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Does it pay to invest in IPOs?
Evidence from the Warsaw Stock Exchange

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Abstract

In this paper we analyze IPO underpricing on the Warsaw Stock Exchange between 2003 and 2011. The average initial return was positive (14.2%), which is similar to the findings on other equity markets. Medium and long-run abnormal returns (1-month, 3-months and 1-year) on average are negative and they show great standard deviations. In general, the more time elapses from the offer day the lower the return from the IPO investment is. The abnormal initial return (AIR) was 2.9% which suggests that although in net terms IPO investments were profitable for investors the rate of return was quite small. Using leverage did not help much to boost returns. Not surprisingly the highest initial returns yielded IPOs of private domestic companies and (what is more striking) offers made by companies that migrated to the WSE from RPW CeTO market or NewConnect platform. This observation goes against information asymmetry theories of IPOs underpricing. Also the abnormal initial return was the highest in case of the latter companies. Four determinants of IPOs underpricing proved to be significant at 0.001 level including: Parkinson's Extreme Value, reduction rate, fad and turnover ratio. These variables explain over 34% of the IPOs initial returns.

JEL classification: G11, G12, G14, O16

Keywords: new equity offerings, IPOs, underpricing, investment strategies

I. Introduction

This paper provides evidence on the short- and long-run performance of investments in Initial Public Offerings (IPO) on the Polish stock market¹. The first objective of this study is to analyse IPO performance in the short- and long-run against a benchmark equity price index. The second objective is to find the main determinants of the IPO returns.

Most empirical studies demonstrate positive short-run returns for IPOs investments. In contrast, mixed results are found with respect to the long-run performance of IPOs. Although some studies provide evidence on positive market adjusted long-run IPO returns, insignificant or negative long-run returns are found in most research papers.

The short-run performance of IPOs significantly varies across markets. Ecbo (2005) presents statistics on average initial IPO returns in 1990-2003 for 19 European countries and for 16 countries in Latin America and the Asia-Pacific region. In Europe the highest average initial IPO returns were in Poland (over 60%) followed by Greece, Germany and Ireland (around 40%). In contrast, the lowest average initial returns were in Luxembourg (ca. 5%) and Denmark (less than 10%). In other regions the highest average initial IPO returns were in Malaysia (around 90%) followed by Thailand and Singapore (over 30%). The lowest average initial returns were in Latin American countries including Chile, Uruguay, Mexico and Brazil (less than 5%). An important conclusion that can be drawn from this data is that although the average initial returns vary significantly across markets, they are always positive. This observation is supported by other studies.

Al-Hassan et al (2007) analyse 47 IPOs on six markets in the Gulf region that went public between 2001 and 2006. They show that average initial return for these IPOs equaled 290%, which is one of the largest returns that can be found in the existing

¹ In this paper as IPOs we consider first offers and sales of equities by companies on the Warsaw Stock Exchange. For that reason in the IPOs are included offers and sales of equities of companies that migrated to the WSE market from the RPW – CeTO market and NewConnect platform.

literature². Moreover, they demonstrate that although in a one-year horizon IPO returns beat the market benchmark, they turn negative once the initial returns are excluded, which is consistent with findings in other markets.

Aggraval et al (2004) examine the relation between investor demand for shares offered in IPOs prior to the offerings and aftermarket performance of IPOs from 1993 to 1997 on the Hong Kong stock market. They find that IPOs with high investor demand have large positive initial returns but negative long-run excess returns. Consequently, IPOs with low investor demand have negative initial returns but positive long-run excess returns.

Aussenegg (2000) analyses the performance of initial public offerings on the Polish stock market between 1991 and 1999 for two sets of companies: private and public sector. He demonstrates that these IPOs were significantly underpriced, as the average initial return equaled 38.5%. Moreover, the IPOs of public sector companies yielded significantly higher returns than the private ones (65.6% and 25.3% on average respectively). The long-run performance of the private and public sector companies was not significantly different from each other. During the first three years of aftermarket trading they neither under- nor overperformed benchmarks.

Lyn and Zychowicz (2002) analyse performance of 103 IPOs carried on Polish and Hungarian markets between 1991 and 1998. They find that first-day market-adjusted average return in Poland equaled 15.1% while in Hungary it was 54.4%. Authors suggest that one of the possible explanations for this disproportion is different investors' structure on both markets. In Hungary in 1996 foreign investors controlled approximately 85% of market's free float while in Poland only 30%. They claim that the foreign investors likely possess the experience, expertise and resources that could reduce informational asymmetries, which should correspond to less underpricing. However, this explanation rather suggests that underpricing in Hungary should be lower than in Poland, taking into account almost three times

² Another example of extremely high IPO average initial returns (also 290%) is presented in study of Mok and Hui for the Chinese market.

higher participation of foreign investors on Hungarian market in comparison with the Polish one. Medium (1M, 3M and 6M) and long-run (1Y, 2Y and 3Y) abnormal returns (i.e. after correction for changes of BUX and WIG indices respectively) on both markets in most of the cases were strongly negative or stayed close to 0%. Authors find that primary determinant of initial returns on these markets was market momentum, i.e. the percentage change in the local market index one month prior to the offering day. An interesting finding is that size of the offer was not found significantly related to initial returns. This is in contrast with asymmetric information theories which claim that the larger the offer the lower the information asymmetry thus lower the level of underpricing. In contrast to Aussenegg they do not find any significant difference between the underpricing of privatization and non-privatization IPOs.

Sukacz (2005) studied 185 IPOs carried on the Polish market between 1991 and 2002. He finds that average underpricing during first-day of listing equaled 26%. IPOs' underpricing was positively related to number of days and change of the broad market index WIG between the last day of the subscription period to the first day of listing, and it was negatively related to such financial ratios as P/E and P/BV. In contrast to Aussenegg (2000) he claims that average initial return on IPOs of private companies was higher than on IPOs of privatized firms and equaled 27.4% and 25.5% respectively. Moreover, he finds that initial return on IPOs of smaller companies (i.e. listed on the WSE parallel market) was higher than of larger firms (i.e. listed on the WSE main market).

Rhee (2002) analyses 803 IPOs on the US stock market in 1999 and 2000, i.e. during the internet bubble. He finds that the average initial returns were 72% and 56% respectively. This is significantly higher than the average initial return for IPOs conducted on the US market between 1990 and 2001 which equaled 24.2%. 182 of these IPOs yielded initial returns of 100% or more. In addition, IPOs of firms with negative earnings prior to the offer yielded higher initial returns than those with

positive earnings (72.0% vs 43.5%)³.

The present paper adds value to the former studies by checking IPO performance on the Polish market between 2003 and 2011, which according to our knowledge has not been studied yet. Moreover, we calculate IPO performance taking into account transaction costs, alternative cost and taxes, which in most of the former studies are omitted. This makes our analysis close to real-life conditions. In addition, we use a new set of variables to verify the direction and strength of their influence on the IPO performance.

The remainder of this paper is organized as follows: Section II provides a background of the market situation on the Warsaw Stock Exchange between 2003 and 2011. Section III describes data selection and sample construction. Section IV explains the methodology applied for measuring IPOs initial and aftermarket abnormal returns and presents several key descriptive statistics. Section V analyses pay-offs from different IPO investment strategies. Section VI discusses determinants of Initial Returns and section VII presents and discusses the empirical findings. Section VIII contains a summary and concluding remarks.

³ More evidence on IPO performance can be found in: Mok and Hui (1998) for China, Husson and Jacquillat (1989) for France, Keloharju (1993) for Finland, Dawson (1987) for Malaysia, Saunders and Lim (1990) for Singapore, Brennan and Franks (1997) for the UK, and Ibbotson et al. (1988) for the US. All these studies show that average initial returns were positive.

II. Market conditions and the IPO market on the WSE between 2003 and 2011

Market conditions

In 2003-2011 on the Warsaw Stock Exchange (WSE) we could observe long-lasting bullish markets, periods of dramatic falls of equity prices and times of lateral trend. In general we can distinguish four well marked periods: 1) bullish market that lasted from January 2003 to July 2007, 2) sharp correction of equity prices in August 2007 that started 20-month bearish market that ended in February/March 2009, bullish period between March 2009 and August 2011 and correction of equity prices between September and December 2011 (Figure 1.).

From January 2003 to the beginning of July 2007 the stock prices were rising to reach their historical high levels. In four years the broad market index WIG rose over four-fold. Increases of equity prices contributed to high and rising interest of companies in obtaining capital via share issues on the stock market. In 2007 alone as many as 81 companies introduced their shares to trading on the WSE.

The correction that took place in July and August 2007, which was ignited by the news coming from the US subprime mortgage market, halted the IPO activity. In six weeks the broad market index WIG dropped by almost 18%. Market confidence was quickly restored and stock prices went up and in many cases surpassed the levels observed before the correction. At the end of October 2007 equity prices started to fall again beginning a long-lasting bearish market⁴.

At the beginning of March 2009 equity prices started to rise again, which was an onset of the bullish market that lasted until August 2011. During this period the WIG index raised by almost 100%.

After that in the first three weeks of September 2011 equity prices fell by 13%. What is important this correction was not a start of the bearish market. After this fall the WIG index stayed in a relatively narrow band.

⁴ More information on the phases of the last financial crisis and factors can be found in Konopczak M., Sieradzki R., Wiernicki M. (2010).

Figure 1. WIG index, 2003-2011

Remark: data was normalized to 100 points as of 31st of December 2002.

Source: www.bossa.pl

Equity issues – an important source of capital for Polish companies

The long-run bullish market and relatively low rates paid by banks for deposits⁵ in 2003-2011 encouraged investors to allocate capital in equities. From 2003 to 2007 the popularity of investing in IPOs was raising what can be proved by the bid reduction rates that we observed. The average reduction rate in IPOs (in individual investors' tranche)⁶ went up from nearly 60% in 2004 to almost 95% in the H1 2007⁷. The wide availability of capital kept costs of funding via share issues low, which made this form of financing very attractive in comparison with other forms, e.g. bank loans⁸. The relatively low cost of financing through share issues and no

⁵ In 2003-2011 the main refinancing operations rate of the National Bank of Poland stayed in the range between 3.5 and 6.5%. In many cases commercial banks offered smaller rates on households deposits.

⁶ In Poland, in the period under analysis shares in IPOs were usually offered in two tranches: for individual and institutional investors. The allocation of shares between these two groups of investors varied significantly. In the institutional investors' tranche, shares were usually allocated via book-building and without any reduction. In contrast, in the individual investors' tranche shares were offered via auctions and large reductions were observed. In this paper we analyse the IPO investment profitability only from the point of the individual investor.

⁷ In 2007 the average reduction rate in individual investors' tranche equaled 68%. The deteriorating situation on the stock market in the H2 2007 (falling prices and increasing volatility) lowered demand for shares offered in IPOs.

⁸ In the analysed period the average cost of raising capital via equity issues on the WSE was relatively stable and stayed in the range 4.0-5.0% of the offer value. For comparison the interest rates on bank loans with maturity 1-5 years granted to non-financial companies stayed in the range 4.0-10.0% annually.

difficulties in placing offers on the market were probably the most important factors that encouraged companies to offer shares⁹. Equity issues were becoming an increasingly important source of external financing for companies in Poland. Between 2003 and 2011 as many as 314 companies entered the WSE. This placed the WSE among the most active IPO markets in Europe. The total IPO value equaled PLN 75.6 billion, and the value of new equity issues in IPOs amounted to PLN 34.4 billion.

The large number of IPOs significantly contributed to the rise in the market capitalization. At the end of 2011 the market value of all companies listed on the WSE (domestic and foreign) equaled PLN 642.9 billion. Market capitalization of domestic companies equaled PLN 446.2 billion in comparison to PLN 110.6 billion at the end of 2002. For selected statistics of the WSE equity market please see Table 1.

Table 1. The WSE equity market selected statistics, 2003-2011

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of IPOs	6	36	35	38	81	33	13	34	38
IPOs value (in PLN million)	1,358	12,743	6,981	4,155	26,942	2,803	583	1,238	417
Value of new share issues (in PLN millions)	1,288	1,166	5,249	2,445	24,016	464	575	302	121
Average IPO value (in PLN millions)	226	354	199	109	333	85	45	36	11
Market capitalization of companies (in PLN billion), of which:									
- domestic companies	140.0	214.3	308.4	437.7	509.9	267.4	421.2	542.6	446.2

Source: the WSE.

⁹ Not only companies themselves, but also the firm owners profited from high equity prices, selling shares in IPOs. In 2003-2011 shares sold by shareholders constituted 18% of the total value of shares offered and sold in the IPOs.

III. Data Selection and Sample Construction

The data set includes 314 companies which conducted IPOs on the WSE between 2003 and 2011. The sample was divided using a criterion of type of the IPO: private domestic company, privatization, migration from other market, foreign company – new share issue, foreign dual-listed company.

During the period under analysis investors were very keen on buying shares of privatized companies¹⁰. One of the possible explanations is that they believed that shares of these firms were sold with a discount relative to public offers of shares by companies run by private owners. This might root from presumption that the Treasury's main goal was to carry out privatization and not necessarily to maximize proceeds from the offer, as it is in case of offers of privately run companies (see for example Aussenegg (2000)).

Private domestic companies prevailed among firms that entered the WSE between 2003 and 2011 (222 companies). There were 26 firms that migrated from the RPW CeTO or NewConnect market to the WSE¹¹. The number of offers carried by the Polish State Treasury (i.e. the number of companies privatized via the stock exchange) and by foreign companies was much smaller and equaled 19 and 31 IPOs respectively. In the sample there are 16 companies that dual-listed they shares on the WSE.

¹⁰ During the privatisations of Bank PKO BP in 2004 and the oil company Grupa Lotos, investors filed for a record value of bank loans for purchases of equities, i.e. PLN 16.7 billion and PLN and PLN 6.9 billion, respectively.

¹¹ RPW CeTO is an off-exchange regulated market. To read more, the official website is: <http://www.mts-ceto.pl> and www.bondspot.pl.

IV. Methodology and Basic Descriptive Statistics

A. Initial Return, Abnormal Initial Return and Aftermarket Abnormal Returns

1. Initial Return

An IPO's initial return is calculated by taking the difference between the issue price and the closing price on the first day of trading as follows:

$$IR_i = \frac{P_{i,t} - P_{i,0}}{P_{i,0}} \quad (1.)$$

where IR_i is the gross initial return for security i from the last day of the subscription period to the closing of the first day of trading, $P_{i,t}$ is the closing price of security i at the first day of trading, $P_{i,0}$ is the issue price of security i at the time of subscription¹².

The initial return gives us the first glimpse of the profitability of an IPO investment but it is not an accurate measure of investment profitability in real market conditions, as one must take into consideration several factors that may affect the rate of return. Firstly, in hot periods on the IPO market investors usually do not get all shares they have subscribed for, which is a widely known phenomenon called oversubscription. In this situation, they bear extra costs of “freezing” a part of their capital in the subscription. This problem augments when investors anticipate reduction and use bank loan (leverage) to get the number of shares they want. Leverage involves additional costs for investors, as banks (and brokerage houses) charge investors for granting the credit and interests for using it. Using leverage also means additional risk for investors. If the oversubscription is lower than they have predicted, they get more shares than they wanted. Lower oversubscription means poorer demand for a company's shares and is often associated with lower initial returns¹³. We suppose that instead of buying shares in an IPO an investor would otherwise buy a market portfolio which may be proxied by the broad market index,

¹² This approach is used (among others) by Al-Hassan et al. (2007).

¹³ See Aggraval and Liu (2004).

in our case the WIG index. Secondly, every transaction generates costs for investors, such as brokerage commissions which negatively affect initial returns. Thirdly, we must take into consideration taxes, which also negatively affect initial returns of IPOs. In Poland, the capital gains tax rate was introduced on 01.01.2004 and equaled 19%. For the sake of simplicity we assume that investors pay capital gains taxes on every transaction that yields positive returns. Consequently, there is no possibility to deduct suffered losses in the following transactions.

2. Abnormal Initial Return

To calculate a return for an investor who buys shares in an IPO and sells them on the first day of trading at the close price (the Abnormal Initial Return – AIR) we must adjust Formula 1. as follows¹⁴:

$$AIR = \left[\frac{P_{i,t} - P_{i,0}}{P_{i,0}} - \frac{TC}{P_{avg}} \right]_{+,0.81} - \left[\frac{WIG_{i,t} - WIG_{i,0}}{WIG_{i,0}} - \frac{TC}{WIG_{avg}} \right]_{+,0.81} \quad (2.)$$

where WIG is the average daily WIG index growth in the period d . TC is the transaction cost for each security of company i . In our case we assume that the transaction cost for each IPO equaled 0.8% (0.4% for buying and 0.4% for selling equities) which was the most common fee that brokerage houses charged individual clients for buying and selling equities. P_{avg} is the average transaction price of IPO shares and WIG_{avg} is the average price for buying and selling market portfolio. 0.81 is a factor that reflects capital gains tax rate.

3. Aftermarket Abnormal Return

In literature there are several methods to calculate the aftermarket performance of IPOs, and there is no consensus which one yields better results¹⁵. In this paper we assume that an investor follows the *buy and hold* strategy, i.e. buys shares offered in

¹⁴ Similar approach is used by Al Hassan et al. Our equations differ only in one aspect. Al Hassan et al. use the average risk-free rate which is proxied by the one-month bank customer deposit rates to reflect the alternative cost of the IPO investment. We believe that a better alternative for IPO investment is other equity investment, namely investing in the market portfolio. Therefore we use WIG index change as a proxy for alternative cost.

¹⁵ See for example: Barber and Lyon, 1997; Kothari and Warner, 1997; Brav and Gompers, 1997; and Lyon, Barber and Tsai, 1999.

an IPO and holds them until the selling day. We analyse IPO aftermarket performance in three different horizons, i.e. one, three and twelve months. We assume that each month has 30 days and the year has 365 days. By calculating abnormal return we are interested if an IPO investment yields higher or lower return than the benchmark portfolio. For the sake of simplicity we do not take into consideration transaction costs and taxes as they would influence both investments (in IPO shares and market portfolio) in the same way and by the same strength. To calculate *Aftermarket Abnormal Return* (AAR) we use the following formula:

$$AAR_{i,t} = \frac{P_{i,t} - P_{i,1}}{P_{i,1}} - \frac{WIG_{i,t} - WIG_{i,1}}{WIG_{i,1}} \quad (3.)$$

where $AAR_{i,t}$ is the buy and hold abnormal return for security i in the period t (which in our case is a) 1 month, b) 3 months or c) 12 months), $P_{i,t}$ is the security i price in the period t , $P_{i,1}$ is the closing price on the first trading day, $WIG_{i,t}$ is the WIG index level in the period t and $WIG_{i,1}$ is the WIG index level at the end of the first day of trading of security i .

Average AAR greater than zero indicates that, on average, investment in IPOs outperformed the market, which means that an investor would be better off investing in shares of companies that were introduced to trading on the stock exchange than investing in the market portfolio. On the contrary if average AAR is smaller than zero investor would achieve greater return while investing in the market portfolio instead of buying IPO shares. This approach will give us an answer whether it is better to sell share on the IPO day or sell them one month, three months or one year after the IPO day.

B. Summary of Results – Basic Descriptive Statistics

1. Initial returns

Between 2003 and 2011 the average initial return equaled 14.2% and the median was 5.0%. Although on average IPOs investments were profitable the number of

IPOs with negative initial returns is quite high (83 or 26% of all offers). In general the negative initial returns stayed in the relatively narrow range, i.e. from -10% to 0%. In contrast 50 IPOs (almost 16% of the total number of offers) yielded over 25%. Detailed figures are presented in Table 2. and Figure 2. The kurtosis of initial returns distribution is positive which means that observations are closer to the mean than in normal distribution. At the same time the skewness is also positive which means that there were IPOs with returns significantly departing from the average (long right tails). We must point out that the aforementioned descriptive statistics are significantly affected by two offers which yielded 395.5% and 481.3% (Figure 2.).

Table 2. Basic descriptive statistics of Initial Return, Abnormal Initial Return and Aftermarket Abnormal Returns, 2003-2011

	Initial Return	AIR	1M AAR	3M AAR	1Y AAR
Average	14.2	2.9	-1.1	-1.0	-4.2
Median	5.0	0.6	-1.8	-2.5	-11.8
Minimum	-75.2	-76.5	-21.7	-32.8	-85.1
Maximum	481.3	317.1	26.2	36.1	57.6
Standard deviation	44.2	23.4	7.5	12.8	37.1
Skewness	6.7	9.5	0.7	0.3	0.1
Curtosis	60.0	120.5	0.8	-0.4	-1.3
Number of IPOs with negative initial returns	83	139	199	182	153
Number of IPOs with positive initial returns, of which:	207	174	114	131	127
- IPOs with initial returns over 25%	50	8	1	5	80
Number of IPOs with initial returns equal to 0%	21	0	0	0	0

Source: own calculations.

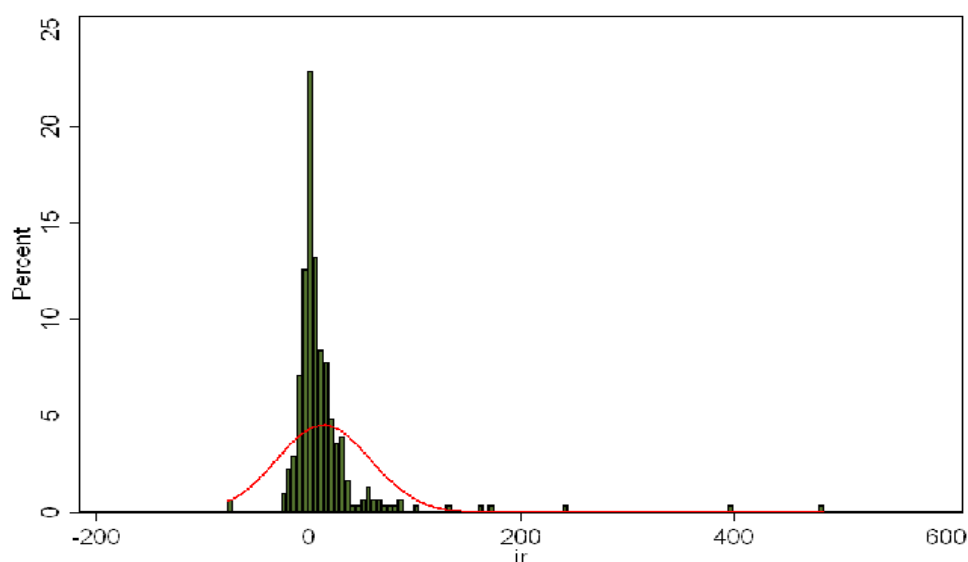
At first glimpse IPO investments on the WSE seem to be very profitable. As we calculated the average initial return between 2003 and 2011 was 14.2%. Nevertheless, in real life investors would realize lower return as both calculations do not take into account some important factors that negatively affect IPO returns, namely capital gain taxes, transaction costs (i.e. brokerage commissions for buying and selling shares) and oversubscription (i.e. reductions). These factors are generally

overlooked in literature. One of the possible explanations is that IPO underpricing is in most of the cases is analyzed from the point of view of the whole market and not individual investors. The first two factors are intuitive and do not require any exhaustive explanation. In Poland, the capital gain tax was introduced on 01.01.2004 and equaled 19%. The third factor not only has the largest impact on investors' net returns but it also increases investment risk. If investors do not take into account reductions while subscribing for shares, they will get lower allocation than they wanted. In consequence, their net returns will be lower as only part of the capital will be invested in IPO shares and only this capital will generate returns from underpricing. The rest of funds will be "frozen" for many days until the subscription is finished. Investors who expect reduction may lever themselves (i.e. take bank loan) for buying IPO shares and get the allocation they want. But taking such a loan generates additional risk. Let's suppose that an investor assumed that the reduction rate would be 90% and he takes a bank loan to subscribe for ten times more shares than he actually wants to buy. If his assumption is correct he will buy exactly the number of shares that he wanted. If the reduction rate is higher than he predicted he will be allocated less shares than he wanted, and symmetrically if the reduction rate is lower than he has predicted he will be allocated more shares than he wanted. The last possibility is the worst possible for the investor as lower reduction rates mean lower demand for IPO shares and is often associated with lower initial returns. When initial returns are negative and the reduction rate is lower than he expected it means huge losses. We must underline that it is very hard to measure uncertainty associated with reduction rates and in practice investors must rather rely on their intuition than on models and equations.

Although from the point of view of investors the positive average initial return is vital it means that companies which carried public offers to gather funds and company owners that wanted to exit investments via IPO, collected less capital than it was theoretically possible. In literature this effect is known as *money left on the*

table¹⁶. Between 2003 and 2011 the total value of IPOs on the WSE equaled PLN 75.6 billion and this number would go to PLN 84.2 billion if the underpricing equaled zero. This indicates that PLN 8.6 billion was left on the table, i.e. 11.4% of the IPO value¹⁷. This, to some extent, may be considered as inefficiency of the IPO market with respect to financing companies. Although on average firms offering shares in IPOs gathered less capital than they theoretically should there were IPOs with negative initial returns which means exactly the opposite. It is worth mentioning that in practice it is extremely hard to set IPO price to satisfy three groups of stakeholders, i.e. company owners and investors.

Figure 2. Distribution of Initial Returns, 2003-2011



Source: own calculations.

3. Abnormal Initial Return

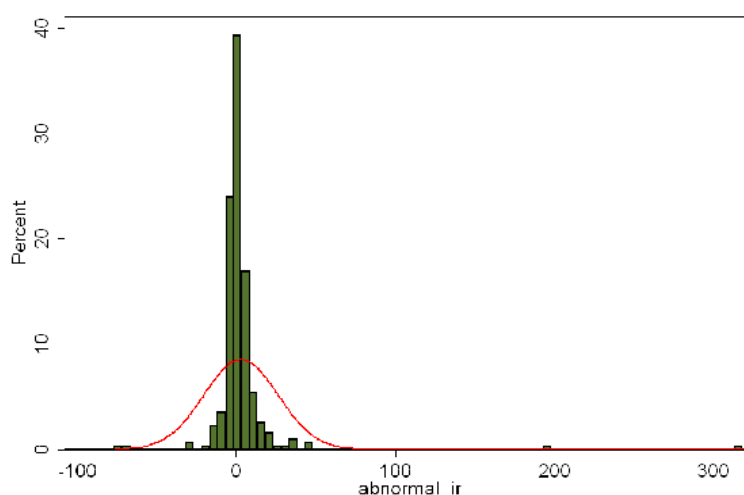
The average AIR in 2003-2011 equaled 2.9% and was by 11.3 pp lower than the initial return. This means that IPO investments were profitable on net basis, i.e. after

¹⁶ For definition please see e.g. Ritter, J.R. (2006).

¹⁷ The value of money left on the table presented in percents (11.4%) was lower than initial return (14.2%) because in general smaller offers showed higher degree of underpricing than large offers. Moreover, there were IPOs with negative initial returns. The percentage value of money left on the table may be considered as average initial return weighted by the IPO value.

adjustments for reduction rate, alternative cost (market portfolio return), transaction costs and taxes. What is interesting the number of offers with positive returns significantly fell down and the number of offers with high returns (over 25%) also significantly decreased. The AIRs cluster more around the mean than it is observed in case of initial returns (higher curtosis) but there are some observations that significantly depart from the average (high positive skewness), which is observed as a long right tail. What affects most this results is the *RED* parameter. The general conclusion that can be drawn is that offers with high reductions rates had a high underpricing. Detailed figures for AIRs are presented in Table 2. and Figure 3.

Figure 3. Distribution of Abnormal Initial Returns, 2003-2011



Source: own calculations.

Table 3. presents the IR and AIR by type of IPOs. The highest IR was in case of private domestic companies and companies that migrated to the WSE from RPW CeTO or NewConnect markets. As the place of the first group of companies is quite intuitive high average initial return in case of the migrating companies is very surprising as it goes against information asymmetry theories of underpricing. What is more the lowest IR yielded offers of foreign companies that carried new issues and in their case the IR was lower than that of foreign companies that dual-listed their shares on the WSE. This also does not support the information asymmetry theories. The average IR of the privatized companies was in the middle of the ranking.

Looking at the AIR we can see a totally different picture. By far the highest return had companies that migrated to the WSE from two other markets. The lowest AIR was in case of privatized companies. What is more the return on investment in foreign companies that *dual-listed* their shares on the WSE was higher than of the foreign companies that carried new share issues.

The differences in IR and AIR are mostly influenced by reduction rates. Although IPOs of private domestic companies had the highest IR they were influenced most by the reductions and thus offered relatively small AIR.

Table 3. Initial returns by types of IPO, 2003-2011

	Initial Return	AIR
Private domestic company	16.3%	2.1%
Privatization	9.9%	1.6%
RPW-CeTO/New Connect migration	15.4%	9.6%
Foreign company – new issue	4.9%	2.5%
Foreign company – <i>dual-listing</i>	5.7%	4.4%

Source: own calculations.

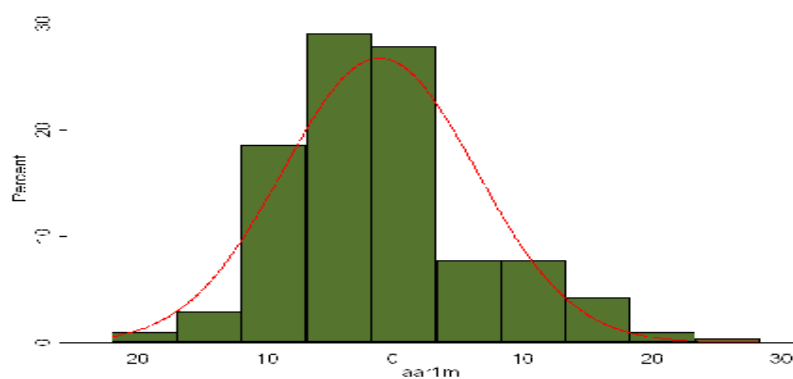
4. Aftermarket Abnormal Returns

As it can be seen from the Table 2. IPO returns turn negative in one month, three months and one year period. Holding shares one and three months after the IPO day results in -1.1 and -1.0% returns respectively. What is more holding shares one year results in even more negative return -4.2%. Looking at the median AAR we can draw a conclusion that the best strategy for an investor who buys shares in an IPO is to sell them on the IPO day. Only in this case (on average) he realizes profit on the transaction. After that day the longer he holds the shares the higher losses he incurs.

In comparison with IR and AIR the distribution of the 1M and 3M is much closer the bell curve (see Figures 4., 5. and 6.). The distribution of the 1Y AAR is quite striking as very few observations are close to the mean. One of the possible explanations is that during the first year after the IPO investors verify the “quality”

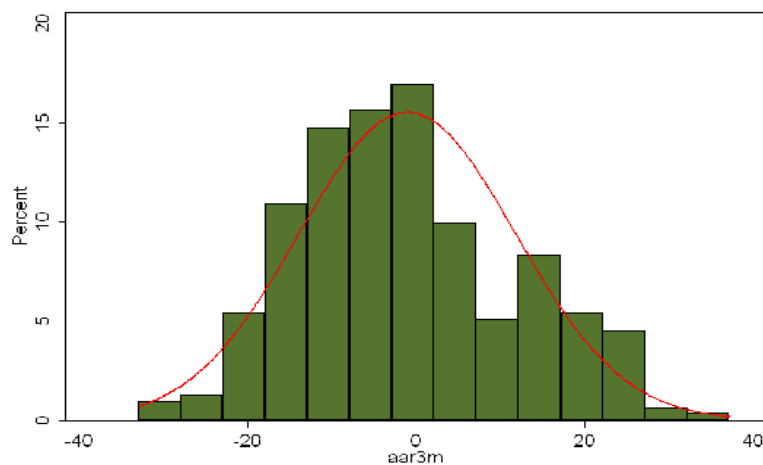
of their investment, i.e. the ability of the company to generate profits and value for the shareholders. The outcome of their assessment is bimodal (bad vs good companies). Selling shares of “bad” companies would result in lowering of their share prices and conversely buying shares of “good” companies would be pushing the share prices up. This effect is not described in the literature and thus it needs further investigation.

Figure 4. Distribution of 1M Aftermarket Abnormal Returns, 2003-2011



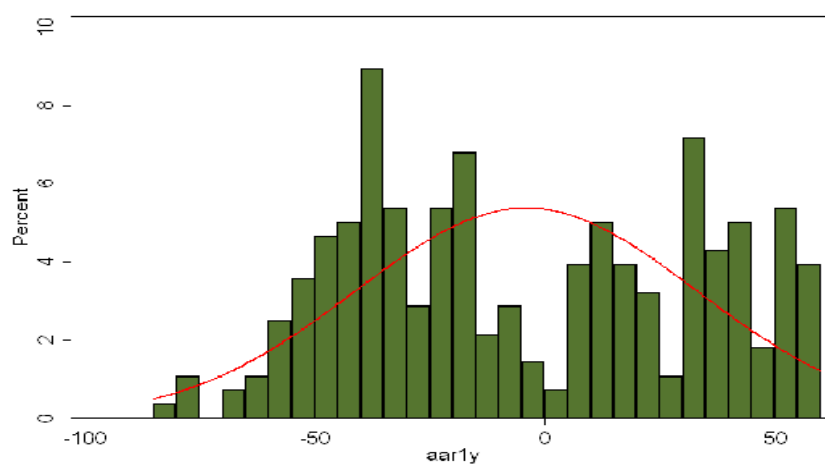
Source: own calculations.

Figure 5. Distribution of 3M Aftermarket Abnormal Returns, 2003-2011



Source: own calculations.

Figure 6. Distribution of 1Y Aftermarket Abnormal Returns, 2003-2011



Source: own calculations.

V. Investment strategies

We assume that investors buy shares on the last day of the subscription period and sell them on the first day of listing at the close price. This assumption is the same as used in calculation of initial return.

Taking into account the aforementioned factors which affect IPO net returns in this paper we will consider two investment strategies which only differ in the use of leverage. The first strategy assumes that investors subscribe for IPO shares using only their own funds (Strategy I). The second one assumes that investors when subscribing for shares expect oversubscription and use leverage to get the number of shares equal to the value of their own funds (Strategy II). This means that if the expected reduction rate is higher investors will lever themselves more. We assume that expected reduction rate equals the average realized reduction rate in a given sub-period of 2003-2011 rounded to a whole 5%. The sample is divided into four sub-periods as follows: 1) January 2003 to July 2007, 2) August 2007-February 2009, 3) March 2009-August 2011 and 4) September-December 2011. The average reduction rates were: 75%, 20%, 45% and 0% respectively.

Using leverage involves additional cost for investors. Based on the empirical data we assume that in every IPO investors were charged a fixed fee for being granted a loan and they were charged 15% annually for using the loans.

In both strategies we adjust results for transaction costs (for buying and selling shares) which equaled 0.8% (i.e. 0.4% for buying and 0.4% for selling shares) and capital gain taxes.

This approach allows us to get the real net return for investors from IPO investments.

The results of both strategies can be seen in the Table 3.

Table 4. Basic descriptive statistics for returns of investment strategies, 2003-2011

	Strategy I	Strategy II
Average	2.9%	3.8%
Median	0.6%	-3.6%
Minimum	-75.8%	-99.9%
Maximum	317.8%	1266.2%
Standard deviation	23.7%	76.8%
Skewness	9.3	14.7
Curtosis	117.6	241.2
The number of IPOs with negative return	86	202
The number of IPOs with positive return of which:	209	103
- IPOs with return over 25%	9	18
The number of IPOs with return equal 0	10	0

Source: own calculations.

As we can see from the Table 4. the picture is mixed. On one hand investors were better off choosing the Strategy II but using leverage would boost rate of return only by a mere 0.9 pp. On the other hand the median was negative which drives us to the conclusion that over half of the returns in Strategy II was negative.

What is more if we look on the standard deviations we can see that Strategy II was far much more risky than Strategy I. This is confirmed by the distance between minimum and maximum returns obtained in both strategies.

VI. Determinants of Initial Returns

In literature one may find many theories attempting to explain IPO underpricing on the equity markets. They may be grouped in four broad categories¹⁸: asymmetric information, institutional, ownership and control and behavioral. Asymmetric information models assume that among the parties involved in a deal, i.e. the issuing firm, the broker advising in a deal and the new investors, one or two of them know more than the others. In consequence, this results in information frictions that cause underpricing. Institutional theories focus on features of the market: possible litigation issues, the price stabilizing activities of brokers once trading starts and taxes. Ownership and control theories claim that underpricing helps shape the shareholder base so as to reduce intervention by outside shareholders once the company is public. Behavioral theories can be divided in two groups. The first one assumes the presence of “irrational” investors who bid up the price of IPO shares beyond the true value. The second one claims that a company that carries the IPO does not put enough pressure on the advising broker to set the issue price relatively higher. The broker wants to maximize the success of the IPO and low issue price raises the probability of the success.

In this study we will check how two of the aforementioned theories explain IPO underpricing on the WSE¹⁹. We will verify the possible impact on the initial return of the asymmetric information and behavioral factors.

Proxies:

a) *Ex-ante uncertainty (PEV, positive)*: One of the possible explanations for IPO underpricing is that issuers anticipate investors' ex-ante uncertainty regarding the future performance of IPOs. Investors are less informed about a company's growth potential than its managers, and the company's managers (and broker) know less about the aggregate demand for shares than the whole market. Thus, two types of

¹⁸ Ljungqvist (2006).

¹⁹ In this study we do not include institutional factors because for most of the offers they were the same, e.g. litigation procedures did not change during analysed period.

information asymmetry between insiders and outsiders exist. Therefore, underpricing is required to attract investors to buy offered shares. The greater the uncertainty, the greater the underpricing needed to attract investors. Companies try to minimize the information asymmetry by organizing road shows, during which company managers (and offering brokers) can learn about potential demand for company's shares among investors and investors can learn about the company itself. This, from two sides, may reduce the information asymmetry. Another measure which is aimed at reducing company uncertainty about potential demand for its shares is to slice the tranche of offered shares into two pieces and offer as many shares as possible to institutional investors. In contrast to the individual investors' tranche, in the institutional investors' tranche generally we do not observe pronounced oversubscription²⁰. This is due to different methods of offering shares to these two groups of investors. Brokers contact large investors to assess potential demand for offered shares²¹. Afterward these investors are allocated the exact number of shares they want. This is a win-win situation for the offering company and large investors as the company has assured the demand for its shares and institutional investors do not unnecessarily freeze capital in the subscription phase. By contrast, individual investors subscribe for shares declaring the number and the maximum price they are willing to pay for them. They are not sure what allocation they will get, and it is conversely related to the aggregate demand for these shares.

In several studies age of the firm has been used as a risk proxy, as one might expect that well established firms are less risky than start-ups. Also reputation of underwriters may serve as a proxy for ex-ante risk (e.g. Carter and Manaster, 1990, Booth and Booth, 2003). This is based on the assumption that high reputation underwriters process more complete information than investors and they normally underwrite securities of low risk firms to avoid losing reputational capital. Ritter (1984) as a proxy for the ex-ante uncertainty uses standard deviation of daily returns

²⁰ Only in 23 cases in our sample of 314 IPOs we observed oversubscription in institutional investor's tranche.

²¹ Gondat-Larralde and James (forthcoming).

of each individual IPO 25 days following its official listing. Knopf and Teall (1999) argue that Parkinson's Extreme Value (PEV) calculated for the first trading day is a superior estimate for ex-ante uncertainty. PEV measures the volatility of the security return during the first day of trading, and is calculated as follows:

$$PEV = \ln_{i,0} \frac{P_{i,0} \max}{P_{i,0} \min} \quad (4.)$$

where, $P_{i,0} \max$ is the maximum price for security i during the first trading day and $P_{i,0} \min$ is the minimum price for price for security i during the first trading day. In this study we will use PEV as a proxy for ex-ante risk.

b) *Oversubscription (RED, positive)*: Oversubscription may indicate the potential demand for offered shares from part of the investors. Higher oversubscription means higher demand. Investors who were allocated fewer shares than they had subscribed for may create additional demand during the first trading day, which may drive prices up. Therefore, the higher the oversubscription, the higher the underpricing is. Some empirical studies have confirmed this positive relation (Rock (1986), Paudyal et al (1998)). Oversubscription is measured as a relation of an IPO's demand for shares to their supply.

c) *Inverse IPO value (INV, positive)*: This variable is used as a proxy for risk of the issue. Large IPOs are considered to be less risky than small IPOs and hence command lower level of underpricing. Another proxy for risk of the issue may be natural logarithm of IPO value.

d) *Market volatility (MVOL, positive)*: Issuers may try to minimize the failure of the offer and thus while the market is volatile, they will lower share prices. In turn a positive relation between market volatility and the level of underpricing is expected. This relation was described by Menyah et al (1995) in the United Kingdom and by Paudyal et al (1998) in Malaysia. These authors as a proxy for market volatility use the standard deviation of daily market returns over a two-month period prior to the last day of the subscription period. In this study we will use similar approach but we

shorten the period to one month as this measure is widely used by investors on the Polish market.

e) *Type of industry (FAD, positive)*: It is well known that from time to time some economy sectors are perceived by investors to be more interesting investment goals than other sectors. In IPO underpricing theory these sectors are known as “fad industries” or “fads”²². We may mention the dotcom bubble at the turn of the century, when internet and IT firms were among the favorite investments goals. In Poland, during the part of the period under analysis construction companies (including developers) were subject of such interest. Moreover, financial and IT firms also draw extra attention from investors. We should underline that investors' perception of fad industries changes over time. Companies operating in fad industries would tend to have greater initial returns than companies operating in “ordinary industries”. This factor is controlled by introducing a dummy variable for companies operating in such industries. Nevertheless, one should take into account that the fad industry effect may be included in the *oversubscription* variable.

f) *Proportion of shares offered (PSO, negative)*: In some cases companies phase their share offering in two or more stages. During the first stage (IPO) they offer a small number of shares, which they sell at substantially low prices. This is aimed to build up a positive opinion about the company among investors. After this “signaling” is finished, it is expected that the firm could reach its capital targets at better prices. That is why a negative correlation between the proportion of shares offered and the level of underpricing is expected. The proportion of shares offered is measured as the number of shares offered to the outstanding number of company's shares before IPO.

g) *Number of shares sold by the company owners to the total number of shares offered in the IPO (OWN, negative)*. A high ratio may suggest that company owners

²² For *fads* on the IPO market see for example Aggraval, R., Rivoli, P. (1990).

do not believe in the long-run potential of the firm and thus they sell its shares.

h) Turnover ratio (TRN , positive): the number of shares traded during the first trading day to the total number of shares sold in the IPO. A high ratio may indicate large speculative demand for IPO shares. On one hand investors buying these shares in IPOs were concerned only about short-run performance of the offers and were keen on selling shares during the first trading day. On the other hand long-run investors (especially during the hot IPO market) who wanted to buy shares in IPOs and did not get the number of shares they wanted (e.g. because of higher than expected reduction rate) were buying them on the first trading day. Relation between turnover ratio and initial return is expected to be positive as higher speculative demand should push equity prices up.

g) Market sentiment (SEN , positive): we must add that in literature one may find that one of the factors affecting the level of underpricing is market sentiment. During bullish periods the number of successful IPOs (i.e. with high initial return) will be higher than during bearish times, as investors tend to be overoptimistic about future IPO performance when overall market conditions are favorable. How et al. (1995) demonstrate that on the Australian IPO market the level of underpricing during bull periods is high and during bear periods is low. Thus, the relation between bullish periods and IPO underpricing is positive. In our analysis market sentiment is taken into consideration by introducing a dummy variable.

The quantitative relationship between these variables and the IPO initial return is set by the equation:

$$IR = \hat{a}_0 + \hat{a}_1 PEV_i + \hat{a}_2 RED_i + \hat{a}_3 FAD_i + \hat{a}_4 TRN_i + \hat{a}_5 INV_i + \hat{a}_6 MVOL_i + \hat{a}_7 PSO_i + \hat{a}_8 OWN_i + \hat{a}_9 SEN_i \quad (5.)$$

where IR is the Initial Return which is the measure of the level of underpricing; $\hat{a}_1 PEV_i$ is the Parkinson's Extreme Value, which refers to the level of ex-ante uncertainty; $\hat{a}_2 RED_i$ is the reduction rate, which measures the oversubscription level for shares of the company i ; $\hat{a}_3 FAD_i$ is a proxy for the company sector (fad, no

\hat{a}_4 TRN is the ratio of the shares traded on the first day of listing to the total number of shares offered; \hat{a}_5 INV measures IPO inverted value; \hat{a}_6 $MVOL_i$ measures market volatility; \hat{a}_7 PSO_i measures proportion of shares offered to the total number of shares outstanding; \hat{a}_8 OWN_i measures the ratio of the shares offered by the company owners to the total number of the shares offered in the IPO; and \hat{a}_9 SEN_i is the market sentiment during the offering period.

VII. Empirical Results

The estimation of our model shows that the only four proxies are significant at the 0.001 level. These were *PEV*, *RED*, *FAD* and *TRN*. The model looks as follows:

$$IR = -17.1 + 94.28PEV + 0.23RED + 26.4FAD - 0.2TRN \quad (6.)$$

The R-squared of the model is 0.3465 and the adjusted R-squared equals 0.3358.

This means that just four variables explain one third of the IPO underpricing²³.

Detailed statistics of the regression are presented in the Table 5.

Table 5. Regression results

IR	Coef	Std. Err.	t	P> t	[95% Conf. Interval]
CONS	-17.087	4.448	-3.84	0.000	-25.848 ; -8.327
PEV	94.283	16.704	5.64	0.000	61.380 ; 127.180
RED	0.227	0.058	3.90	0.000	0.112 ; 0.342
FAD	26.426	5.406	4.89	0.000	15.780 ; 37.070
TRN	-0.018	0.004	-4.97	0.000	-0.025 ; -0.011

Source: own calculations.

The most significant variable is *PEV* which is the proxy of the information asymmetry. Moreover, *RED* and *FAD* proved to be important while explaining IPO underpricing. Both of these variables are proxies for behavioral factors. It suggests the existence of irrational investors on the Polish market who bid up the prices of shares offered in IPOs beyond their fair value and/or it suggests that companies did not put enough pressure on the offering brokers to set higher issue prices. Bearing in mind that aftermarket abnormal returns are smaller and smaller as the time passes by we can draw a conclusion that the first theory (the existence of irrational investors) is more probable.

What may be striking is that there is no significant relationship between the initial return and the size of the offer (*INV*). This suggests that in terms of information

²³ For example Lyn and Zychowicz that analyse Polish and Hungarian IPO market report for the Polish market adjusted R-squared that equals 0.20 and their model that includes six variables. Al-Hassan et al for their model report R-squared 0.4385 and adjusted R-squared 0.3203 for their model that includes seven variables.

asymmetry IPOs of large companies do not reveal more information than offers of small companies. In other words we find no evidence to support the contention that asymmetric information is smaller, and therefore underpricing should be smaller for bigger offerings. This finding is consistent with the results obtained by Lyn and Zychowicz that analysed the IPO market in Hungary in Poland between 1991-1998. The data shows that also the structure of the offer (*PSO* and *OWN*) is not significant. This suggests that investors are indifferent if the company increases capital or company owners exit their investment via public selling of shares. Another interesting finding is that market conditions at the time of the IPO (*MVOL*, *SEN*) are not significant either. This in part may result from the fact that if the market is volatile companies either postpone their IPOs.

To sum up, the regression results support our theory that both information asymmetry and behavioral factors explain part of the IPO underpricing in Poland.

VIII. Summary and Concluding Remarks

The major objective of this paper is to provide documentation of the initial return and aftermarket behavior of new equity offerings in Poland between 2003 and 2011. The initial return was 14.2% over the study period. In the analyzed period the strongest determinant of underpricing in Poland was the information asymmetry proxied by the Parkinson's Extreme Value. The second important determinant of IPO initial returns is the size of a speculative demand for the IPO shares proxied by TRN. Moreover, investors' sentiment towards certain economy sectors significantly contributes to explaining the magnitude of the IPO underpricing. Reduction rate in the individual investors' tranche is also an important determinant of underpricing.

The size of the offerings was not found significantly related to initial returns. This means that large offers do not reveal more information than small IPOs. It may be considered as a positive conclusion because it proves that the requirements put on issuers to reveal important information to investors are well executed in Poland. What may be striking market volatility is not significant proxy for IPO underpricing. In general during volatile market conditions companies rather postpone their IPOs than offer shares to investors with huge discounts. Structure of the offers is also an insignificant factor of underpricing. It shows that investors do not care what proportion of shares companies offer and if company owners sell their shares or not. Market sentiment was not significant either as a factor influencing the IPO underpricing. It may root form the fact that during bull markets investors are keen on buying IPO shares which contributes to their underpricing and during bear periods companies lower issue prices to attract investor. For this reason underpricing during the bull periods can be considered to be demand driven and during the bear periods it can be treated as supply driven. Nevertheless, this needs further investigation.

IX. References

Al-Hassan, A., Delgado, F., Omran, M., IPO Behavior in GCC Countries: Goody-Two Shoes or Bad-to-the-Bone?, International Monetary Fund, WP/07/149, Washington, 2007.

Aggraval, R., Liu, Ch., Rhee S.G., Investor Demand for IPOs and Aftermarket Performance: Evidence from the Hong Kong Stock Market, 2004.

Aggraval, R., Rivoli, P., *Fads in the initial public offering market?*, Financial Management, 19, 1990, p. 45-57.

Aggarwal, R., Kunz, R., *Why initial public offerings are underpriced: evidence from Switzerland*, Journal of Banking & Finance, Vol. 18 No.6, p.705-723, 1994.

Allen, F., Faulhaber, G.R., *Signaling by underpricing in the IPO market*, Journal of Financial Economics, Vol. 23 p.303-323, 1989.

Alvarez, S., Gonzalez, V.M., *Signaling and the long-run performance of Spanish initial public offerings (IPOs)*, Journal of Business, Finance and Accounting, Vol. 32 No.1/2, pp.325-350, 2005.

Aussenegg, W., 2000, *Privatization Versus Private Sector: Initial Public Offerings in Poland*, Multinational Finance Journal, 4 (1-2), 69-99.

Barber, B., Lyon, J., 1997, *Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics*, Journal of Financial Economics, 43 (3), 341-372.

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

Booth, J.R., Booth, L., *Agreeing to Disagree: Why IPOs are Underpriced?*, mimeo, July 2003.

Brav, A., Gompers, P., *Myth or reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture Capital and Non-VentureCapital Backed Companies*, Journal of Finance, 52 (5), 1791-1822, 1997

Brav, A., Geczy, C., Gompers, P., *Is the abnormal return following equity issuance anomalous?*, Journal of Financial Economics, Vol. 56 No.2, pp.206-49, 2000.

Carter, R.B., Manaster, S., *Initial Public Offerings and Underwriter Reputation*, Journal of Finance, Vol. 45 pp.1045-1067, 1990.

Carter, R.B., Dark, F.H., Singh, A.K., *Underwriter reputation, initial returns and the long-run performance of IPO stocks*, Journal of Finance, Vol. 53 p. 285-311, 1998.

Chen, C., Mohan, N., *Underwriter spread, underwriter reputation and IPO*

- underpricing: a simultaneous equation analysis*, Journal of Business, Finance and Accounting, Vol. 29 pp.521-40, 2002.
- Chen, G., Firth, M., Krishnan, G.V., *Earnings forecast errors in IPO prospectuses and their associations with initial stock returns*, Journal of Multinational Financial Management, Vol. 11 No.4, p. 225-40, 2001.
- Chien-Hsun, C., Shih Hui-Tzu, S., *Initial Public Offering and Corporate Governance in China's Transitional Economy*, NBER Working Paper No. W9574, March 2003
- Clarkson, P.M., *The underpricing of initial public offerings, ex ante uncertainty and proxy selection*, Accounting and Finance, Vol. 34 No.2, p. 67-78, 1994.
- Demers, E., Lewellan, K., *The marketing role of IPOs: evidence from internet stocks*, Journal of Financial Economics, Vol. 68 p. 413-437, 2003.
- Eckbo, B. E., *Initial Underpricing of IPOs*, mimeo, 2005.
- Eckbo, B.E., Norli, O., *Liquidity Risk, Leverage and Long-Run IPO Returns*, Journal of Corporate Finance, 11, 1-35, 2005.
- Fama, E.F., *Agency problem and the theory of the firm*, Journal of Political Economy, Vol. 88 No.2, p. 288-308, 1980.
- Gondat-Larralde, C., James K., R., *IPO Pricing and Share Allocation: The Importance of Being Ignorant*, Journal of Finance - forthcoming
- Gongmeng, C., Firth, M., Kim, J.B., *IPO underpricing in China's new stock markets*, Journal of Multinational Financial Management, Vol. 14 No.2, p. 283-302, 2004.
- Hovey, M., Li, L., *Does IPO Underpricing in China Explain a Firm's Long-Term Performance? An Empirical Study of IPOs in China with Corporate Governance Perspectives*, January 2009.
- How, J., Izan, H., and Monroe, G., *Differential Information and the Underpricing of Initial Public Offerings: Australian Evidence*, Accounting and Finance, 35 (1), 87–106, 1995.
- Hughes, P., Thakor, A., *Litigation risk, intermediation and underpricing of initial public offerings*, Review of Financial Studies, Vol. 5 p. 709-742, 1992.
- Ibbotson, R., *Price performance of common stock new issues*, Journal of Financial Economics, Vol. 2 No.3, p. 235-72, 1975.
- Ibbotson, R. G., Jaffe J. F. , *Hot issues markets*, Journal of Finance 30, 1975.
- Ibbotson, R., Sindelar, J., Ritter, J., *Initial Public Offerings*, Journal of Applied Corporate Finance, vol. 1, p. 37-45, 1988.
- Knopf, J.D. and Teall, J.L., *The IPO Effect and Measurement of Risk*, Journal of

Financial and Strategic Decisions, 1999, vol. 12, number 2.

Keloharju, M., *The winner's curse, legal liability and the long-run price performance of initial public offerings in Finland*, Journal of Financial Economics, Vol. 34 p. 251-277, 1993.

Konopczak M., Sieradzki R., Wiernicki M., *Kryzys na światowych rynkach finansowych – wpływ na rynek finansowy w Polsce oraz implikacje dla sektora realnego*, Bank i Kredyt 41 (6), 2010, National Bank of Poland, Warsaw.

Kothari, S., and Warner, J., 1997, *Measuring Long-Run Horizon Security Price Performance*, Journal of Financial Economics, 43 (3), 301-340.

Ljungqvist, A., (2005), *IPO Underpricing*, in: *Handbook in Corporate Finance: Empirical Corporate Finance*, editor Eckbo, B.E, Elsevier, New York, NY.

Ljungqvist, A., Wilhelm, W.J., *IPO pricing in the Dot-Com bubble*, Journal of Finance, Vol. 58 p. 723-52, 2003.

Loughran, T., Ritter, J.R., *The new issues puzzle*, Journal of Finance, Vol. 50 No.1, p. 23-51. 1995.

Loughran, T., Ritter, J.R., *Why don't issuers get upset about leaving money on the table in IPOs?*, Review of Accounting Studies, Vol. 15 p. 413-43, 2002.

Loughran, T., Ritter, J.R., *Why has IPO underpricing increased over time?*, Financial Management, Vol. 33 p. 5-37, 2004.

Lyn, E.O., Zychowicz, E.J. (2003), "The performance of new equity offerings in Hungary and Poland", *Global Finance Journal*, Vol. 14 pp.181-95.

Lyon, J.; Barber, B.; and Tsai, C.; 1999, *Improved Methods for Tests of Long-Run Abnormal Stock Returns*, Journal of Finance, 54 (1), 165-201.

Menyah, K., Paudyal, K., Inyangete, C., *Subscriber return, underpricing, and long-term performance of UK privatization initial public offers*, Journal of Economics and Business, Vol. 47 No.5, p.473-495, 1995.

Michaely, R., Shaw, W., *The pricing of initial public offerings: tests of adverse-selection and signaling theories*, Review of Financial Studies, Vol. 7 No.2, p.279-319, 1994.

Mok, M. K., Hui, Y. V., *Underpricing and after-market performance of IPOs in Shanghai, China*. Pacific-Basin Finance Journal 6, p. 453-474, 1998.

Parkinson, M., *The Extreme Value Method for estimating The Variance of the Rate of Return*, Journal of Business, 1980, number 57, p. 61-65.

Paudyal, K., Saadouni, B., and Briston, R.J., 1998, *Privatization Initial Public Offerings in Malaysia: Initial Premium and Long-Term Performance*, Pacific-Basin Finance Journal, number 6, 427-451.

- Pritsker, M., *A Fully-Rational Liquidity-Based Theory of IPO Underpricing*, Federal Reserve Board, Washington, D.C., 2006.
- Rhee S.G., *A review of the New Issue Puzzles*, OECD Round Table on Capital Markets Round Table on Capital Market Reform in Asia, Tokio, Japan 9-10 April, 2002.
- Ritter, J.R., *The Hot Issue Market of 1980*, Journal of Business, 57, 215-240, 1984.
- Ritter, J.R., *The Long-Run performance of Initial Public Offerings*, Journal of Finance, 46 (1), 3-27, 1991.
- Ritter, J.R., *Differences between European and American IPO markets*, European Financial Management, Vol. 9 No.4, p. 421-434, 2003.
- Ritter, J.R., *Money Left on the Table in IPOs by Firm*, University of Florida, Working Papers, January 2006.
- Rock, K., *Why new issues are underpriced*, Journal of Financial Economics, 15, p. 187-212, 1986.
- Shefrin H., Statman M., *The disposition to sell Winners Too Early and Ride Losers Too Long: Theory and Evidence*, Journal of Finance Vol. XL, No 3, July 1985.
- Sukacz, D., *Pierwsze oferty publiczne na rynkach kapitałowych*, Cedetu, Warszawa, 2005.
- Ting, Y. U., Tse, Y.K., *An empirical examination of IPO underpricing in the Chinese A-share market*, China Economic Review Vol. 17, Issue 4, 2006, p. 363-382.