were calculated for each IPO on the basis of the market capitalisation from the IPO date; value weighting was done daily

BM_ew	The equally-weighted mean return for the WSE companies in the book-to-market quartile; the breakpoints for those portfolios were calculated for each IPO on the basis of the book-to-market ratio from the IPO date
BM_vw	The value-weighted mean return for the WSE companies in the book-to-market quartile; the breakpoints for those portfolios were calculated for each IPO on the basis of the book-to-market ratio from the IPO date; value weighting was done daily
MV&BM_ew	The equally-weighted mean return for the WSE companies according to the size quartile and book-to-market; the breakpoints for those portfolios were calculated for each IPO on the basis of the market capitalisation and book-to-market ratio from the IPO date; the portfolios were formed by first forming size quartiles for the WSE firms and then, book-to-market quartile breakpoints were formed; each company was allocated to one of those 16 portfolios
MV&BM_vw	The value-weighted mean return for the WSE companies according to size quartile and book-to-market; the breakpoints for those portfolios were calculated for each IPO on the basis of the market capitalization and book-to-market ratio from the IPO date; the portfolios were formed by first forming size quartiles for the WSE firms and then, book-to-market quartile breakpoints were formed; each company was allocated to one of those 16 portfolios; value weighting was done daily.

To minimise the potentially detrimental effect of extreme outliers, Winsorising was applied. Outliers were found with the use of the interquartile range (*IQR*). The lower bound was set as $Q_1 - 1.5 \cdot IQR$ and the upper bound as $Q_3 + 1.5 \cdot IQR$.

The Shapiro-Wilk test was used to test the distribution normality of abnormal returns. A conventional parametric test has often been supposed to confirm long-run abnormal performance where none was present (Kothari and Warner 1997; Barber and Lyon 1997). Hence, both a parametric and non-parametric test was employed, namely the Student t-test and the Wilcoxon signed-rank test.

In consequence, the short-term IPO performance was observed on the basis of daily returns with nine benchmarks. The long-term IPO anomaly was challenged with two general approaches (BHARs, CARs), nine reference portfolios (WIG, ALL_ev, ALL_vw, MV_ev, MV_vw, BM_ew, BM_vw, MV&BM_ew and MV&BM_vw), three reference prices (the 1st day close price, the 64th day close price and the offer price) with observations up to the third and the fifth IPO anniversary. As a result of the research design, a variety of different methods was tested to observe the IPO anomaly.

4 Results

This section presents the results of the analysis of short-term underpricing and long-term underperformance for the Warsaw Stock Exchange in Poland.

First, the short-term performance of IPO firms was considered. It was checked for two samples. The first sample was used for both the short- and long-term research with 345 initial public offerings and covered the period from 1995 to 2013. The sample period for long-term studies started in 1995 and ended in 2008 in order to make the 5-year performance analysis possible for all of the IPOs, with the price data ending in 2013. In order to examine the short-term performance on the most recent data, the full sample of 405 IPOs from 1995 to 2013 was also investigated. The abnormal initial returns were also Winsorized. The results are shown in Table 2.

It can be seen that independently of the benchmark used, the initial adjusted returns were positive. Although there were some differences between results for alternative benchmarks, these were rather small. The minimum mean achieved for 1995–2013 was 13.58 for value-weighted two-dimensional size and book-to-market matching (MV&BM_vw), and the maximum was 13.84 for value-weighted book-to-market matching (BM_vw). The minimum median totalled 9.53 with equally-weighted book-to-market matching (BM_ew) and the maximum was 10.14 with equal-weighted size matching (MW_ew). The underpricing level was slightly lower in terms of means and medians for the more recent sample (1995–2013) in comparison to the sample covering the years from 1995 to 2008. This was similar to the conclusions of previous studies for the Warsaw Stock Exchange. The Shapiro-Wilk test revealed the non-normality of the distribution of abnormal initial returns. The returns were statistically significant at the 1 % level, both with the parametric and the non-parametric test.

After studying the short-term IPO anomaly, buy-and-hold and cumulative abnormal returns were examined. As described earlier in the chapter, nine benchmarks were used. The BHARs in the third and fifth year after the IPO date, when the security was bought during the first day of trading, are shown in Table 3. The results for the cumulative approach are in Table 4.

Independently of the benchmark used, the results reveal the existence of negative abnormal returns in the third and fifth year after going public for investments, starting on the first and 63rd day in the aftermarket. More severe underperformance was documented for benchmarks with value-weighting than equal-weighting. This is in line with Loughran and Ritter's results (1995). Adjusting portfolios by characteristic-based reference revealed worse long-term returns in comparison to a simple market-adjusting with WIG index. This is in accordance with Loughran and Ritter's suggestion (2000) that adjusting by index results in underestimation of the underperformance as the index also contains the issuing firms.

As the distribution of abnormal returns was non-normal, the emphasis was placed on medians. Long-term investor experience captured by compounding daily returns and by cumulating abnormal returns showed that the most negative

Table 2 Short-term IPO performance according to first-day abnormal returns

	WIG		ALL		MV		BM		MV&BM	
	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw
<i>Panel A: 1995-2008</i>										
Mean [%]	14.95	14.97	14.85	14.84	14.84	14.88	14.76	15.02	14.76	14.72
Median [%]	11.69	11.31	11.46	11.35	11.35	11.43	11.22	11.20	11.39	11.50
% negative	72	72	73	73	73	73	72	72	73	73
Skewness	0.41	0.42	0.39	0.39	0.39	0.39	0.37	0.41	0.37	0.37
Kurtosis	-0.33	-0.30	-0.39	-0.40	-0.40	-0.39	-0.43	-0.31	-0.38	-0.40
p-val (S-W)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
N	326	326	326	326	326	326	325	325	319	319
<i>Panel B: 1995-2013</i>										
Mean	13.78	13.79	13.70	13.69	13.69	13.72	13.62	13.84	13.63	13.58
Median	9.99	9.87	9.99	10.14	10.14	9.93	9.53	10.01	10.04	10.12
% negative	73	73	73	73	73	73	73	73	74	73
Skewness	0.50	0.51	0.48	0.48	0.48	0.48	0.46	0.50	0.46	0.46
Kurtosis	-0.03	-0.00	-0.11	-0.12	-0.12	-0.10	-0.16	-0.02	-0.10	-0.13
p-val (S-W)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
N	384	384	384	384	384	384	383	383	377	377

Notes: Significance at the 1 % (***) level. Tests: Shapiro-Wilk test (S-W), Student t test (t-Stud), Wilcoxon signed rank test (WSR). Benchmarks: WIG index, mean equity return (ALL), size portfolio (MV), book-to-market portfolio (BM), size and book-to-market portfolio (MV&BM) with equal weighting (ew) and value weighting (vw)

Table 3 Long-term IPO performance according to buy-and-hold abnormal returns

<i>1995–2008 IPOs</i>		3-year returns		5-year returns
Panel A		WIG		WIG
Mean [%]		−20.46		−33.42
Median [%]		−34.41		−48.80
% negative		70		75
Skewness		0.61		0.65
Kurtosis		0.06		0.19
p-val (S-W)		0.0000***		0.0000***
p-val (t-Stud)		0.0000***		0.0000***
p-val (WSR)		0.0000***		0.0000***
N		334		297
Panel B	ALL_ew	ALL_vw	ALL_ew	ALL_vw
Mean [%]	−41.57	−82.69	−68.05	−131.83
Median [%]	−47.79	−88.74	−54.66	−128.90
% negative	76	85	79	89
Skewness	0.12	0.34	−0.14	0.13
Kurtosis	−0.06	0.20	−0.01	0.15
p-val (S-W)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
N	334	334	297	297
Panel C	MV_ew	MV_vw	MV_ew	MV_vw
Mean [%]	−46.69	−148.96	−57.93	−268.62
Median [%]	−43.47	−107.91	−47.16	−162.38
% negative	75	89	78	94
Skewness	−0.03	−0.48	−0.09	−0.88
Kurtosis	−0.37	−0.48	−0.02	0.14
p-val (S-W)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
N	334	334	297	297
Panel D	BM_ew	BM_vw	BM_ew	BM_vw
Mean [%]	−57.04	−73.84	−74.79	−114.79
Median [%]	−52.42	−76.69	−67.34	−108.40
% negative	77	83	79	89
Skewness	−0.09	0.12	−0.13	0.02
Kurtosis	−0.17	0.12	−0.13	0.26
p-val (S-W)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
N	333	333	296	296
Panel E	MV&BM_ew	MV&BM_vw	MV&BM_ew	MV&BM_vw
Mean [%]	−36.30	−99.19	−41.72	−158.13
Median [%]	−33.69	−73.73	−30.47	−100.29

(continued)

Table 3 (continued)

Panel E	MV&BM_ew	MV&BM_vw	MV&BM_ew	MV&BM_vw
% negative	69	84	70	87
Skewness	-0.08	-0.41	-0.23	-0.61
Kurtosis	-0.24	-0.33	-0.06	-0.11
p-val (S-W)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
N	327	327	290	290

Notes: Significance at the 1 % (***) level. Tests: Shapiro-Wilk test (S-W), Student t test (t-Stud), Wilcoxon signed rank test (WSR). Benchmarks: WIG index, mean equity return (ALL), size portfolio (MV), book-to-market portfolio (BM), size and book-to-market portfolio (MV&BM) with equal weighting (ew) and value weighting (vw)

results were achieved after accounting for size effect with value-weighting. All of the BHARs and CARs for the third and fifth IPO anniversary were statistically significant. The magnitude of underperformance also proved that it was economically significant. The levels of abnormal performance for WIG-adjusted and characteristic-based portfolios are illustrated on Fig. 1. An interesting finding was that the cumulative abnormal returns were partly positive at the third and fifth IPO anniversary for three benchmarks (WIG, MV&BM_ew and MW_ew adjusting).

Brav and Gompers (1997) and Fama (1998) concluded that the long-term underperformance of initial public offerings was not an IPO-specific phenomenon, but rather the effect of a broader anomaly observed for small firms. In other words, the IPO anomaly may merely be a result of a more systematic pattern of returns on capital markets. Given that IPO firms tend to be smaller firms, the long-run underperformance after offerings may be perceived as a size anomaly instead of an IPO anomaly. However, the introduction of alternative benchmarks did not confirm the nonexistence of the IPO anomaly on the Polish exchange for the sample period of 1998–2013. Even after accounting for size and book-to-market characteristics, the research revealed significant underperformance. Additionally, the division into small and large companies was introduced. The sample of IPOs on the Warsaw Stock Exchange from 1995 to 2008 was divided into three groups according to the market value of equity on the IPO day with the bounds at the 0.33rd and 0.66th percentile. Then, the underperformance of IPOs with the lowest and highest capitalisation levels was observed (SmallCap and BigCap, respectively). The differences between both groups were tested with the use of the Mann-Whitney test. The results are detailed in Table 5 and illustrated on Fig. 2.

Previous studies generally concluded that small firms tended to perform worse in the long-term (Ritter 1991; Page and Reyneke 1997). However, some studies found the opposite (Jelic et al. 2001; Corhay et al. 2002; Ahmad-Zaluki et al. 2007).

Table 4 Long-term IPO performance according to cumulative abnormal returns

<i>1995–2008 IPOs</i>		3-year returns		5-year returns	
Panel A		WIG		WIG	
Mean [%]		−10.11		−11.20	
Median [%]		−14.57		−9.64	
% negative		58		53	
Skewness		0.12		−0.08	
Kurtosis		0.13		0.07	
p-val (S-W)		0.0298**		0.0027***	
p-val (t-Stud)		0.0205**		0.0479**	
p-val (WSR)		0.0113**		0.0642*	
N		334		297	
Panel B	ALL_ew	ALL_vw	ALL_ew	ALL_vw	
Mean [%]	−20.61	−53.52	−20.98	−71.87	
Median [%]	−21.54	−58.08	−20.46	−67.84	
% negative	62	76	57	79	
Skewness	0.10	0.21	−0.10	−0.03	
Kurtosis	0.22	0.27	0.25	−0.02	
p-val (S-W)	0.0062***	0.0073***	0.0807*	0.0016***	
p-val (t-Stud)	0.0000***	0.0000***	0.0004***	0.0000***	
p-val (WSR)	0.0000***	0.0000***	0.0007***	0.0000***	
N	334	334	297	297	
Panel C	MV_ew	MV_vw	MV_ew	MV_vw	
Mean [%]	−22.84	−80.17	−19.23	−106.17	
Median [%]	−25.93	−79.33	−17.93	−97.69	
% negative	63	81	59	84	
Skewness	0.14	0.03	−0.03	−0.09	
Kurtosis	0.11	0.03	0.15	−0.03	
p-val (S-W)	0.0503*	0.2298	0.1939	0.1182	
p-val (t-Stud)	0.0000***	0.0000***	0.0010***	0.0000***	
p-val (WSR)	0.0000***	0.0000***	0.0016***	0.0000***	
N	334	334	297	297	
Panel D	BM_ew	BM_vw	BM_ew	BM_vw	
Mean [%]	−30.41	−49.00	−34.07	−66.70	
Median [%]	−30.71	−49.71	−30.31	−62.55	
% negative	65	75	64	76	
Skewness	0.13	0.09	−0.05	−0.08	
Kurtosis	0.03	0.02	0.02	0.06	
p-val (S-W)	0.0470**	0.0348**	0.2966	0.0327**	
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***	
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***	
N	333	333	296	296	
Panel E	MV&BM_ew	MV&BM_vw	MV&BM_ew	MV&BM_vw	
Mean [%]	−23.40	−67.16	−21.28	−90.19	
Median [%]	−18.23	−60.35	−14.97	−77.00	

(continued)

Table 4 (continued)

Panel E	MV&BM_ew	MV&BM_vw	MV&BM_ew	MV&BM_vw
% negative	57	77	55	75
Skewness	-0.26	-0.30	-0.34	-0.45
Kurtosis	0.14	0.10	0.19	0.35
p-val (S-W)	0.0001***	0.0001***	0.0000***	0.0000***
p-val (t-Stud)	0.0000***	0.0000***	0.0036***	0.0000***
p-val (WSR)	0.0001***	0.0000***	0.0207**	0.0000***
N	327	327	290	290

Notes: Significance at the 1 % (***), 5 % (**) and 10 % (*) level. Tests: Shapiro-Wilk test (S-W), Student t test (t-Stud), Wilcoxon signed rank test (WSR). Benchmarks: WIG index, mean equity return (ALL), size portfolio (MV), book-to-market portfolio (BM), size and book-to-market portfolio (MV&BM) with equal weighting (ew) and value weighting (vw)

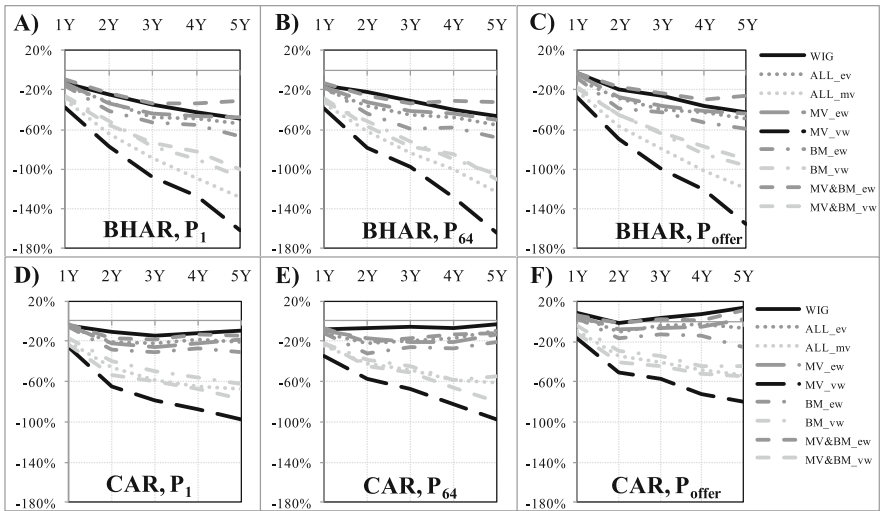


Fig. 1 Median long-term performance of IPOs

The long-term underperformance for the Warsaw Stock Exchange was definitely more severe in the group of smaller IPOs. But it did not disappear for offerings from bigger companies. Even here, the average 3- and 5-year abnormal cumulated and compounded returns were significant and strongly negative.

Table 5 Buy-and-hold abnormal returns for small and big capitalization firms

1995–2008 IPOs	3-year returns		5-year returns	
	SmallCap	BigCap	SmallCap	BigCap
<i>Panel A: WIG</i>				
Mean [%]	−24.4	−16.7	−46.3	−25.1
Median [%]	−46.4	−26.6	−62.6	−42.2
p-val (t-Stud)	0.0008***	0.0210**	0.0000***	0.0002***
p-val (WSR)	0.0006***	0.0046***	0.0000***	0.0002***
p-val (MW)	0.0951*		0.0043***	
<i>Panel B: ALL_ew</i>				
Mean [%]	−40.2	−42.8	−74.1	−69.4
Median [%]	−53.7	−42.4	−63.0	−49.7
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (MW)	0.5638		0.2355	
<i>Panel C: ALL_vw</i>				
Mean [%]	−86.7	−78.6	−153.7	−122.4
Median [%]	−104.1	−77.3	−157.9	−106.4
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (MW)	0.1161		0.0042***	
<i>Panel D: MV_ew</i>				
Mean [%]	−74.7	−22.9	−98.1	−30.1
Median [%]	−66.5	−23.3	−93.0	−33.0
p-val (t-Stud)	0.0000***	0.0034***	0.0000***	0.0002***
p-val (WSR)	0.0000***	0.0026***	0.0000***	0.0001***
p-val (MW)	0.0000***		0.0000***	
<i>Panel E: MV_vw</i>				
Mean [%]	−200.2	−94.4	−421.4	−141.5
Median [%]	−167.4	−68.8	−404.2	−112.7
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (MW)	0.0000***		0.0000***	
<i>Panel F: BM_ew</i>				
Mean [%]	−46.2	−68.5	−71.6	−79.0
Median [%]	−51.0	−54.9	−71.0	−72.8
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (MW)	0.1717		0.9615	
<i>Panel G: BM_vw</i>				
Mean [%]	−79.6	−69.2	−133.2	−100.0
Median [%]	−89.0	−66.2	−142.4	−85.9
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (MW)	0.0583*		0.0032***	

(continued)

Table 5 (continued)

1995–2008 IPOs	3-year returns		5-year returns	
	SmallCap	BigCap	SmallCap	BigCap
<i>Panel H: MV&BM_ew</i>				
Mean [%]	-51.6	-23.5	-64.4	-27.0
Median [%]	-41.2	-22.8	-39.3	-26.7
p-val (t-Stud)	0.0000***	0.0035***	0.0000***	0.0023***
p-val (WSR)	0.0000***	0.0020***	0.0000***	0.0009***
p-val (MW)	0.0141**		0.0771*	
<i>Panel I: MV&BM_vw</i>				
Mean [%]	-122.7	-71.3	-207.7	-102.9
Median [%]	-90.4	-56.7	-116.6	-85.2
p-val (t-Stud)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (WSR)	0.0000***	0.0000***	0.0000***	0.0000***
p-val (MW)	0.0013***		0.0213**	

Notes: Significance at the 1 % (***), 5 % (**) and 10 % (*) level. Tests: Shapiro-Wilk test (S-W), Student t test (t-Stud), Wilcoxon signed rank test (WSR), Mann-Whitney test (MW). Benchmarks: WIG index, mean equity return (ALL), size portfolio (MV), book-to-market portfolio (BM), size and book-to-market portfolio (MV&BM) with equal weighting (ew) and value weighting (vw)

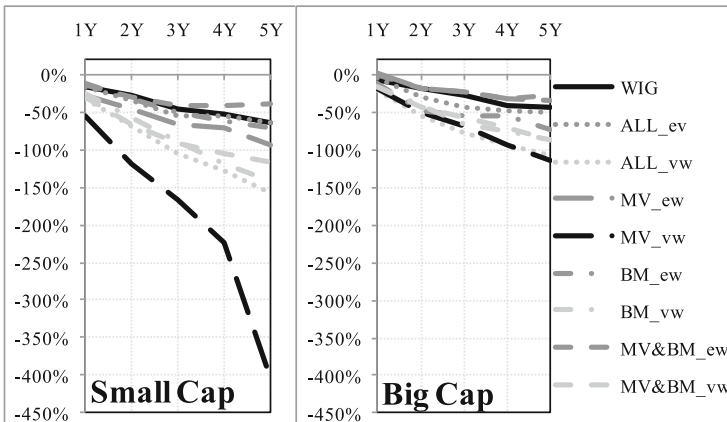


Fig. 2 Long-term IPO performance for small and big firms

5 Conclusion

This study is a part of the discussion on the existence of the IPO anomaly. It employed a wide set of benchmarks and methods in the process of abnormal performance analysis. The chapter focused on short- and long-term abnormal

performance for a sample of IPOs on the main market of the Warsaw Stock Exchange in Poland. The present study differs from previous studies in several aspects. First, it contributes to the literature by updating the results for the IPO anomaly for Poland. Abnormal performance was examined using a recent sample of IPOs, also covering the recent crisis years. The main sample covered the period from 1995 to 2008. The second sample period from 1995 to 2013 was used for detecting short-term underpricing.

The conclusions are also important in terms of enriching the discussion with the application of alternative reference portfolios. Here, size, book-to-market and two-dimensional benchmarks were introduced along with equal- and value-weighting. In most of the studies for emerging markets or smaller exchanges the abnormal returns were dominated by index-adjusting. As proved by other studies, such a general market comparison is not supposed to be an ideal benchmark in the IPO case.

The research also provides evidence of the 5-year abnormal performance of initial public offerings in Poland, whereas previous studies only examined 3-year returns.

The benchmarks used to check for the size and book-to-market ratio did not show big differences in short-term returns. Independently of the benchmark used, the initial adjusted returns on the first trading day were positive. Although there were some differences in return levels between results for alternative benchmarks, they were rather small.

The data on Polish IPOs during the period from 1995 to 2008 largely confirms that buy-and-hold abnormal returns for the third and fifth IPO anniversary in the case of investing on the IPO day and after the first quarter in the aftermarket were negative, independently of the benchmark used. The level of underperformance depended strongly on the method used to measure performance, but it did not influence the fact that the long-term returns were negative. However, an interesting finding was that the cumulative abnormal returns were positive for the third and the fifth IPO anniversary for some benchmarks.

Smaller IPO firms experienced more severe underperformance. However, the long-term performance of large companies was also not positive. Even checking for size and book-to-market characteristics by using different benchmarks, the underperformance still holds at quite substantial levels, for small as well as for large businesses. Such results suggest, at least for the Polish initial public offerings during the sample period of 1995–2008, that anomalous IPO returns cannot purely be a manifestation of more systematic return patterns in the capital market. However, we leave the question about the existence of the IPO anomaly open, as such negative and such long-lasting performance after equity offerings is still quite puzzling.

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