MACROECONOMIC AND CAPITAL MARKET DETERMINANTS OF INITIAL PUBLIC OFFERINGS: A TIME-SERIES ANALYSIS IN THE POLISH CAPITAL MARKET

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Abstract: *The main objective of this study is to indicate the influence of local macroeconomic and capital market factors on the values of IPOs in Poland over the period of 2003 to 2012. Our sample includes 330 local enterprises that conducted an IPO on the Main Market of the Warsaw Stock Exchange after Polish EU accession. The models for which estimation results are presented in this paper reveal that the individual country regression analysis working with untransformed IPO values (Model 1) did not generate significant parameter estimates. On the other hand, a logarithmic transformation of IPO values leads to persistently significant estimates for our regressions. Based on the Model (2) the empirical evidence supported the hypothesis that Polish ten-year government bond yields (indicating the price of competing financing funds) have explanatory power for IPO values. However, our assumption that also other macroeconomic- and capital market indicators have explanatory power for IPO values in the Polish capital market could not be supported by empirical evidence.*

Keywords: *Going Public, Initial Public Offering, IPO, Capital Market, Macroeconomics, Determinants, Poland.*

JEL Classification: *E44, G23, G32.*

Introduction

Substantial academic literature devotes a significant amount of research to emphasising the importance of the financial system to economic growth. Kominek [14] summarises recent empirical research and concludes that "well developed financial systems stimulate economic growth". Although the continental financial system is traditionally focused on banking, there is increasing interest in the stock markets and initial public offering (IPO) implementation [e.g. 22, 27].

Most of the studies examining initial public offerings examine the following issues: IPO determinants, i.e. motivations for going public, timing of the IPO, underwriter selection, under-pricing, signalling, IPO process issues, the decision to stay private and IPO pricing process [3]. Academic research dealing with initial public offerings´ determinants focuses on the analysis of two categories: the external factors such as macroeconomic and capital market environment [1, 13] and the internal factors such as the tendency of a company to reduce leverage or to obtain capital for new projects [4, 20].

Relations between the number of IPOs and macroeconomic factors have been investigated for example by Loughran et al. [19]. His paper reviews the IPO timing in fifteen countries in relation to inflation-adjusted stock price indexes and GDP growth rates. The results suggest a positive relationship between the number of IPOs and stock price levels, however no positive correlation with the cycle movements. Rydqvist and Högholm [29] compare the data for a sample of family-owned enterprises in Sweden (1970–1991) and eleven European countries (1980-1989). They find that "most going public

activity took place after an exceptionally sharp stock price increase, and that going public activity is not related to the business cycle". Ljungqvist [18] suggests that high number of IPOs is positively correlated with both high stock index levels and good business conditions and tends to follow phases of extensive IPO underpricing. Breinlinger and Glogova [4] investigate the explanatory power of selected macroeconomic factors influencing IPOs by analysing a data set of annual IPO volumes for six developed continental European countries over a time period of 18 years. The authors followed the question if there are stable indications that IPOs depend on stock index returns for what they termed consolidated periods. The results show that a "logarithmic transformation of IPO volumes (representing authors´ supposition of a nonlinear relationship between IPO volumes and stock index returns) leads to persistently significant estimates for both pooled and individual country regressions". The hypothesis that percentage changes in savings, GDP growth and interest rates have explanatory power for IPO volumes could not be supported by empirical evidence. A paper by Ameer [1] shows a significant negative relationship between the interest rate and the number of IPOs and a significant positive relationship between the industrial production and the number of IPOs in the emerging market of Malaysia. Bilson et al. [2] find a moderate evidence to support the connection between local macroeconomic factors and stock returns in emerging markets.

Capital market determinants affecting going public activities have been empirically investigated by Peterle [23] and Roženský [28]. They address the issue of the attractiveness of primary capital markets in the CEE region and for this used quantitative a qualitative indicators.

The quantitative factors such as the capital market size, the capital market liquidity and stock market indices returns have been the subject of investigations. Peterle [23], who studied IPOs in the CEE region between 2000 and 2009, conclude that capital market factors such as "market size, liquidity and market capitalization to GDP do not have a decisive impact on IPO activities in the CEE region". On the other hand, "the attractiveness of capital market as measured by annual stock index returns and by annual market and liquidity growth" could have been an incentive for decision makers about IPOs in the observed period.

Institutional and historical (i.e. qualitative) factors have been assessed by "soft" indicators such as perception of the capital market by enterprises, their confidence in the capital market and quality of the national regulations and structures. Roženský [28] also explored conditions created by local stock exchanges using the following indicators: cost of going public, administrative requirements towards issuers, market segmentation of the particular stock exchange and finally its marketing and public relations. Groh, Lichtenstein and Lieser [10] calculated composite indices to compare the attractiveness of 27 European countries for institutional investments into the Venture Capital and Private Equity. They conclude that "the investor protection and corporate governance rules and the size and liquidity of its capital market are likewise a proxy for the professionalism of the financial community, for deal flow and exit opportunities".

1 Statement of the Problem

Academic studies conducted on CEE markets cover mainly descriptive statistical analyses of individual markets [23, 25, 28] and analyses of determinants and consequences of going public [15, 23, 28].

This study intends to study the explanatory power of selected macroeconomic and capital market factors on IPO values in Poland over the period 2003-2012 and thus to complement our prior research aimed at an analysis of the following question: What is the influence of local macroeconomic factors on the number of IPOs in Poland over the period of 2004 to 2012? "Unlike IPO numbers, IPO values (being monetary data) can appropriately reflect the extent to which the primary market was actually tapped – information that cannot be simply deduced from the number of IPOs" [4]. In this study we extend the IPO literature by analysing a unique set of data to test the existing theories examining the IPO determinants by using a quantitative model on the Polish capital market which is the most developed capital market in the region of Central and Eastern Europe (CEE).

Concerning the composition of the data set no previous paper has, to our knowledge, used either Polish IPO values data or the same time-series.

This paper is structured as follows. Section 2 describes the research design, i.e. data and methodology. Section 3 presents the empirical research results. The last section summarizes and provides concluding remarks.

2 Methods

2.1 Data Set

The nature of this study is based on the theory and previous empirical research. All macroeconomic and capital market indicators analysed in this paper have sufficient support in the finance academic studies [1, 4, 5, 17, 25, 28].

For purposes of this paper the following hypotheses have been outlined:

Hypothesis 1: There is a positive relationship between GDP growth rates and IPO volumes.

La Porta et al. assess the influence of economic conditions (namely the legal system) on the number of IPOs using a sample of 49 countries. La Portas et al. [17] research results show that "the quality of law enforcement, which is highly correlated with the level of GDP per capita, has a strong positive effect on the number of IPOs". The authors identify a statistically significant relationship between long-term GDP growth rates, i.e. average annual percentage growth of per capita GDP for the period 1970 to 1993, on the number IPOs. Peterle [23] confirmed that macroeconomic factors, specifically "a quicker reform development in terms of governance and enterprise restructuring, competition, policy, improved business regulations and sizeable pension funds, could have had a positive impact on IPO activities in Poland in the 2000s". On the other hand, the studies conducted by Rydqvist and Högholm [29] and Loughran et al. [19] show that the GNP short-term growth rates are no significant explanatory power for IPO activity across the sample of European countries. In a similar way, Breinlinger and Glogova´s analysis [4] of annual IPO volumes for six continental European countries over a time period of 18 years could not support the hypothesis that GDP growth rates have explanatory power for IPO volumes. Complementary to these empirical findings we want to test the explanatory power of GDP growth rates for IPO volumes for our sample.

Hypothesis 2: There is a negative relationship between the reference interest rate and IPO volumes.

Rees [26], concentrating on UK data, found no significant link between the number of IPOs and interest rates. Research results by Breinlinger and Glogova [4] also indicate that

there is no perceivably influence of interest rates (ten-year government bond yields/GBY) on demand for raising equity through IPOs. On the contrary, the study published by Ameer [1] reports the opposite. Ameer´s results [1] imply that "monetary policy has a direct impact on capital markets and that central bank intervention propagates IPO cycles in Malaysia". Based on a paper by Jovanovic and Rousseau [13] Ameer [1] supposed a negative relationship between interest rate and the number of IPOs. We also included this assumption in our investigation.

Hypothesis 3: There is a positive relationship between industrial production growth rates and IPO volumes.

The industrial production index as a measurement of the output of an economy also helps to map structural economy development. The industrial production index rate is the indication of business lifecycle and business life cycle affects by its fluctuations the stock market prices. Besides, authors say that enterprises enter capital markets when other enterprises enter them too, meaning potentially higher overall industrial production [7, 20]. Therefore, industrial production growth analysis is a next part of our investigation.

Hypothesis 4: There is a positive relationship between the stock market index returns and IPO volumes.

The pessimism and optimism which affects stock markets is in alignment with investor sentiment theory and the market timing theory. As the stock market index mirrors the investor´s willingness to invest or not, the number of IPOs vary accordingly. Enterprises are more likely to implement IPOs when the stock market promises higher returns and therefore profit for enterprises and also for potential investors. Studies by Loughran et al. [19], Rees [26] and Rydqvist and Högholm [29] detect a significantly positive influence of stock index levels and stock index returns on the number of IPOs. Brzeszczynski [5] analysed the number of new IPOs and the main stock market index (WIG) returns for the Polish stock market over a period from 1997 to 2008. He detects the correlation coefficient between those two variables 0.0244 when IPOs and stock market index return are analysed simultaneously. However, the value of this index is 0.5683 when the WIG returns are lagged by one year. Brzeszczynski [5] concluded that "the number of IPOs in emerging markets and the profitability of the public offers are related to macroeconomic conditions, business cycles and stock market activity. In most emerging market countries there is a time lag between movements of the stock market index and decisions to launch new IPOs".

Hypothesis 5: There is a positive relationship between private equity investments volume and IPO volumes.

Private equity investors view emerging markets as a suitable opportunity to diversify their investment portfolios and to catch excess risk premiums. In the financial literature the going public strategy has been considered for an important channel how venture capitalists can leave investee companies [8].

This paper is based on evidence from the Polish capital market over the period of 2003 to 2012. Our sample includes only local enterprises that conducted an IPO on the Main Market of the Warsaw Stock Exchange (WSE). The IPO data were obtained from the WSE Fact Books [30] and Federation of European Securities Exchanges (FESE) [9]. Macroeconomic data such as gross domestic product growth rates (GDPGR), reference interest rates (GBY), industrial production growth rates (IPGR), Warsaw stock exchange index (WIG) and private equity investments (PEI) were obtained from the Polish National

Bank (PNB) [24], OECD Stat Extracts [21] and European Venture Capital Association (EVCA) [11].

Tab. 1 shows an overview of the variables outlined above, their data sources and calculations and expected sign expressing the relation of these variables to the dependent variable.

Tab. 1: Source Data and Data Description

Note: IPOs on the Main Market of the Warsaw Stock Exchange, only Locals

	Data Sources	Calculation	Expected Sign
Explanatory Variables			
% Real GDP Growth Rates in Period *t-1* ($GDPG_{t-1}$)	OECD Stat Extracts, PNB	annual growth rates in % (using yearly closing dates)	+
% Industrial Production Growth Rate in Period *t-1* (IPG_{t-1})			+
% Ten-Year Government Bond Yields in period *t-1* (GBY_{t-1})		in % (using yearly closing dates)	-
% Change in Stock Market Index Returns in period *t-1* (WIG_{t-1})		in % (using yearly closing dates)	+
Private Equity Investment as % of GDP in period *t-1* (PE_{t-1})	EVCA Yearbooks	in % (using yearly closing dates)	+
Gross Domestic Product in period *t* (GDP_t) / *t-1* (GDP_{t-1})	OECD Stat Extracts	in EUR m (using yearly closing dates)	
Dependent Variable			
IPOs value in period *t* (IPO_t) / *t-1* (IPO_{t-1})	WSE Fact Books, FESE	in EUR m (using yearly closing dates)	

Source: Authors

Tab. 2 reflects market statistics of the annual going public numbers and values at the Warsaw Stock Exchange, Main Market.

Tab. 2: Summary Statistics for the Sample of IPOs in Poland (2003-2012)

Panel A: Distribution of IPOs´ Numbers and Values by Year

Year	Value of IPO Shares (in EUR m)	Proportion (%)	Number of IPO Shares	Proportion (%)
2003	288	1.30	6	1.82
2004	3,124	14.14	36	10.91
2005	1,809	8.19	35	10.61
2006	1,085	4.91	38	11.52
2007	5,097	23.07	81	24.55
2008	2,235	10.12	33	10.00
2009	1,701	7.70	13	3.94
2010	4,006	18.13	34	10.30
2011	1,931	8.74	38	11.52
2012	819	3.70	16	4.85
Total	22,095	100.00	330	100.00

Panel B: Descriptive Statistics of IPOs´ Characteristics

Variable	Mean	Median	Minimum	Maximum	St. Dev.
Value of Offerings (EUR	44.09	7.83	0.032	2 992.77	228.65
Number of Offerings	33.00	34.50	6.00	81.00	19.46
% of Primary Shares	52.35	49.05	8.07	99.03	33.08

Panel C: Descriptive Statistics of Explanatory Variables

Variable	Mean	Median	Minimum	Maximum	St. Dev.
% GDP Growth	4.29	4.20	1.60	6.80	1.58
% IPG	6.55	7.85	-3.90	12.90	5.14
% GBY	5.91	5.87	5.00	7.30	0.70
% WIG	17.85	27.09	-51.07	46.85	29.77
% PE	0.13	0.12	0.05	0.22	0.06

Source: [34, 50], Authors

2.2 Model Specifications

Based on above-hypotheses (Tab. 1) the following models are specified:

$$IPO_t = \alpha + \beta_1 IPO_{t-1} + \beta_2 GDPG_{t-1} + \beta_3 IPG_{t-1} + \beta_4 GBY_{t-1} + \beta_5 WIG_{t-1} + \beta_6 PE_{t-1} + u_t$$

(1)

Where the variables are defined as stated below:

$$IPO_t = \left(\sum_{j=1}^{p} FLP_j \times NB_j \right) (million) \times DC/EUR$$

j = index of IPOs in period t

p = number of IPOs in period t

FLP_j = first listed price of IPO$_j$

NB_j = number of stocks of IPO_j

DC/EUR = exchange rate of the PLN against the EUR for period t

We also test this model formulation by taking first differences, "as the IPO series is not unambiguously stationary whereas first differences of IPOs are".

$$ln\left(\frac{IPO_t}{GDP_t}\% \times 100\right) =$$
$$= \alpha + \beta_1 ln\left(\frac{IPO_{t-1}}{GDP_{t-1}}\% \times 100\right) + \beta_2 GDPG_t + \beta_3 IPG_{t-1} + \beta_4 GBY_{t-1} + \beta_5 WIG_{t-1}$$
$$+ \beta_6 PE_{t-1} + u_t$$

(2)

2.3 Methodology

As follows from the research done [1, 4, 5], the situation in the year preceding the company's initial public offering is crucial. Therefore, our models use one-year delay for all the explanatory variables in relation to the dependent variable. The idea behind the model specification (2) is to put IPO values into proportion with GPD. This ratio is connected with the assumption that "a nonlinear (specifically a logarithmic) relationship could possibly better model any dependence of IPO values on included independent variables than a linear one" [4]. Model (2) is tested with and without one year delay of the dependent variable as an explaining variable.

To estimate the model coefficients we used a panel data approach. The normality of the data was checked by the Kolmogorov–Smirnov test. The data was evaluated at the significance level of $\alpha=5$ %. The model estimation was performed with the regression model and with the use of the Statistica.CZ software, version 12.

3 Problem Solving

Tab. 3 presents the results of the estimation of the model described with the formula (1). An important feature of the model is the one-year shift of new IPOs relative to the macroeconomic and capital market indicators. The unmodified IPO series are denominated in EUR. The model is statistically correct. Based on the F test (F-statistics) it can be stated that no significant dependences of IPO values on explanatory variables could be identified. The general performance of the model is satisfactory ($R^2 = 0.6543$).

Tab. 3: Results of the Estimation Model Describing the IPO Values in Poland in the Years 2003-2012 with Macroeconomic- and Capital Market- Determinants (Model 1)

Explanatory variables	Coefficient	Standard Error	t-statistics	p-value	Significance[a]
Intercept	4972.68	7211.49	0.690	0.5127	
IPO_{t-1}	-0.33	0.36	-0.910	0.3929	
$GDPG_{t-1}$	865.82	1301.91	0.665	0.5273	
IPG_{t-1}	-185.50	439.56	-0.422	0.6857	
GBY_{t-1}	-460.85	391.70	-1.177	0.2778	
WIG_{t-1}	106.20	60.28	1.762	0.1215	
PEI_{t-1}	39861.65	39140.59	1.018	0.3424	

Observations	10
Standard error of residuals	4682.522
R	0.8089
R^2	0.6543
F (6, 7) = 2.208	p-value 0.1618

Source: Authors

Estimation results for model (2) are presented in Tab. 4. We put IPO values into proportion with GDP to investigate the assumption that a "nonlinear (a logarithmic) relationship could possibly better model any dependence of IPO values on included explanatory variables than a linear one" [6].

Interest rates expressing the price of a competing form of financing are the only macroeconomic factor with a statistically significant impact on the IPO values executed in Poland. The model uses one-year delay for the explanatory variable in relation to the examined phenomenon (GBY_{t-1} variable). The general performance of the model is satisfactory and statistically significant ($R^2 = 0.8913$, p=0.004). The parameter α amounted to -0.49 (p=0.003) and indicates a very strong influence of this variable on the IPO values. We can conclude that on average GBY decrease of 1% results in a more than proportional (by nearly 0.50%) decrease in the value of IPOs. Therefore, the hypothesis H2 was verified positively.

The hypotheses that GDP growth (H1), industrial production growth (H3), stock market index returns (H4) and private equity investments (H5) have explanatory power for IPO values in the Polish capital market could not be supported by the model (2). Therefore, the hypotheses H1, H3, H4 and H5 failed to be verified positively.

Tab. 4: Results of the Estimation Model Describing the IPO Values in Poland in the Years 2003-2012 with Macroeconomic- and Capital Market- Determinants (Model 2)

Dependent variable: $Ratio\ 1 = ln\left(\frac{IPO_t}{GDP_t}\% \times 100\right)$					
Explanatory Variables	**Coefficient**	**Standard Error**	**t-statistics**	**p-value**	**Significance[a]**
Intercept	1.21	2.16	0.561	0.5926	
$Ratio\ 2 = ln\left(\frac{IPO_{t-1}}{GDP_{t-1}}\% \times 100\right)$	-0.19	0.26	-0.713	0.4989	
$GDPG_{t-1}$	0.37	0.44	0.844	0.4264	
IPG_{t-1}	-0.06	0.12	-0.491	0.6387	
GBY_{t-1}	-0.49	0.11	-4.423	0.0031	**
WIG_{t-1}	0.02	0.02	1.218	0.2628	
PEI_{t-1}	-2.84	9.22	-0.308	0.7667	
Observations	10				
Standard error of residuals	1.2018				
R	0.9441				
R^2	0.8913				
F (6, 7) = 9.573	*p-value* 0.0044**				

Source: Authors

4 Discussion and Conclusions

In this paper we investigated the explanatory power selected macroeconomic and capital market factors have for IPO values in Poland by analysing a data set of annual IPO values for Poland over a time period of 2003 to 2012. Companies' specific aspects were excluded. Previous researches of this issue [e.g. 1, 4, 5, 20] conducted under conditions in terms of both developed and emerging countries show no consistent results regarding the explanatory power of macroeconomic and capital market indicators and values of capital raised by IPOs.

Our sample includes only local enterprises that conducted an IPO on the Main Market of the Warsaw Stock Exchange. The main conclusions of this work are: Firstly, individual country regression analysis working with untransformed IPO values (Model 1) did not generate significant parameter estimates. This result implies that the business cycle indicated by GDP and industrial production growth rates as well by the level of private equity investments has not a direct impact on the IPO values in the Polish capital market. In this respect, our research results are similar to those of the study by Breinlinger and Glogova [4]. They concluded that "percentage changes in GDP growth have no significant influence on IPO values". Contrary to the conclusions by Peterle [23], who indicates an importance of the capital market characteristics supporting its "attractiveness for investors, as measured by annual index returns and annual market and turnover growth", our results does not support the assumption that the attractiveness of a capital market

for investors measured by annual stock index returns to be an important factor for amounts of capital raised by IPOs. The last conclusion of this study is that a logarithmic transformation of IPO values leads to persistently significant estimates for our regressions. Based on the Model specification (2) the empirical evidence supported the hypothesis that Polish ten-year government bond yields (indicating the price of competing financing funds) have explanatory power for IPO values. However, our assumption that also other macroeconomic- and capital market indicators have explanatory power for IPO values in the Polish capital market could not be supported even by the Model (2).

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