LONG-TERM EQUITY PERFORMANCE IN POLAND –
SEARCHING FOR ANSWERS WITH THE CALENDAR-TIME
PORTFOLIO APPROACH

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Abstract

Research background: The study examines the performance of companies that are going public with equity issuance (IPO) in Poland.

Purpose: Some scholars argue that the buy-and-hold strategy that has been quite widely used suffers from cross correlation and the "bad model" problem. Hence, the calendar-time portfolio approach is used to extend the methodology.

Research Methodology: The empirical procedure is two-step. At the beginning, we calculate an average abnormal return for the portfolio of IPOs firms. The portfolio is rebalanced each month. Next, the risk-adjusted performance is measured by regressing returns on a multifactor time-series regression model. We employ the Fama-French (1993) three-factor model and CAPM for the robustness check.

Results: In a sample of IPOs listed on the Warsaw Stock Exchange, we find negative and highly significant abnormal returns. Alphas are statistically significant in all of the Fama-French regressions and in most of the cases for CAPM.

Novelty: This paper discusses the puzzle of the long-term equity performance of initial public offerings (IPOs) using the calendar-time portfolio approach. Our results point to the economic and statistical significance of long-term IPO underperformance.

Keywords: capital market, market anomalies, IPO, long-term wealth effect, calendar-time portfolio approach

JEL classification: G12, G14, G32, G4

Introduction

Many anomalies connected with long-term market performance have become an area of research interest within finance literature. Such studies concentrate on many areas of finance decisions, such as mergers (Asquith, 1983; Agrawal, Jaffe, Mandelker, 1992), share repurchases (Ikenberry, Lakonishok, Vermaelen, 1995; Yook, 2010), dividend omissions (Michaely, Thaler, Womack, 1995), or equity issuance (Ritter, 1991). A widely applied approach is the buy-and-hold approach connected with the estimation of various benchmarks (Mitchell, Stafford, 2000). However, E.F. Fama (1998) argues against this methodology and points out its deficiencies.

This paper attempts to resolve the puzzle of the long-term equity performance of initial public offerings (IPOs) using the calendar-time methodology. Analysing abnormal performance over long horizons following going public is important for academics as well as practitioners. In contrast to the event-time method, the calendar-time portfolio approach may shed new insight into the economic and statistical significance of public offerings.

This study does not seek to develop new methodologies for evaluating the long-run performance of equity issuers. By applying estimation approaches other than those used in the studies published so far, the robustness of the performance of IPOs is checked. Our study contributes to the existing literature by showing that long-term IPO underperformance is still present among equities in Poland, even after changing the methodology. Our evidence reveals negative, highly statistically and economically significant estimates of monthly average abnormal returns for the calendar time portfolios formed on the basis IPO firms (i.e. an intercept). Alphas are statistically significant in all of the Fama-French regressions and in most of the cases for the CAPM.

The rest of the paper is organized as follows: The next section provides background for the long-term price behaviour of IPOs and methods of long-term equity performance detection. Section 2 presents data and summary statistics, as well as the methodologies used in the research. Empirical results with robustness tests are detailed in Section 3. The last part concludes the paper and presents recommendations for future research.

1. Literature review

Research on the price behaviour of initial public offerings is part of a broader discussion on market anomalies. Anomalies are described as empirical findings inconsistent with accepted asset pricing models. The most prominent examples of anomalies include seasonal anomalies (e.g. Rozeff, Kinney, 1976; Ariel, 1987; Lakonishok, Smidt, 1988; French, 1980; Dichev, Janes,

2003; Zhang, Risen, Hosey, 2014; Hirshleifer, Shumway, 2003), anomalies related to company characteristics (Banz, 1981; Basu 1977; Hackel, Livnat, Rai, 1994; Goodman, Peavy, 1986; Aharony, Lin, Loeb, 1993) or those connected with information release and corporate actions (Loughran, Ritter, 1995; Foster, Olsen, Shevlin, 1984; Agrawal et al., 1992; Davidson, Tong, Worrell, Rowe, 2006; Michaely et al., 1995; Spiess, Affleck-Graves, 1999). The last group also includes research on price reaction following equity issues, both initial and seasoned offerings.

Some academics have pointed out that many market anomalies are not robust to the choice of sample, period, or methodology. There is a broad and still heated discussion on measuring long-term price behaviour on equity markets. On the methodological ground, this performance has quite often been observed using the buy-and-hold approach. E.F. Fama (1998) argues that the methodology heavily influences long-term returns connected with market anomalies and shows systematic errors that may arise in measuring long-term wealth effects. B.M. Barber and J.D. Lyon (1997) and S.P. Kothari and J.B. Warner (1997) show biases arising in the buy-and-hold approach. Fama suggests that the calendar-time portfolio approach is a more appropriate methodology. M.L. Mitchell and E. Stafford (2000) and J.D. Lyon, B.M. Barber, and C.L. Tsai (1997) also advocate this methodology and they conclude that it is robust to the most important statistical problems. This approach was first used by J.F. Jaffe (1974) and G. Mandelker (1974) and it is now quite well known in empirical finance.

Anomalous price behaviour after initial public offerings (IPOs) has been discussed for the short as well as the long run. The very first studies on the long-term performance of IPOs appeared in the early 1970s (Stoll, Curley, 1970; Ibbotson, 1975) but the best known opening of the academic discussion is the paper by J.R. Ritter (1991). He documented the long-term underperformance of IPOs in relation to benchmark firms. Subsequent papers concerned empirical as well as theoretical issues on the long-term price performance of IPOs and they also extended empirical research to other, non-US markets. The conclusions are not uniform. A vast number of studies have documented long-run underperformance (e.g. Chan, Moshirian, Ng, Wu, 2007; Cai, Liu, Mase, 2008) but some papers do not reach such clear conclusions (e.g. Paudyal, Saadouni, Briston, 1998; Stehle, 2000; Xia, Wang, 2003; Drobetz, 2005; Omran, 2005; Durukan, 2002; or Corhay, Teo, Rad, 2002).

Calendar-time portfolios were first implemented for US IPOs in a work by T. Loughran and J.R. Ritter (1995). They find negative intercepts for portfolios of equity issuers but the sample combined both initial and seasoned offerings. Then, A. Brav, C. Geczy and P.A. Gompers (2000) document that according to the Fama-French three factor model, the equal weighted and smallest tercile returns show underperformance (intercept of –0.31% and –6.5%, respectively).

However, intercepts for value weighted and large portfolios are small and insignificant. A. Brav and P.A. Gompers (1997) report a significant and negative intercept of –0.52% for non-venture backed IPOs (the results for venture backed offerings were not significant). They also conclude that IPO underperformance is driven by non-venture backed IPOs in the smallest decile of firms. M.L. Mitchell and E. Stafford (2000) also test IPO performance. They find equal- and value-weighted CAPM intercepts of –0.71% and –0.82% per month. The alphas from the Fama-French three-factor model equal to –0.43% and –0.45% for equal- and value-weighting, respectively.

This paper discusses initial public offerings on the Warsaw Stock Exchange (WSE) which is an emerging market. Poland has been a leader in Central and Eastern Europe in terms of capital market development. The progress of its economy is unquestionable and it is among the fastest growing in Europe. This makes the conclusions of the research for Poland important for academics and practitioners. Along with the re-opening of the public equity market in Poland, the first studies on the prices reaction to IPOs appeared. The existing studies on Polish IPOs have used the event-time approach. However, the first papers were strongly focused on issues of privatization (see Aussenegg, 2000; Jelic, Briston, 2003; Lyn, Zychowicz, 2003). More recent papers include T. Jewartowski and J. Lizińska (2012), L. Czapiewski and J. Lizińska (2014) and J. Lizińska and L. Czapiewski (2016). They all conclude that first-time equity issuers experienced a negative long-term price reaction after going public. All of the studies are based on the buy-and-hold strategy.

2. Sample Description and Methodology

The research sample covers initial public offerings (IPOs) on the Warsaw Stock Exchange (WSE), which is the main equity market in Poland. It includes only offerings with a new common stock issuance, and those without a prior trading history on alternative markets. The data sources include Notoria Serwis, the official site of the WSE (gpw.pl) and gpwinfostrefa.pl. Data were prepared manually, as equity close prices were derived from authors' own database, which encompasses all of the necessary adjustments in close equity prices (such as dividends, splits and pre-emptive rights) and also covers delisted firms. The sample consisted of 254 IPOs from 2001–2014.

Figure 1 gives the time series of IPOs in our sample according to macro sectors. The number of IPOs was the highest in 2007, with 60 firms and the lowest in 2002. The number of IPO companies after the peak of the last financial crisis decreased substantially. It is hard to see any stable trends in the relation between financial and non-financial IPOs. However, manufacturing

companies seemed to experience both lower relative decreases and higher relative increases in comparison to the financial sector in the period after the peak of the crisis.
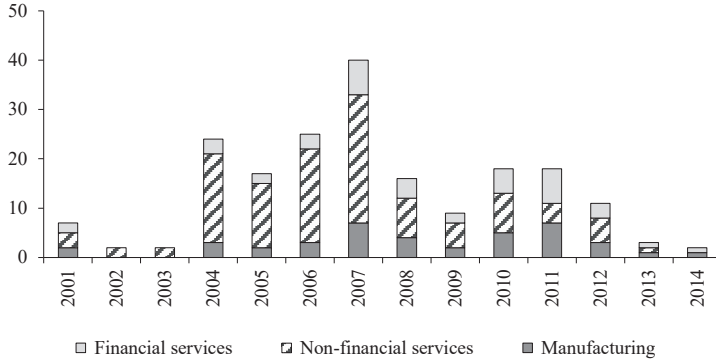

Figure 1. Number of IPOs in according to macro sectors across years
Source: authors' own.

The discussion on different issues of long-term performance measures is still present in the literature. Many of the previous studies on the long-run abnormal underperformance of IPOs abroad, and all of the studies on Polish offerings are based on the buy-and hold abnormal return (BHAR) approach. Some academics argue that this method is appropriate to measure an investor's wealth changes. However, some other scholars prove that it suffers from the cross correlation and the "bad model" problem (for a discussion, see Barber, Lyon, 1997; Lyon, Barber, Tsai, 1998; Kothari, Warner, 1997; Fama, 1998; Mitchell, Stafford, 1998; Brav, 2000).

We apply the monthly calendar-time portfolio approach in this study for measuring a long-horizon abnormal return as proposed by E.F. Fama (1998). We employ the Fama-French (1993) three-factor model. For robustness, we also estimate the CAPM model. The monthly abnormal returns are intercepts in the models. The regressions on the Fama-French three-factor model proceed as follows:

$$R_t^P - R_t^F = \alpha + \beta_M \left(R_t^M - R_t^F \right) + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \varepsilon_t^P \qquad (1)$$

R_t^P – calendar time portfolio return,
R_t^F – risk-free rate calculated with WIBOR,
R_t^M – monthly market return calculated with the main Polish market index, WIG,
$\left(R_t^M - R_t^F \right)$ – market risk premium,
SMB_t – difference in returns of portfolios of small and big firms by monthly intervals,

HML_t – return differential of portfolios of high and low book-to-market ratio firms by monthly intervals,

α – average monthly abnormal return on portfolio of IPO firms,

β_M, β_{SMB}, β_{HML} – OLS regression parameters specific to the portfolio,

ε_t^P – the error term.

The values of SMB_t were estimated monthly according to:

$$SMB_t = \frac{Small\ Value_t\ +\ Small\ Neutral_t\ +\ Small\ Growth_t}{3} - $$
$$-\frac{Big\ Value_t\ +\ Big\ Neutral_t\ +\ Big\ Growth_t}{3} \qquad (2)$$

The values of HML_t were estimated according to:

$$HML_t = \frac{Small\ Value_t\ +\ Big\ Value_t}{2} - \frac{Small\ Growth_t\ +\ Big\ Growth_t}{2} \qquad (3)$$

Figure 2 presents the way of calculating SMB_t and HML_t.

Figure 2. SMB_t and HML_t portfolios

Source: authors' own.

For robustness check, excess returns of the event portfolio are also regressed on the Capital Asset Pricing Model (CAPM) as follows:

$$R_t^P - R_t^F = \alpha + \beta\left(R_t^M - R_t^F\right) + \varepsilon_t^P \qquad (4)$$

In each calendar month, a portfolio is formed by including all IPO firms that went public in the previous period. The portfolio is rebalanced each month. This allows us to include companies that have just gone public and to disregard those companies that have completed their IPO before the given period. For each calendar month, we calculate the return on a portfolio composed of all firms that went public during the previous period. We take several holding periods for robustness check, i.e. 12, 18, 24, 30, and 36 months. For example, construction of the 36-month portfolio for January 2011 includes the return on all IPOs issued in the period from January 2008 to December 2010. The time series of monthly portfolio excess returns (portfolio return less the risk-free rate) was regressed on the factors mentioned above in the Fama-French model and CAPM. The ordinary least square repression was used as in A. Brav, C. Geczy and P.A. Gompers (2000). The intercept is estimated to test the null hypothesis that the mean monthly abnormal return on the calendar portfolio is zero.

3. Results

The model was calculated for the full sample of IPOs from January 2001 to December 2014. We report estimates of monthly average abnormal returns (i.e. the intercept) for calendar-time portfolios. The portfolios were formed using the Fama-French three-factor model on the basis of firms going public with simultaneous equity issuance. For robustness, estimates for the CAPM model are also presented below. Table 1 and Table 2 present OLS estimates of monthly abnormal returns for several holding periods, i.e. 12, 18, 24, 30, and 36 month portfolios.

As reported in Table 1, the estimated monthly alphas for portfolios based on all holding periods are negative. They are also robust to a model change. Alphas are statistically significant in all research specifications of models and holding periods except for the 12-month portfolio for the CAPM. Nevertheless, the alphas for the four other holding periods were highly significant. The average long-term underperformance was equal to –12.3 for the Fama-French three-factor model and –10.0% for CAPM and –11.1% for all research specifications (in terms of annualized intercepts). The worst underperformance was observed for the Fama-French three-factor model on a 36-month portfolio and it was equal to –13.8% annually. The least severe underperformance was observed for the CAPM with a 12-month portfolio for the three-year portfolio as it equalled to –8.2% per year. However, this was the only insignificant alpha, so the least severe and significant underperformance was estimated under the Fama-French three-factor model on a 24-month portfolio.

Table 1. Fama-French time-series regressions on IPO rolling portfolios

	12 mth	18 mth	24 mth	30 mth	36 mth
Intercept	−0.86%	−1.02%	−0.99%	−1.11%	−1.15%
p-value	(0.0414)	(0.0054)	(0.0016)	(0.0004)	(0.0003)
significance	**	***	***	***	***
RMP	0.6959	0.8391	0.8367	0.8600	0.8215
p-value	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
significance	***	***	***	***	***
SBM	0.3841	0.2745	0.3610	0.4195	0.4918
p-value	(0.0010)	(0.0077)	(0.0001)	(0.0000)	(0.0000)
significance	***	***	***	***	***
HML	0.1634	0.0553	0.1532	0.2243	0.3052
p-value	(0.1747)	(0.5932)	(0.0887)	(0.0198)	(0.0057)
significance			*	**	***
p-value for F	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
significance	***	***	***	***	***
Adjusted R^2	0.4631	0.6137	0.7051	0.7420	0.7239

Notes: p-values are in brackets. Significance at the 1% (***), 5% (**) and 10% (*) level.

Source: authors' own.

Table 2. CAPM time-series regressions on IPO rolling portfolios

	12 mth	18 mth	24 mth	30 mth	36 mth
Intercept	−0.68%	−0.93%	−0.79%	−0.86%	−0.89%
p-value	(0.1038)	(0.0105)	(0.0142)	(0.0080)	(0.0089)
significance		**	**	***	***
RMP	0.7181	0.8528	0.8692	0.9079	0.8730
p-value	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
significance	***	***	***	***	***
p-value for F	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
significance	***	***	***	***	***
Adjusted R^2	0.4308	0.5997	0.6727	0.7014	0.6592

Notes: p-values are in brackets. Significance at the 1% (***) and 5% (**) level.

Source: authors' own.

Summing up, our results document strong evidence of underperformance following the initial public offering in Poland. The level of abnormal returns measured with the intercept in the Fama-French three-factor model and the CAPM is slightly different in the alternative specifications. The results confirm the existence of long-term IPO underperformance using the calendar-time portfolio approach as the conclusions seem to be similar to those revealed in the previous studies for Polish IPOs based on the buy-and-hold approach. The findings for the Fama-French three-factor model as well as the CAPM are mostly consistent with previous

studies based on similar assumptions (Brav, Geczy, Gompers, 2000; Brav, Gompers, 1997; Loughran, Ritter, 1995).

Conclusions

The research continues the discussion on the long-price behaviour of initial public offerings (IPOs). We use the intercept from time series regressions as an indicator of the risk-adjusted performance of IPOs. Alphas are interpreted analogously to Jensen's alpha. The monthly abnormal returns are intercepts in the Fama-French three-factor model and CAPM. The slope coefficients are statistically significant in all of the Fama-French regressions and in most of the cases for CAPM. Polish initial public offerings experienced average underperformance of about –12.3% annually according to the three-factor Fama-French model and –10.0% according to CAPM. Our results point to an economically and statistically significant underperformance of initial public offerings in Poland.

The research findings also provide opportunities for future research. We plan to extend the research by applying other existing factor models. First, momentum appeared to be important in explaining equity returns as proposed by N. Jegadeesh and S. Titman (1993) and M.M. Carhart (1997). Next, the five-factor Fama-French model (Fama, French, 2016) is a possible contribution in the examination of IPO abnormal performance as it adds profitability and investment factors to the three-factor model of E.F. Fama and K.R. French (1993).

Another possible research task for the future is to apply another weighting scheme. M.L. Mitchel and E. Stafford (2000) conclude that the calendar-time portfolio approach is well specified to detect abnormal performance regardless of equal or value weighting. However, they also point out that it works better when portfolios are value-weighted than equally-weighted. Following this, we propose to extend the research by the application of value weighting for our sample of equity offerings.

Finally, an interesting area for future research could be to check if IPO returns in Poland are similar to the returns observed for portfolios of similar size, book-to-market or momentum-based non-issuing firms. This question remains unanswered for Polish IPOs with the calendar – time approach.

Acknowledgements

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