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**Louvain School of Management**

**and**

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# Assessment of Micro and Macro Indicators Influence on IPO Overpricing Before and After the Global Financial Crisis


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# FOREWORD

This Master thesis is written as the final result of Double Degree Master thesis in Louvain School of Management in Belgium and Vytautas Magnus University in Lithuania.

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Judita Perminaitė

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# ABSTRACT


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The aim of the Master thesis is to identify and to assess micro and macro indicators influence on IPO overpricing before and after the global financial crisis. This thesis consists of three parts. The first part includes the analysis of the theoretical concept of IPO overpricing and the overview of the indicators influencing IPO overpricing with the analysis of previous researches. The methodology for assessment of micro and macro indicators influencing IPO overpricing before and after crisis event together with the overview of sample and limitations are provided in the second part of the thesis. The results of analysis of the dynamics of IPO overpricing levels and changes in micro and macro indicators influence before and after the global financial crisis are provided. The results revealed that the IPO overpricing phenomenon exists in EU IPOs market. The importance of the indicators during the periods before and after the global financial crisis differs and macro indicators have the higher influence on the IPO overpricing level.

# SANTRAUKA


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Magistro baigiamojo darbo tikslas yra nustatyti ir įvertinti micro ir macro indikatorių įtaką IPO pervertinimui prieš ir po pasaulinės finansų krizės. Šis darbas susideda iš trijų dalių. Pirmojoje darbo dalyje pateikta teorinė IPO pervertinimo sampratos analizė ir indikatorių, įtakojančių IPO pervertinimą, apžvalga kartu su ankstesnių tyrimų analize. Micro ir macro indikatorių, įtakojančių IPO pervertinimą prieš ir po ekonominės krizės įvykio, įtakos vertinimo metodologija, imties ir apribojimų apžvalga pateikiami antrojoje darbo dalyje. Trečiojoje darbo dalyje pateikiami IPO pervertinimo lygio dinamikos vertinimo, micro ir macro indikatorių įtakos pokyčių prieš ir po pasaulinės finansų krizės analizės rezultatai. Tyrimo metu nustatyta, kad IPO pervertinimo fenomenas egzistuoja ES IPO rinkose. Indikatorių svarba prieš ir po pasaulinės finansų krizės skiriasi ir macro indikatoriai turi daugiau įtakos IPO pervertinimo lygiui.

# INTRODUCTION

Every successful owner of a firm comes to the moment if to take the decision to go public. The advantages and drawbacks of IPO issuance have to be taken into consideration of each owner before taking the decision. IPO issue process is complex and one of the greatest challenges during this process is pricing due to current market price and trading history absence of the IPO firm shares. In many cases, a firm even has the lack of historical financial data.

Theoretically, in the efficient market, current market price of issued IPO shares is equal to fair value of these shares. However, the evidence about the price anomalies in the market after IPO event are found. According to the empirical researches, in practice IPOs are often underpriced in short-run and overpriced in long-run (Eckert, Hannweber & Egteren, 2012). While underpricing is related to the short-term issues, this phenomena evaluation is relatively easy and, therefore, it can be argued that it is a reason why most of the findings agree on the underpricing in short-term. In the contrast, the long-period testing requires appropriate adjustment for risk in calculating abnormal price performance (Khotari & Warner, 2006). This means that calculation of abnormal returns over the long-run period is highly sensitive to the chosen methodology. As a result, the findings on the overpricing phenomena of previous researches are divergent. On the other hand, many of them confirm the existence of IPO overpricing and underperformance in long-run (Chan et al., 2007; Gao, 2010; Saade, 2015; Reber & Vencappa, 2015; Zheng, 2006; Wadhw et al. 2016; Shu et al. 2012).

The IPO overpricing anomaly is explained by the different hypotheses. Most of them are based on information asymmetry problem among participants in the IPO transaction. The assumption that the IPO issuer knows the fair value of the firm but the investor hasn't all information in comparison with the issuer can be taken. As a result, investor accepts the decision based on partial information and invests in the IPO shares only if he beliefs that shares are not overpriced. So, beliefs of investor have crucial importance. However, according to the behavioral finance theory, investors are not always rational. This creates the possibility for mispricing. Therefore, a question can be raised which indicators cause the IPO overpricing by influencing beliefs of investors. Two types of indicators can be distinguished: (1) related to the firm's quality and (2) related to the conditions in the environment. This allows to define that IPO overpricing could be influenced by internal (micro) and by external (macro) indicators with the open question which indicators - micro or macro - have more influence on IPO overpricing. Moreover, an important characteristic of IPO market is its high cyclicality (Ivanov & Lewis, 2008). The volumes of IPOs highly correlate to the current status of the economy. There is evidence that decision-making behavior of investors sharply changes reacting to changes in the different external market environment. In addition, recessions are

highly volatile periods with high information asymmetry. All these statements lead to the question what was the impact of the global financial crisis on the IPO market. The answer to this question requires to analyze and to compare IPOs in the periods before and after the global financial crisis.

**The problem of the research** is formulated as follows: what is micro and macro indicators influence on the IPO overpricing before and after the global financial crisis?

**The novelty of the research** is that even there are many researches about indicators influencing IPO overpricing but the space for more complex research, which would include more micro and macro indicators in one analysis, exists. Also, this Master thesis focuses on comparable aspects of micro and macro indicators impact on IPOs, this was not addressed in the previous researches. This would allow to deepen the understanding of the investor decision-making behavior. Moreover, this Master thesis puts attention to the global financial crisis influence on the IPOs' pricing based on the most recent historical data, allowing proper analysis of post-crisis event period. The advantage of this research is that there past enough time since the crisis and analysis can cover proper post-event period. This Master thesis analyzes all IPOs cases in EU member states as in one market during the selected period. Previous researchers addressed only separate EU member states IPO markets.

**The object of the research** is IPO overpricing and indicators influencing it.

**The aim of the research** is to identify micro and macro indicators and to assess their influence on IPO overpricing before and after the global financial crisis in EU IPOs market.

The following **objectives** have been formulated to reach the purpose of the analysis:

1. To analyze and to synthesize the previous researches of IPO overpricing phenomenon.
2. To identify indicators and to disclose the economic cycle influence on IPO overpricing.
3. To develop the methodology for the assessment of micro and macro indicators influence on IPO overpricing before and after the global financial crisis.
4. Using the developed methodology to analyze the IPO overpricing cases and the dynamics of IPO overpricing levels in EU IPOs market.
5. To evaluate micro and macro indicators influence on IPO overpricing level and to identify changes in these indicators importance before and after the global financial crisis.
6. To discuss the research results, to compare them with the previous researchers' results and to provide recommendations for investors in IPOs.

**The structure of the research.** Master thesis is divided into three parts. The first part of the paper is devoted to the theoretical framework which supports the background of the research. Firstly, the theoretical concept of IPO overpricing and its importance are introduced. Secondly, the indicators influencing IPO overpricing are described and the economic cycle importance on IPO overpricing is

discussed. Thirdly, an overview of previous empirical researches on IPO overpricing and indicators influencing it are given. The second part of Master thesis is aimed to determine the methodology for assessment of micro and macro indicators influencing IPO overpricing before and after the crisis event. Firstly, the hypotheses and the stages of the research are presented. Secondly, the overview of the research methods and sample is given. Finally, limitations of the research are defined. The third part of the Master thesis provides the analysis of the IPO overpricing cases and evaluation of micro and macro indicators influencing IPO overpricing level, based on the research methodology presented in the second part. Also, analysis of the dynamics of IPO overpricing levels and changes in the importance of the micro and macro indicators before and after the global financial crisis are provided. Finally, the empirical results of testing research hypotheses are presented and discussed.

**Methods and sources:**

The analysis of the theoretical literature, synthesis and evaluation of previous empirical researches were implemented in this Master thesis in order to conduct the theoretical background for the empirical analysis. The empirical analysis is based on mathematical and comparative analysis while identifying micro and macro indicators and assessing their influence on IPO overpricing before and after the global financial crisis in EU IPOs market. The identification of IPO overpricing cases is based on Buy-and-Hold-Abnormal-Returns (BHAR) method for 3 years and 5 years holding periods. The benchmarks are selected according to the market ratios approach. The influence of macro and micro indicators on IPO overpricing level are analyzed based on multilinear regression analysis. All data are collected from the Bloomberg (2017) database.

# I. THEORETICAL ASPECTS AND RESEARCH AREA OF IPO OVERPRICING PHENOMENON AND INDICATORS INFLUENCING IT

The aim of this part is to analyze the theoretical framework which supports the background of the research. Therefore, in chapter 1.1. theoretical concept of IPO overpricing and its importance are introduced. In chapter 1.2. indicators influencing IPO overpricing are described and influence of economic cycle on IPO overpricing is discussed. Finally, in chapter 1.3. an overview of previous empirical researches on IPO overpricing and indicators influencing it are provided.

## 1.1. Theoretical concept of IPO overpricing and its importance

An initial public offering (IPO) is "the first sale of shares by a private firm to the public on a securities exchange" (Reber & Vencappa, 2015). As commented by J. Davis & H. Keiding (2010), every successful enterprise finally experience a moment when it has to be sold by the entrepreneur. The decision go public is led by the complex process. One of the most important decisions are related to the pricing of the initial stock. However, this decision is challenging because the firm does not have current market prices and trading history. In many cases, it even does not have enough historical financial data. E. B. Steven, J. C. Avina & C. Y. Cheng (2015) argue that the success of IPO event depends on both internal and external indicators which are:

- "the state of the public equity markets generally;
- the perception of the firm and its industry segment by the financial community;
- the financial condition and recent operating results of the firm; and
- the quality, experience and commitment of the firm's management and the board of directors, as well as other members of the working group."

According to this qualification, first two indicators: equity market condition and perception of investors, are external. These indicators cannot be controlled by the firm and can be called macro indicators. Following two: the firm financial position and the quality of governance, are internal indicators. They are influenced by the firm and can be called micro indicators.

Theoretically, in the totally efficient equity market, the issued IPO prices should reflect the fair value of the firm. However, the empirical finance literature suggests that in practice IPOs are often underpriced and/or overpriced. The underpricing problem occurs for almost all stock prices

immediately after they are issued while the overpricing problem usually rises in the long-term period (Eckert, Hannweber & Egteren, 2012).

Underpricing is a situation when the IPO shares offer price is set lower than the fair value of the shares. In the literature, it is agreed that issuers discount the fair value of the IPO shares in order to encourage investors to buy them because if investors wait IPO would fail (Gao, 2010). This leads to large first-day returns and left money on the table by the firms (Santos, 2016). However, the evidence that in average IPOs shares underperform in comparison with non-issuing firms in long-run period was found in many empirical researches (Chan et al., 2007; Gao, 2010; Saade, 2015; Reber & Vencappa, 2015; Zheng, 2006; Wadhw et al. 2016; Shu et al. 2012). These findings suggest that in average IPOs are overpriced. According to Y. Gao (2010), overpricing can be defined as a situation when the IPO shares "offer price substantially exceeds the corresponding intrinsic value computed using multiples of firms in the peer group of the issuing firm" and that "difference between IPO market value and intrinsic value represents overpricing". H. Eckert, T. Hannweber & H. Egteren (2012) overpricing describe through the returns perspective. According to them, overpricing is situation "when average IPO stock returns were compared to the average returns for a similar, matched, group of non-IPO firms in the three to five year after market, the IPO firms sustained systematically lower average returns". It is important to point out that, as said in both definitions, IPO performance are compared with the peer groups and overvaluation of IPO is considered only if IPO underperform in comparison with these peer companies. Although Y. Gao (2010) provides the definition of IPO overpricing through the share prices value perspective and H. Eckert, T. Hannweber & H. Egteren (2012) – through IPO returns, the overpricing effect is the same – investors experience the loss. There can be made an assumption that issuer knows the fair value of the firm (Cho, 2001). However, outside investors do not have full information and have to make adjustments based on the publicly available information. Logically, investors will subscribe for IPO only if they believe that issued stocks are not overpriced. An important point, in this case, is that decision is made based on beliefs which can be rational or irrational as well.

Many hypotheses are explaining the IPO overpricing. Most of them are based on information asymmetry between participants in the IPO transaction (IPO firm and investor). The overview of most often described hypotheses are presented in Table 1. One of it is the agency cost hypothesis which argues that managers prefer to issue IPO in order to receive cash to finance the projects with negative net present value (Yong, 2007). The expenses are covered by shareholders' wealth. This situation occurs because the interest between managers and shareholders diverge.

Another distinguished hypothesis is earnings management hypothesis which says that IPO firms display large gains in operating performance in comparison with earnings management (Yong, 2007). This lead to overoptimistic investors' valuation of firm's future performance. However, when

initial earnings are not durable, investors revalue the firm down to more rational levels. On the other hand, looking from the firm perspective, managers of the firm can have intentions to create an image of better firm's prospects than the real situation.

**Table 1**

**Overview of hypothesis explaining IPO overpricing**

| Hypothesis | Short description |
|---|---|
| Agency cost hypothesis | Managers issue IPO in order to receive cash to finance the projects with negative NPV and cover the expenses by shareholders' wealth because the interests of managers and shareholders diverge. |
| Earnings management hypothesis | Firm displays large gains in operating performance in comparison with earnings management which lead to overoptimistic investors' valuation of firm's future performance. |
| Fads hypothesis | Irrational investor behavior in the equity market is led by fads in these markets. |
| Window of opportunity hypothesis | IPO markets are cyclical during the peak periods and investors are overoptimistic while managers take an opportunity of the conditions in the market in order to lower the costs of capital. |
| Short-selling & heterogeneous beliefs hypothesis | IPOs are subscribed only by most optimistic investors or speculators while time passes more information about the firm become available and the variance of opinions among investors decrease. |
| Cumulative prospect hypothesis | Investors are tended to overweight tails and securities can be positively skewed meaning that investors overprice IPOs. |

*Note: compiled by author, based on O. Yong (2007), P. T. Chana et al. (2007), N. Barberis & M. Huang (2008).*

Third, the fads hypothesis represents the irrational investor behavior in the equity market by arguing that there are fads in these markets which lead to IPO overpricing (Yong, 2007). P. T. Chana et al. (2007) use the term "impresario" hypothesis and add the role of the underwriters to the understanding of fads in the market. Underwriters create the excess demand expression by intentionally underpricing the IPOs. As P. T. Chana et al. (2007) say that "underwriters, behaving like the stars of a rock concert, make the IPO an event". This leads to the initial prices increase in the short-term but during the long-run, they significantly fall.

The window of opportunity hypothesis is based on the IPO shares correspond with the stock market cyclicality (Chana et al., 2007). Moreover, there are identified hot and cold periods in the IPO markets as well. During the peak periods, investors are overoptimistic and overvalue the IPOs in general. As O. Yong (2007) describes, managers take an opportunity of the conditions in the market in order to lower the costs of capital. However, this does not increase the firm's performance in the future. As support for this statement can be mentioned F. Santos (2016) idea about two types of firms which issue IPOs: *Good* and *Bad* firms. *God* firms are described as those which are profitable but have short-term living and at the IPO issuing moment needs external equity to invest in opportunities. Meanwhile, *Bad* firms are without any project and issue IPO in order to exploit market conditions by taking advantage of lower capital costs. The offer price is a function of expected aftermarket retail demand and while in hot periods activity of investors increase, issuers can collect the higher amount of cash. As F. Santos (2016) says, there is some uncertainty about aftermarket demand. However,

"when expected retail demand is high, offer prices significantly exceed fundamental value and all firms go public". Meanwhile, during the recession periods, *Bad* firms wait for the improvement of environment conditions while *Good* firms with profitable projects experience loss due to waiting. So, these firms issue IPO even the market conditions are unfavorable.

Short-selling and heterogeneous beliefs hypothesis argues that IPOs are subscribed only by most optimistic investors or speculators. However, after issuance of IPO more information about the firm and its fair value become available as a time passes. As a result, the variance of opinions among investors decrease and the valuation of the most optimistic investors decrease close to average (Chana et all., 2007). On the other hand, D. Jiang, D. R. Peterson & J. S. Doran (2014) argue that overpricing of high idiosyncratic volatility arises not only because of the overconfident investors but also is affected by short-sale constraints. Authors assume that risk averse overoptimistic investors and rational arbitrageurs trade against each other based on the information which each receives about the firm's prospects. In the case when investors are over-optimistic about the information they receive "rational arbitrageurs are unable to short against mispricing due to short-sale restrictions", then occurs an overpricing. This means that exists insufficient arbitrage which cannot eliminate over-optimism and IPOs overpricing appear.

There also are hypotheses which try to explain investors irrational behavior based more on analysis of human psychology. These analyses seek to find out how investors behave under pressure of the risk. One of the hypothesisis is cumulative prospect hypothesis. As N. Barberis & M. Huang (2008) describes, "people evaluate risk using a value function that is defined over gains and losses, that is concave over gains and convex over losses, and that is kinked at the origin". According to this theory, investors are tended to overweight tails. N. Barberis & M. Huang (2008) argue that securities can be positively skewed meaning that investors overprice IPOs. N. Barberis (2013) explains this theory by looking more detail to the investor's psychology. According to author, there are two steps in the psychology of tail events. Firstly, investor evaluates the probability of a tail event. Secondly, based on the results he makes a decision. The author argues that investors are tended to overestimate tail events, as was said by N. Barberis & M. Huang (2008). N. Barberis (2013) says that this happens because tail events are rare and have a significant impact if occurs, so they get the disproportional attention of the media. Also, these events usually create stronger emotional images.

According to the overlooked hypotheses, it can be said that available information about the indicators before and after IPO issue plays an important role. Also, a critical point is how these indicators are interpreted and what beliefs they generate for investors. There can be looked from two perspectives. Firstly, IPO overpricing can occur because of adjustments and beliefs of investors based on the indicators of the specific characteristics of a firm. Secondly, IPO overpricing can emerge due to indicators about market conditions which influence beliefs about the firm's prospectus and

decision-making behavior of investors. The open question is which indicators – micro or macro – lead to over-optimistic beliefs of investors and IPO overpricing. Therefore, in the following chapter the overview of micro and macro indicators influencing the IPO overpricing discussed in the literature is provided.

## 1.2. Indicators influencing IPO overpricing

As presented in the previous chapter, many hypotheses explain the IPO overpricing phenomenon. It was concluded that available information before and after IPO issue plays an important role because it forms beliefs of investors. The information consist of many indicators which are interpreted by investors. These indicators are either related to the specific characteristics of IPO firm or either with environment conditions surrounding the IPO event. As a result, indicators influencing the IPO overpricing can be distinguish between the micro and macro indicators. Therefore, further in this chapter, these indicators are presented. Additionally, the importance of economic cyclicality is explained.

### 1.2.1. Micro indicators

IPOs shares are surrounded by a greater information asymmetry than currently trading shares. Moreover, IPO firms have the shorter horizon of historical data which leads to the higher role of firms accounting numbers for the fair value of shares assessment and pricing. As a result, in the literature are overlooked many firm-specific indicators which have a potential influence on IPO overpricing.

Firstly, it is discussed the importance of the firm's size.Y. Gao (2010) says that small size firms have a higher information asymmetry problem. Moreover, according to the behavioral finance theory, investors are more over-optimist about small firms. That partly can be explained by the easier manipulation of prices. As a result, there is a risk that small firms are more overpriced than large. Similar reasoning can be provided for the firm's age. Young firms have short historical data. Therefore, the visibility of the firm's potential and operational performance for the investors is low and can be misinterpreted (Saade, 2015). This creates the information asymmetry which potentially leads to the overpricing.

In the literature is agreed that governance of the firm plays an important role in the IPO event. One of the cases can be that a firm is run by an entrepreneur. Then the firm usually has earlier presented characteristics: is small and young. Moreover, S. M. Locke & K. Gupta (2008) argue that entrepreneurial firms are in average overpriced in the long-run. One of the explanation is related to the earlier presented agency theory which argues that managers of the firm transfer the costs of

negative present value projects to the investors due to interest divergence of these two agents. Another interesting aspect is presented by S. M. Locke & K. Gupta (2008) who argue that in some countries (e. g. the US, Irish, Israel) government participates in the IPO market by supporting the medium and small firms, environmentally friendly firms. This can lead to overpricing. As the authors say, the government in these case should invest carefully because by supporting the inefficient entrepreneurial firms can be created a situation when investors won‘t be interested in these firms anymore by taking into consideration that they have a high probability of overpricing. So, it can be said that the indicators that the firm is run by the entrepreneur may influence the IPO overpricing.

Supporting the importance of firm governance can be presented the aspects about venture-capital-backed IPO (VC-backed) and not venture-capital-backed IPO (non-VC-backed) firms. The VC-backed IPO firm is a firm privately provided with funding by venture capital investors and non-VC-backed IPO firm has another source of founding. C. B. Barry & V. T. Mihov (2015) argue that VC-backed firms in average outperform non-VC-backed firms in the long-run. A. Dorsman & D. Gounopoulos (2013) agree to the same aspect. They say that VC-backed firms are supported not only by the investments but also with managerial and technical expertise by the venture capitalist. Moreover, venture capitalists are more focused on long-term performance and managers are encouraged to seek long-term goals. Also, as A. Dorsman & D. Gounopoulos (2013) point, venture capitalists seek to have the positive reputation of the firm, so do not tolerate the failure of IPO which lead to the low risk of overpricing. All these factors create VC-backed indicator as some certification of fairly valued IPO (Gao, 2010).

Also, some characteristics of firm’s financial position which have the effect on the IPO overpricing are analyzed in the literature. One of these characteristics is capital structure. C. B. Barry & V. T. Mihov (2015) argue that both: lenders and venture capitalist, before lending and investments do a careful analysis of the firm. However, the difference between these two founders is that lenders are more interested in the risk, performance volatility and uncertainty level of the firm in order to ensure that the lending is relatively safe. Meanwhile, venture capitalists are looking for the potential of relatively higher gains from the investment. Therefore, C. B. Barry & V. T. Mihov (2015) argue that firms with higher level of debt financing in capital structure “have predictable cash flows, to show less volatility, and to be comparatively easier to value“. This also leads to lower risk of mispricing of IPO shares and can be assumed that it should cause lower risk of overpricing even if these firms with higher debt financing levels tended to have lower returns in long-term. However, S. B. Amor & M. Koolib (2016) provide contrasting argument by saying that firms with higher debt financing levels may be tended to use the window of opportunity discussed earlier. This means that these firms during hot periods can issue IPOs without having a project which requires funding but in order to cover high levels of debts by taking advantage of low equity costs.

Next, X. Li (2010) says that the relation between the high discretionary current accruals in the year of IPO issue and IPO pricing exists. When the firm has high discretionary current accruals calculated "as the abnormal portion of the change in non-cash current assets minus the change in operating current liabilities" its IPO underperform in the aftermarket. X. Li (2010) says that this happens because investors fail to rationally evaluate the future cash flows and are overoptimistic about firm's prospects. The same opinion is proposed by Z. Shen, J. Coakley & N. Instefjord (2013). They argue that investors are tended to overreact to the earnings announcements by overpricing total accruals and in particular abnormal accruals. So, current accruals is the characteristic which has the influence on the investors' beliefs and, as a result, has the impact on IPO overpricing.

The corporate social responsibility is discussed in the literature as one of the indicators which has influence on IPO short-term and long-term performance. As discussed by P. Chan & T. Walter (2014) environmentally friendly firms have lower performance in short-run while experiences non-financial costs. However, in the long-run firms which applied environmentally friendly policy avoid the potential costs of the corporate social crisis. This allows to reach better performance in comparison with non-environmentally friendly firms and creates value for the shareholders. The same argumentation can be applied to other corporate social responsibility policies, e. g. sustainability policy, health and safety policy and etc. Therefore, the corporate social responsibility indicator is one of the indicators which investors could consider before investing in IPO firm. However, the risk that investors overvalue IPO firms, which apply corporate social responsibility, arises.

The internet bubble in 2000 was led by noticeable overpricing of technology sector IPOs. There can be argued that technology IPOs at this period were as some fad and investors were too optimistic about these specific firms. This can be related not only to the technology sector. There are sectors which are held by investors as having a higher growth potential, so are evaluated higher, such as, companies producing chemical products, computers, electronic equipment, scientific instruments or communications (Koop & Li, 2001). If the higher valuation of these IPO is influenced mainly because of firm's dependence on the particular sector, means that it is some fad among the investors. This would mean that IPOs firm dependence on the specific sector has an impact on the IPO pricing and potentially for overpricing.

Investors beliefs and decisions are influenced by many indicators. One group of these indicators are micro indicators which represent the specific characteristics of IPO firm. The micro indicators most often excluded in the literature as having influence on IPO overpricing are size and age, governance structure (entrepreneurial, VC-backed), financial data (level of debt, high discretionary current accruals) of the IPO firm. Second group of indicators influencing IPO overpricing are macro indicators which are presented in following sub-chapter.

### 1.2.2. Macro indicators

Many researchers analyze the external indicators influencing IPO overpricing, like financial markets, the role of intermediaries, regulatory constraints. These indicators influence the investors beliefs and preferences.

In the literature is widely analyzed the underwriters' importance for IPO. E. H. Feroz et al. (2006) argue that underwriters which have the high reputation in the market avoid the IPOs which have high risk in order to keep their prestige. Authors argue that high reputation underwriters have higher capabilities to evaluate the firm's prospectus and based on that set the IPO shares price equal to the fair value. Therefore, the high reputation underwriter is an indicator that its issued IPO is relatively high quality and the offered price represents the fair value of the IPO. The logic of the underwriter pricing issues can be described in order to support this argument. Firstly, if underwriter constantly overprices the IPOs, investors will experience losses and will avoid to submit IPOs from this underwriter in the future (Feroz, et al., 2006). Secondly, if underwriter constantly underprices the IPOs, firms will experience losses and other firms will recognize it and won't use this underwriter's service in the future. Therefore, underwriters which have enough capabilities to evaluate the firm correctly will be tended to offer IPO shares with the fair value price. As mentioned earlier this capabilities have underwriters with high reputation. Moreover, there can be commented that these underwriters have enough bargaining power to set IPO price in bit unfavorable price for the firm in order to lower the risk of IPO failure. On the other hand, B. Reber & D. Vencappa (2015) say that underwriter with high reputation is tended to support the IPO price in the early aftermarket. This leads to the higher mispricing distribution, what can mean the overpricing as well.

Investors' sentiment has the high influence on IPO pricing and long-term performance. Y. C. Chan (2014) argues that underwriters price IPOs above their fair value by taking advantages of high investors' sentiment in the IPO market. As author comments, higher demand of overoptimistic, irrational investors has the higher influence on IPO overpricing level. The similar argumentation expresses F. Santos (2016) by saying that firms are tended to issue IPOs during the periods of high investors' sentiment in order to gain from pricing IPO above the fair value.

Market momentum plays an important role in IPO pricing. The IPOs market cycles are divided into two periods: hot or cold periods. As it is said by Y. C. Chan (2013), "bullish retail sentiment can lead to overpricing of IPO shares and ultimately price reversals in the long-run". Hot periods in the IPO markets are described as those which have high volumes of IPO (Saade, 2015). IPOs in the hot markets are overpriced not only because investors are tended to be too optimistic but also it can be argued that IPO firms qualiaty is lower based on open window of opportunity hypothesis. This is mentioned by M. Goergen, A. Khurshed & R. Mudambi (2007). Authors say that in the IPO market exist "pseudo market timing". At the beginning of the hot market IPOs are issued

by firms which have high prospects and require investment for the project. These firms succeeded with the IPOs and are taken as an example and signal for other firms about the favorable conditions in the market. At the same time sentiment of investors increase. However, firms, which issue IPO at the boom or at the end of hot period, potentially are using the open window opportunity in the market and issue overpriced IPOs. As M. Goergen, A. Khurshed & R. Mudambi (2007) argue, while these volumes are high it is ending that in average issued IPOs during the hot period are overpriced. However, IPO issued at the end of hot period has a higher possibility of overpricing. So, according to these arguments hot period can be taken into account as a macro indicator which creates a potential for the IPO overpricing.

Additionally to IPO market cyclicality, the general economic cyclicality has the influence on firms financing activities. M. Hu (2014) argue that momentum strategies are more profitable during the expansion than recession periods of the economy. Even the IPO firms have the higher probability of better performance when issue IPO during the expansion of economy, investors may be tended to overvalue these IPOs while securities can be positively skewed by investors during expansion periods of the economy (Barberis & Huang, 2008). The economic cycle influence on IPO overpricing is wider explained in the following sub-chapter.

Two types of IPO markets can be distinguished: EU-regulated and Exchange-regulated. These markets differ in terms of regulatory requirements. Exchange-regulated markets have less strict requirements (Guide to listing of debt on European stock exchanges, 2012). As presented in this report the firm takes decision based on investor needs, listing requirements, ability to produce IFRS accounts and etc. Exchange-regulated markets are chosen by smaller, younger firms while it creates the lower amount of costs. As discussed in previous sub-chapter, investors are tended to overprice these firms. While the IPO firms are required to fulfill lower regulatory requirements the risk of information asymmetry increases and the possibility of IPO overpricing increases.

Second group of indicators are macro indicators which represent the external environment which cannot be affected by the IPO firm but has a great influence on IPO overpricing. Most often analyzed macro indicators are the underwriter reputation, IPOs market cycle period (hot or cold period), investors' sentiment. Besides, the economic cycle is also important for the IPO overpricing phenomenon, therefore, the overview of economic cycle influence on IPO overpricing is presented in the following chapter. The summary of overviewed micro and macro indicators influencing IPO overpricing is presented in Figure 1.

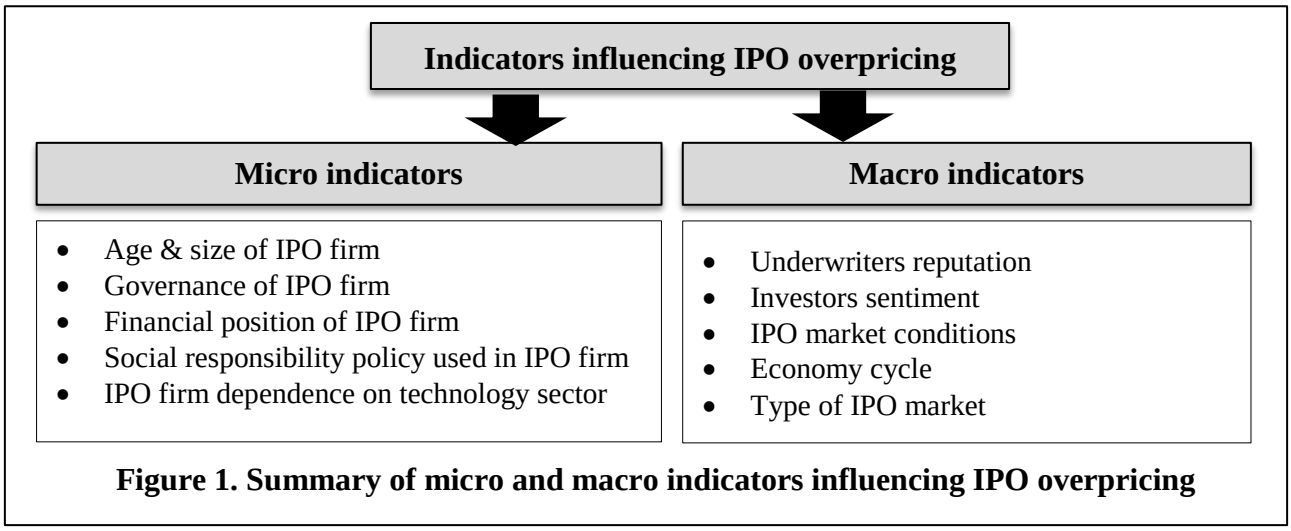


**Figure 1. Summary of micro and macro indicators influencing IPO overpricing**

*Note: compiled by author, based on Y. Gao (2010), S. M. Lock & K. Gupta (2008), A. Dorsman & D. Gounopoulos (2013), C. B. Barry & V. T. Mihov (2015), X. Li (2010), P. Chan & T. Walter (2014), G. Koop & K. Li (2001), E. H. Feroz et al. (2006), Y. C. Chan (2014), M. Hu (2014).*

As can be seen from Figure 1, in this Master thesis overviewed micro indicators influencing IPO overpricing are age & size, governance, financial position, social responsibility policy usage, dependence on technology sector of IPO firm. These indicators represent IPO firm characteristics and depend on IPO firm. The overviewed macro indicators: underwriters reputation, investors sentiment, IPO market conditions, economy cycle, type of IPO market, do not depend on IPO firm and cannot be influenced by it. The following sub-chapter overview the economic cycle influence on IPO overpricing.

### 1.2.3. Economic cycle influence on IPO overpricing

The IPO market is highly cyclical and the volumes of the IPO highly correlate to the current conditions of economy (Ivanov & Lewis, 2008). The number of IPOs significantly dropped after the technology bubble in 2000. The same results was after the global financial crisis in 2008 (Dorsman & Gounopoulos, 2013). As G. Çolak & H. Günay (2011) say, IPO market has been "anemic" and gives an example that "there were only two IPOs issued in the U.S. during 2008Q4 and three issued during 2009Q1". Already this indicates that economic cycles has the impact on the IPO market.

To the cyclicality aspect can be looked from two perspectives. Firstly, it can be discussed the stock exchange market and the IPO market cycles. Secondly, the economic cycle importance can be analyzed.

The period of high IPO volumes in the literature is called the "hot issue" period as discussed earlier. Many researches confirms existence of IPO cycles (Benveniste et al., 2003; Yung et al., 2008; Ritter et al., 2013; and etc.). P. Peterle & A. S. Berk (2016) argue that two potential reasons of IPO market fluctuations can be identified. Firstly, it can be influenced by high need of fresh capital for firms in order to invest in the projects. Secondly, investors have a lot of liquid assets which they are

willing to invest and that could be led by optimistic views. Moreover, as was argued earlier, hot periods in the IPO market are followed by the higher sentiments and over-optimism. This leads to the overpricing of IPO. Besides, the atmosphere during the hot period is highly speculative and at the same time the activity of the investors are increased (Li, Wang & Dong, 2015). All that results in the increased demand of the IPO shares. This is not only recognized by the individual investors who in the literature are also called as noisy investors but also between the institutional investors. They are considered as rational investors. However, because of noisy investors' irrational behavior during the hot periods, institutional investors are misled as well.

Talking about the economic cycle, P. Peterle & A. S. Berk (2016) comment that "The 2000s exhibited a very dynamic period for IPOs in the developed capital markets". The authors mean the two important economic cycle events: the dot-com bubble in 2000 and the global financial crisis in 2008. According to the authors, IPO is an important source of capital rising, therefore, the business crisis affects the IPO markets as well. N. Barberis (2013) argues that "people often overestimate the likelihood of rare, extreme events". However, the underestimation also possible, as according to the author, was before the 2008 financial crisis in the U. S. Looking to the recession period from the investors' perspective, G. Çolak & H. Günay (2011) argue that investors become over-pessimistic. They say that investors absorb that the aggregate economic situation is unfavorable and suspend participation in the IPO market. Investors start to believe that despite the firm's quality, no one firm can successfully manage the investment project. Even there are some optimistic investors during this period, the number of them is too low that firm could generate adequate demand and IPO fails, despite the pricing strategy. In addition, Z. Li, F. Wang & X. Dong (2015) argue that investors during the stock market recession are more cautious in the IPO selections. These authors argue that depending on the market cycle, if it is bull or bear, different strategies of investors are taken in considering the investment into IPO. So, it can be said that during the recessions the overpricing of the IPOs are irrelevant. However, there can be raised a question how long takes to reduce the pessimism of investors after the crisis.

Moreover, recession in the economic cycles is considered as a period of high volatility and information asymmetry. As A. Dorsman & D. Gounopoulos (2013) comment, because of this uncertainty in the economy and in financial markets venture capitalists and investors become less active and do not invest "unless there is some guarantee of obtaining attractive rewards for the risk they bear". As a result, firms which have a need of equity funding during the recession have to accept the risk and the costs (Dorsman & Gounopoulos, 2013). Therefore, many firms choose to postpone the IPOs till the situation in the market stabilizes. So, firms in the later phase of life face lower effect of the recession. G. Çolak & H. Günay (2011) support this argument by saying that firms during the crisis and after it, while the market is still in slowdown conditions, take strategical decision to

postpone the IPO. The strategy is to wait till more information about the economic conditions will occur. This information can be obtained by observing the success of other firms IPOs in current economic situation. As G. Çolak & H. Günay (2011) argue, if firm issue IPO and succeeded it become a pioneer which motivates other firms issue IPOs. Authors call this process as "social learning among firms". The same opinion expresses M. Hu (2014) by saying that according to neoclassical efficiency hypothesis the economic cycle conditions and the economic fluctuations influence the firms' decisions of financing transactions. This means that during the economic expansion firms see an opportunity and issue shares and during slowdowns – repurchase their shares.

So, the IPO market is highly cyclical and the volumes of the IPOs highly correlate to the current conditions of the economy. The cyclicality aspect can be looked from two perspectives: the stock exchange market and the economy as a whole. The period of high IPO volumes in the literature is called as the "hot issue" which is followed by the higher sentiments and over-optimism of investors. The two important economic cycle events were in recent period: the dot-com bubble in 2000 and the global financial crisis in 2008. The recessions are led by high volatility and information asymmetry, investors are tended to overestimate the likelihood of the recession event.

## 1.3. Analysis of previous research on IPO overpricing and indicators influencing it

According to the literature overview in the previous chapter, the high number of theoretical indicators, which influence the IPO overpricing, are distinguished. These indicators are broadly analyzed in the previous researches. However, not all aspects are confirmed in the practices what provides debates. Therefore, following in this chapter the results of previous empirical researches, used methodology and discussed possible extensions of research are provided.

### 1.3.1. Areas of problem analysis and results of previous empirical research

Many of researches confirm that IPO overpricing exists in practice. As discussed in the previous chapter, many hypotheses explain this phenomenon. However, some of the theoretical aspects are not confirmed by empirical analysis. Therefore, in this chapter are overlooked analyzed problems and findings of previous empirical researches.

The previous empirical researches of the IPO overpricing are analyzed in many countries and covers different periods of time (see Table 2). IPOs issued in the U. S. market have the highest level of investigation (Amor & Koolib, 2016; Chan, 2013; Saade 2015; Barry & Mihov, 2015; Zheng, 2006). However, the level of interest about other IPO markets is increasing. The great attention are put on the Asian countries, especially China (Gao, 2010; Shen, Coakley & Instefjord, 2013; Locke &

Gupta 2008). Many of these researches analyze the period which includes the Internet bubble peak in 2000. On the other hand, there is a number of researches which pay attention to the period which covers to the global financial crisis as well.

**Table 2**

**Summary of previous researches of IPO overpricing**

| Author | Period | Country | Results |
|---|---|---|---|
| Y. Gao (2010) | 07 2006-04 2008 | China | Market sentiment, individual investor oversubscription and trading volume positively effect IPO overpricing. Firm size, underwriter reputation, price range, market momentum are not significant. Only the overpricing component determines IPO underperformance in the long-run. |
| S. M. Lock & K. Gupta (2008) | 11 2003-03 2006 | New Zealand | Entrepreneurial IPO firms are overpriced and suffer a price decline in post-listing. |
| Z. Shen et al. (2013) | 1998–2003 | China | Changes in ROA, CFOA, sales growth, capital expenditures, ATO are negatively related to long-term abnormal returns, meaning that investors are over-optimism about the growth prospects. |
| S. B. Amor & M. Koolib, (2016) | 1996-2012 | U.S.A. | The level of debt has the negative and significant effect on long-run returns. Underwriter reputation has positive and VC-backed IPOs has negative but not statistically significant effects on long-run returns. Bubble in 2000 and the global financial crisis in 2007 have the negative significant effect on long-run abnormal returns. |
| Y. C. Chan (2013) | 1994-2004 | U.S.A. | Underwriter reputation and VC-backed IPOs variables have positive, while technology firm and bubble in 2000 variables have the negative effect on long-run abnormal returns. IPO underperformance is due to overpricing. Investor sentiment increases overpricing. |
| B. Kirkulak (2008) | 1998-2001 | Japan | In long-run: no significant difference between VC-backed and non-VC-backed firms, high overoptimism about high-tech industries IPOs, the largest size group underperform the most |
| S. Saade (2015) | 1992-2009 | U.S.A. techn. industry | In long-run IPO performance are: negatively affected by over-optimism of individual investor sentiment (but not by the institutional investor), negatively associated with the bubble period, positively affected by investor overconfidence, age. IPOs which are taken by prestigious underwriters and are VC-backed underperform in long-period. |
| P. G. Shu, S. J. Chiang & H. Y. Lin (2012) | 2004-2008 | Taiwan | The overreaction is not affected by earnings management and managerial optimism. Managerial over-optimism is the dominant indicator in explaining long-run underperformance. Underwriter's reputation, corporate governance affects positively the initial return. |
| C. B. Barry & V. T. Mihov (2015) | 1980-2012 | U.S.A. | In long-run firms with high debt levels and non-VC-backed underperform. During the financial crisis, the debt levels of IPO firms increased but the fraction of VC-backed IPOs decreased. |
| S. X. Zheng (2006) | 1980-1997 | U.S.A. | IPO valuation results are sensitive to the control for growth expectation and whether new primary shares are included when calculating price multiples. Alternative methods addressing these issues showed that the IPO firms are not overvalued and do not underperform against matching the firm in long-run. |

*Note: compiled by author based on previous empirical researches presented in Table 2.*

One of the problematic aspect analyzed in previous researches is the variables which influence the IPO overpricing. The recent researches mostly concentrate on the aspects of investor behavior, particularly, the investors' sentiment. For example, Y. Gao (2010) analyzes the rational and irrational indicators influencing the IPO overpricing. According the results, IPO overpricing are influenced by market sentiment, individual investor oversubscription and trading volume variables. These variables

represent the irrational aspects of the investors. Meanwhile, rational indicators, such as IPO firm size, chosen underwriter, price range, market momentum, oversubscription, IPO volume, are not significant. These results confirmed the behavioral finance theory existence in the practice. Other authors, like Z. Shen, J. Coakley & N. Instefjord (2013), Y. C. Chan (2013), confirm that investor sentiment leads to IPO overpricing. These findings support the investor sentiment importance mentioned in the literature overview.

Many micro indicators influencing the IPO overpricing are founded in the previous empirical researches. S. M. Locke & K. Gupta (2008) provide evidence that entrepreneurial firms issuing IPO are overpriced. As a result, these firms underperform in post-market. Next, Z. Shen, J. Coakley & N. Instefjord (2013) show that discretionary accruals are overpriced and overreaction leads to overpricing. S. B. Amor & M. Koolib, (2016) find that IPOs which declare debt repayments as the possible use of proceeds underperform in comparison with benchmarks. P. Carey, V. Fang & H. F. Zhang (2016) analyze the positive information about the firm impact on its IPO pricing. Authors identified that in general IPO is overpriced in comparison with the industry benchmark. However, IPO which receives the positive news before the first day of trading is not overpriced. This is specific for Australian IPO market because, opposite to the U. S. market, there is not silent period before the first day of trading.

Another aspect analyzed in the previous researches is the relations between IPO overpricing and post-market underperformance. According to the results of Y. Gao (2010) analysis, the only indicator which has significant importance for IPO shares underperformance in the long-run is IPO overpricing. Y. C. Chan (2013) confirms these findings by providing the evidence that shares of overpriced IPOs underperform in comparison with other benchmarks in long-run. However, results show that these IPO not necessary underperform in comparison to the benchmarks from the same industry. As the author says, this is because all firms in the same industry are overpriced. This proves the existence of fads theory overlooked in the previous chapter. On the other hand, B. Kirkulak (2008) analyzes the Japan market and provides the opposite results: overpriced IPO perform better than underpriced IPO in the long-run. There are identified many indicators which cause the underperformance in the long-run. These indicators can be related to the characteristics of IPO firm like non-venture-backed, poor underwriter prestige, high capitalization, young age of firm, high debt levels. Moreover, long-run underperformance is affected by irrational components like over-optimism of investors and managerial over-optimism. These shows the interconnections between indicators influencing IPO overpricing and underperformance.

As mentioned before, many of researchers analyze the period which includes the internet bubble or the global financial crisis. These researchers provide the findings of business cyclicality importance to IPO market. Y. C. Chan (2013) finds that individual investors are overoptimistic during

the bubble period. This, according to the most of the researches, leads to the IPO underperformance in post-market (Chan, 2013; Saade, 2015; Carey, Fang & Zhang, 2016). Also, the business cyclicality influence the characteristics of the firm, for example, C. B. Barry & V. T. Mihov (2015) find that during the global financial crisis the debt levels increased but the number of VC-backed companies decreased. While these characteristics can influence either IPO overpricing and underperformance, business cyclicality is an important aspect for IPO market. The strong supporting arguments are provided by Z. Li, F. Wang & X. Dong (2015) research. Authors analyze the IPO timing and find that volume of IPO at hot periods are higher than in cold periods. According to the results, firms use IPO timing strategy not necessary to get benefits from overpricing in the market but because of strategic reasons, absorbed economic conditions. These findings partly deny the opportunity window hypothesis. Also, on the contrary to the literature, the results show that first firms issuing IPOs in the recovering market are not high-quality firms. However, extremely low-quality firms issue IPO during the mid-to-late stage of raising cycles.

Despite all these findings, there is some evidence that IPOs are not overpriced in general. S. X. Zheng (2006) argues that IPO overpricing analysis is sensitive to the chosen methodology. The author provides improvements of the methodology by adding the control variable for expectation growth and adding new primary shares to multiples calculations. After these modifications results show that there is no evidence of the IPO overpricing and underperformance in the comparison with the benchmark.

The findings of indicators influencing IPO overpricing differ in previous researches. The highest disagreement is in evaluating a firm-specific – micro – indicators such like firm size, governance structure, financial data. The macro indicators like: a crisis event, underwriter reputation, investor sentiment, in most cases are identified as significant indicators for IPO overpricing. Also, most of these findings support the IPO overpricing as the main determinant for long-run underperformance.

### 1.3.2. Methods used in previous empirical research

IPO overpricing is considered as an anomaly in the market because it raises a question about market inefficiency. The mispricing in the long-run is analyzed as abnormal returns performance over one-to-five year period following a certain event (Khotari & Warner, 2006). In this case, the particular even is IPO issue. The most often used methods for abnormal returns performance measurement are buy-and-hold abnormal returns (BHAR) method, Fama and French (1993) three-factor model and Carhart (1997) four factors model. The overview of methods used in previous empirical researches are presented in the Table 3.

**Table 3**

**Overview of methods used in previous empirical researches**

| Method | Research | Benchmark | Horizon |
|---|---|---|---|
| Buy-and-hold abnormal returns (BHAR) | P. T. Chana et al. (2007) | A control firm by size and industry or BTM and industry & the market index: Hang Seng Index | 1-day, 3-days, 1-month, 3-month, 6-month, 1-year, 2-year, 3-year |
| Buy-and-hold abnormal returns (BHAR) | Y. C. Chan (2013) | Monthly return on Fama and French's (1993) value-weighed portfolios by size and BTM | 1-year, 2-year, 3-year |
| Buy-and-hold abnormal returns (BHAR) &Fama and French (1993) model | F. Moshirian, D. Ng, E. Wu (2009) | Market indexes, a control firm by size and BTM & matched reference portfolios by size and BTM | 1-month, 3-month, 6-month and 1-year, 3-year and 5-year |
| Capital Asset Pricing Model (CAPM), Fama and French(1993) three-factor model & Carhart (1997) four factors model | A. Dorsman, D.Gou nopoulos (2013) | - | 1-year, 2-year, 3-year |

*Note: compiled by author based on previous empirical researches presented in Table 3.*

The characteristic-based matching approach in literature is also called as the buy-and-hold abnormal returns approach (BHAR). As S. P. Khotari & J. B. Warner (2006) cited Mitchell & Stafford (2000, p. 296), BHAR measures abnormal returns as "the average multiyear return from a strategy of investing in all firms that complete an event and selling at the end of a specified holding period versus a comparable strategy using otherwise similar non-event firms." BHAR approach assumes that "event firms differ from the "otherwise similar nonevent firms" only in that they experience the event" (Khotari & Warner, 2006). This means that it is necessary to find the similar peer firm in order to compare the firm which issue IPO and the firm which not issues IPO. The peer firm is chosen according to the matching indicators which were selected for the analysis. As it is presented later, it has not necessary to be a firm. In practice are used other benchmarks, like market indexes. When the peer firm (or another benchmark) is identified, *T*-month BHAR for event firm *i* is calculated using the following formula:

$$BHAR_i(t, T) = \prod_{t=1 \text{ to } T}(1 + R_{i,t}) - \prod_{t=1 \text{ to } T}(1 + R_{B,t}) \quad (1)$$

where $R_B$ is the return on a non-event firm (or another benchmark) that is matched to the event firm *i* (Khotari & Warner, 2006). In this case, an event firm is a firm which issues IPO.

The buy-and-hold abnormal returns approach is used by P. T. Chana. et al. (2007). The authors build two models. First one, the buy-and-hold abnormal returns calculated based on the Hang Seng Index (because it was analyzed Hong Kong IPO market). The second one calculates BHARs based on 1) the industry and book-to-market ratio; 2) the industry and size; and 3) the size and book-

to-market matched control firm approaches. As can be seen in the first case, instead of using returns of matched firm, authors use investment return for the market index at month *t*. F. Moshirian et al. (2009) also use BHARs method and give argumentation for this decision: 1) "cumulative abnormal returns (CARs) neglect compounding effects whereas BHARs include compounding effects and produce returns that reflect investor experience"; 2) "the BHAR which is calculated as the rate of return for the sample firm less the rate of return for a reference portfolio is subject to a new listing bias, a skewness bias and rebalancing bias". Besides, authors comment that the test statistics of this method takes into account the transaction costs and is well specified. There can be mentioned Y. C. Chan (2013) research which also uses the buy-and-hold abnormal returns approach. Authors construct two models. One adjusts BHAR by style and the second – adjust by industry. Therefore, in the first case $R_{B,t}$ return from the (1) formula is replaced by the corresponding month on value-weighed portfolios formed on size and book-to-market ratios. In the second case $R_{B,t}$ return is replaced by the corresponding monthly return on value-weighted industry portfolios. Y. Gao (2010) uses buy-and-hold abnormal returns method as well. He analyzes the period of 2006-2008, which means that sample covers short period. However, the author says that BHAR approach can be used and instead using three-to-five-year returns as is common practice in other researches, the author uses three months, six months, and one year periods. The variables for the (1) formula are calculated similarly to P. T. Chana. et al. (2007) research because the abnormal return are calculated either as the IPO return minus market index return or the IPO return minus the corresponding industry index return instead of using matching firms returns.

However, BHAR method has drawbacks. F. Moshirian et al. (2009) argue that this approach tends to over-estimate the long-run underperformance of IPOs. Additionally, according to the authors, "the use of benchmark market indices suffers from new listing bias, survivorship bias and rebalancing bias". Also, F. Moshirian et al. (2009) point that BHARs calculated as the mean of monthly calendar-time returns (cumulative returns) brings a problematic issue for investment which is held for a long period of time. In this case returns are not adequately calculated because of the compounding effect.

One of problematic question is to choose characteristics according which to select the peer firm. As mentioned earlier, P. T. Chana et al. (2007) calculate abnormal returns in two ways: by using the market index and by using matched control firm approaches. Authors argue that control firm approach in contrast to market index approach allows to improve the results. This is because it excludes irrelevant information and compares only with similar companies.

F. Moshirian et al. (2009) express the similar opinion and for the control firm approach use matching firm size and book-to-market ratios. According to the authors, both indicators are important in taking the decision to go public. They argue that "Value firms tend to have higher book-to-market ratios, whilst growth firms have lower book-to-market ratios". F. Moshirian et al. (2009) say that it

is important to distinguish these two aspects because it would be incorrect to compare an IPO with high growth potential but at an early stage of its life cycle with a control firm that is also small but without future growth prospects. P. T. Chana et al. (2007) use the same argumentation for the selecting the peer firm by using firm size and book-to-market ratio. F. Moshirian et al. (2009) select the peer firm in two steps: firstly, select firms which match the size, secondly, choose a firm with the closest book-to-market ratio. The same steps follow P. T. Chana et al. (2007). Additionally, authors comment that it is necessary to find a tradeoff between these two measures. In order to compare the IPO firm with the peer firm more similar in terms of book-to-market ratio, it may need to be more flexible on the size criteria.

Y. Gao (2010) argues that a matching firm can be chosen according to the industry, size, and profit margin. However, the author uses the only industry as a criterion for the matching firm because his analysis covers only short period and only China IPO market what leads to the small sample. An industry importance as the indicator for the matching firm selection confirms P. T. Chana et al. (2007). However, these authors next to the industry indicator also include the size measure and in another model the book-to-market ratio measure. So, in first case matching firm is in the same sector and closest in terms of size. In the second case, the chosen peer firm is in the same industry and closest in the terms of book-to-market ratio. P. T. Chana et al. (2007) argue that industry is an important indicator because there can be the unexpected event in the industry which will affect all firms in that industry. However, authors notice that in some cases it may be difficult to find matching firm according to industry and additional indicator: size or book-to-market ratio. As it was said, this is a case for Y. Gao (2010) research.

In the literature are chosen different length periods for the buy-and-hold abnormal returns calculations. P. T. Chana et al. (2007) argue that holding period is tradeoff between two aspects. On one hand, chosen longer period may result in higher total underperformance. On the other hand, it brings higher variability which reduces significance level of findings. P. T. Chana et al. (2007) use 1-day, 3-days, 1-month, 3-months, 6-months, 1-year, 2-years and 3-years periods. In the analysis are included the short-term periods because authors next to the long-term underperformance analyze the short-term returns. Similarly, Y. C. Chan (2013) analyze 1-year, 2-years and 3-years periods. Authors point that abnormal returns are started to calculate "from the second month after the IPO in order to remove the effect of price stabilization activities conducted by the underwriters". F. Moshirian et al. (2009) use 3 years and 5 years periods based on different benchmarks. So, authors focus on longer period analysis. In contrast, Y. Gao (2010), as mentioned earlier, uses 3-months, 6-months, and 1-year periods because of the short period of the sample (the period of 2006-2008). These periods are analyzed separately in order to see the different points of time after IPO.

The second approach usually used in the researches are the Jensen-alpha approach. It is also called as the calendar-time portfolio approach. This method assumes that the sample of firms experiences a corporate event which in this case is IPO issue (Khotari & Warner, 2006). The second assumption is that price performance are estimated over 24 month period following the IPO event for each sample firm. The number of firms in the portfolio changes each month because each month are added new IPO issues and extracted firms which issued IPO more than 24 months before current month. Then an equal or value weighted portfolio excess return is calculated. Then there can be chosen between three methods: "The resulting time series of monthly excess returns is regressed on the CAPM market factor, or the three Fama-French (1993) factors, or the four Carhart (1997) factors" (Khotari & Warner, 2006). The formula of Carhart (1997) four factors method is presented below:

$$R_{pt} - R_{ft} = a_p + b_p (R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t \div m_p UMD_t \div e_{pt} \quad (2)$$

where:

$R_{pt}$ is the equal or value-weighted return for calendar month t for the portfolio of event firms that experienced the event within the previous T months;

$R_{ft}$ is the risk-free rate,

$R_{mt}$ is the return on the equal-weighted market index;

$SMB_{pt}$ is the difference between the return on the portfolio of "small" stocks and "big" stocks;

$HML_{pt}$ is the difference between the return on the portfolio of "high" and "low" book-to-market stocks;

$UMD_{pt}$ is the difference between the return on the portfolio of past one-year "winners" and "losers";

$a_p$ is the average monthly abnormal return (Jensen alpha) on the portfolio of event firms over the T-month post-event period;

$b_p$, $s_p$, $h_p$, and $m_p$ are sensitivities (betas) of the event portfolio to the four factors.

F. Moshirian et al. (2009) also use the Fama–French three-factor model. The difference between this and previously presented the four Carhart factors method is that Fama–French three-factor model does not include the $UMD_{pt}$ factor which is the difference between the return on the portfolio of past one-year "winners" and "losers" (see formula 2). F. Moshirian et al. (2009) use 5 years period for the abnormal returns calculation instead of 2 years pointed by S. P. Khotari & J. B. Warner (2006).

The multilinear regression model can be built after abnormal returns calculations. The dependent variable is IPO overpricing level calculated as abnormal returns. Independent variables represent the indicators which have effect on IPO overpricing.

In order to measure the IPO overpricing, the abnormal returns calculations are needed. The most often used methods are buy-and-hold abnormal returns (BHAR) method, the three-factor model

and Carhart (1997) four factors model. Market indexes and a control firm approaches are used for benchmark selection. Analysis horizon differs by different researches but for the long-term period, it can take from 1 till 5 years.

### 1.3.3. Gaps in the previous problem research and possibilities to extent analysis on IPO overpricing and indicators influencing it

As can be seen from the previous chapter, many researches analyze IPO overpricing phenomenon. Despite this, there still is a space for further analysis of the topic by providing new insights and deepening the understanding of the IPO overpricing. As follows, this paper extents the previous researches by adding new components.

Firstly, previous empirical researches most often were focused on few indicators or on the group of specific indicators (e. g. S. M. Locke & K. Gupta (2008) analyzed the indicator of entrepreneurial companies, Z. Shen, J. Coakley & N. Instefjord (2013) – earnings management and investor sentiment, B. Kirkulak (2008) – venture capital (VC-backed vs non-VC-backed). This paper expanded the research by including the greater number of variables possibly affecting the IPO overpricing based on literature review and previous research findings. This allows to see the broader view of the IPO overpricing phenomena.

The previous researches do not address distinguish between the micro and macro indicators. Y. Gao (2010) analyzes such variables as market sentiment, individual investor oversubscription, underwriter reputation which can be called as macro indicators. Also, the author analyzes the size of the firm and other characteristics which can be influenced by the firm like offer price adjustment, initial pricing range. However, Y. Gao (2010) does not put attention if these indicators are micro or macro indicators. Similarly, S. B. Amor & M. Koolib (2016) address firm-specific characteristics like the level of debt, VC-backed versus non-VC-backed firms, sales, investment. On the other hand, authors include macro indicators: underwriter reputation, internet bubble in 2000 and the global financial crisis. These authors do not point out this aspect as well. Other researchers often include only micro or only macro indicators in the analyzes, e. g. Z. Shen et al. (2013) analyze only micro indicators such as changes in ROA , CFOA, sales growth, capital expenditures. Therefore, the space for the different scope of analysis exists by pointing out micro and macro indicators effect on IPO overpricing separately.

The most recent data included in the overview of previous researches covered period till 2012 (Amor & Koolib, 2016; Barry & Mihov, 2015). These and some other researches (Gao, 2010; Saade, 2015; Shu, Chiang & Lin, 2012) include the period which covers the global financial crisis event. However, many even recent researches concentrates on the internet bubble event in 2000 (Shen

et al., 2013; Kirkulak, 2008). While the years pass after the global financial crisis the researches can include longer time periods by using most recent data.

Finally, the U.S. market is highly analyzed by previous researches (Amor & Koolib, 2016; Chan, 2013; Zheng, 2006; Barry & Mihov, 2015). Also, the increasing attention is on Asian market (Gao, 2010; Locke & Gupta, 2008; Shen et al., 2013; Kirkulak, 2008). Some researches analyze the IPO markets of the separate European countries (e. g. A. Dorsman & D. Gounopoulos (2013) analyzed the Dutch case, W. Bessler & S. Thies (2007) – Germany case, M. Goergen, A. Khurshed & R. Mudambi (2007) – U.K. case). However, there is a lack of the research which systematically covers the whole EU IPOs market.

The analysis of the previous IPO overpricing phenomenon research results discloses the possibility for further research of this problem by addressing gaps like including more indicators and distinguishing them to micro and macro indicators. Also, EU IPOs market can be analyzed in more systematic way by using most recent data.

# II. METHODOLOGY FOR THE ASSESSMENT OF MICRO AND MACRO INDICATORS INFLUENCE ON IPO OVERPRICING BEFORE AND AFTER THE GLOBAL FINANCIAL CRISIS

The aim of this part of Master thesis is to develop the methodology for assessment of micro and macro indicators influencing IPO overpricing before and after the global the financial crisis event. Therefore, in chapter 2.1. the relevance and the aim of the empirical research are presented, in chapter 2.2. empirical research hypothesis are formulated and in chapter 2.3. the logics of the research is presented. The review of the data sample and methods are provided in chapters 2.4. and 2.5. Finally, limitations of the research are described in chapter 2.6.

## 2.1. Relevance and aim of the empirical research

The aim of the research is to assess the influence of micro and macro indicators on IPO overpricing before and after the global financial crisis. The relevance of this research arises from the complexity and importance of IPO pricing issues. The absence of current market prices, trading history and, in many cases, even the lack of historical financial data of the IPO firm leads to pricing anomalies. One of the phenomena is IPO overpricing.

The IPO overpricing is not only discussed in the theoretical framework but also analyzed in many empirical researches which provide evidence about IPO overpricing and underperformance in long-run (Chan et al., 2007; Gao, 2010; Saade, 2015; Reber & Vencappa, 2015; Zheng, 2006; Wadhw et al. 2016; Shu et al. 2012). IPO overpricing is more relevant in the long-run period which creates methodological difficulties for evaluation. As a result, the findings exist more divergent than in underpricing phenomena. So, IPO overpricing remains an important issue in the dynamic environment despite the number of existing previous researches.

The IPO overpricing anomaly is explained by the different hypotheses. Most of them are based on information asymmetry problem among participants in the IPO transaction. An assumption that investors make decisions to invest in the IPO based on partly information can be taken. Also, investors not always take rational decisions and are led by sentiments. The information about specific indicators can be either related to the characteristics of the firm or with the conditions in the market and the economy overall. Therefore, this research is focused on distinguishing between micro and macro indicators what was not addressed in previous researches. This increase the scope of research complexity.

Another an important characteristic of IPO addressed in this research is the IPO market cyclicality (Ivanov & Lewis, 2008). The volumes of IPOs highly correlate to the current conditions in the economy. The decision-making behavior of investors differs in different economic environment. They are tended to overestimate the likelihood of rare, extreme events (Barberis, 2013). Additionally, the level of information asymmetry depends on the economic cycle. The IPO market cyclicality was confirmed by the global financial crisis. This crisis left many consequences which led to changes in the political, legal, financial environment and possibly in the investors' decision-making behavior on IPO valuation. This research pays attention to the global financial crisis event and includes most resent and longer-term period data available after this event.

The analyzed matket in this research is the EU IPOs market. The EU IPOs market is sellected because other markets like U.S. and Asia already have high number of recent researches of IPO overpricing. Some researches analyze the IPO markets of the separate EU countries e. g. A. Dorsman & D. Gounopoulos (2013) analyze the Dutch case, W. Bessler & S. Thies (2007) – Germany case, M. Goergen, A. Khurshed & R. Mudambi (2007) – U.K. case. This research include IPOs issued in all EU member states.

As a result, the aim of this empirical research is to assess micro and macro indicators influence on IPO overpricing before and after the global financial crisis in EU IPOs market.

## 2.2. Empirical Research Hypotheses

In order to reach the aim of this research, four hypotheses were raised. These hypotheses are formulated based on the literature review and are presented and described further in this chapter.

The IPO overpricing existence is supported by previous researches in various IPO markets, e. g. Y. Gao (2010) and Z. Shen et al. (2013) analyze and provide evidence about overpricing in China IPO market, S. M. Locke & K. Gupta (2008) - in New Zealand market, S. B. Amor & M. Koolib, (2016) and Y. C. Chan (2013) – in U.S. market, P. Carey, V. Fang & H. F. Zhang (2016) – in Australia market. On the other hand, S. X. Zheng (2006) analysis U.S. market and finds no evidence about IPO overpricing. Moreover, the author argues that IPO overpricing calculations are very sensitive to the methodology and many researches do not include the critical aspects. As a result, according to the author, findings suggest the existence of IPO overpricing while in reality, it is not. However, many researches prove evidence of IPO overpricing existence which allows to hypothesize that there is a high probability of IPO overpricing existence in general. This may differ depending on the specific markets and time periods but it is reasonable to state that IPO overpricing phenomenon exists. This can be applied for the EU IPOs market. Therefore, one of the hypothesis which is raised for this research is:

*Hypothesis 1: IPO overpricing phenomenon exists in EU IPOs market.*

Y. Gao (2010) analyzes IPO overpricing by distinguishing the influencing indicators into rational theory and behavior theory indicators leading the investors' sentiments. The author finds evidence that rational theory indicators such as firm size, underwriter, price range, market momentum, are not significant for IPO overpricing. On the other hand, Y. Gao (2010) provides evidence that behavior theory indicators: market sentiment, individual investor oversubscription and trading volume variables, have a significant influence for the IPO overpricing. This research concentrates on the distinguishing indicators influencing IPO overpricing into micro and macro indicators. These indicators are divided into these two groups based on the firm's ability to influence them. Respectively, micro indicators are those which the firm can influence and control, macro indicators are not dependent on the firm's influence and cannot be controlled by it. Most of the micro indicators, such as size, age, the level of debt backed firm, debt, accruals, represent the indicators analyzed in rational theory. Meanwhile, macro indicators (e. g. IPO volatility, underwriters reputation) have the higher probability to be interpret with sentiment of investors leading to irrational investment decisions. This means that macro indicators can be related to the behavior theory. As a result, micro and macro indicators distinguished in this research to some extent can be respectively linked to Y. Gao (2010) distinguished rational theory and behavior theory indicators. Linking this research to Y. Gao (2010) research, the statement that macro indicators have higher influence to the IPO overpricing then micro indicators can be formulated. Also, this can be explained by the argument that overpricing is irrational phenomenon. Therefore, irrational indicators dominated in the market have greater influence to the investor sentiment which leads to the IPO overpricing than firm-specific characteristics which are more related to the rational evaluation. As a result, the second hypothesis was raised:

*Hypothesis 2: Macro indicators have the higher influence on IPO overpricing than micro indicators in EU IPOs market.*

Many researches confirm the existence of hot and cold periods in IPO markets (Benveniste et al., 2003; Yung et al., 2008; Ritter et al., 2013). In literature, it is agreed that hot periods are followed by the higher sentiments, over-optimism and speculative atmosphere which, as a result, has greater impact on IPO overpricing. However, during cold periods activity of the investors decrease. Another important aspect, as it was presented in the theory review, is IPO overpricing dependence on the cyclicality of the economy (Ivanov & Lewis, 2008). The IPO market stagnation after the global financial crisis confirms it. This happens because of investors behavior changes during the different cycle periods. As F. Wang & X. Dong (2015) argue, investors during the stock market recession are more cautious in the IPO selections. Additionally, N. Barberis & M. Huang (2008) say that investors are tended to overweight tails what in this case is the global financial crisis. All these arguments prove the economic cycle importance to the IPO market. The global financial crisis is not an exception.

Moreover, while investors tend to overweight tail events, they are more cautious even after the global financial crisis when economic conditions come back in the stable position. This means the lower space for IPO overpricing. Also, extreme events, like the global financial crisis, give some experience to the investors which leads to decision-making behavior changes. It can be expected that investors would become more rational and therefore would pay higher attention to the firm-specific characteristics – micro indicators. Therefore, two hypothesis 3 and 4 were raised:

*Hypothesis 3: Influence of micro indicators on IPO overpricing increased in EU IPOs market after the global financial crisis.*

The opposite situation with the macro indicators can be expected. Macro indicators have the higher influence on IPO overpricing than micro indicators (as it was discussed in *Hypothesis 2*) even after the global financial crisis. However, the importance level of the macro indicators potentially decreased comparing with the pre-crisis situation. Therefore, the following hypothesis can be raised:

*Hypothesis 4: Influence of macro indicators on IPO overpricing decreased in EU IPOs market after the global financial crisis.*

The testing of these four hypotheses provides an ability to reach the aim of this research. *Hypothesis 1* allows to identify the existence of the overpricing in the EU IPOs market. *Hypothesis 2* allows to analyze the difference in importance of micro and macro indicators influencing the IPO overpricing. *Hypothesis 3* and *Hypothesis 4* allow to analyze the global financial crisis influence on changes in the importance of micro and macro indicators on IPO overpricing. The specification of the logic and stages of this research are presented in the following chapter.

## 2.3. Logics and stages of empirical research

This chapter is dedicated to the explanation of logics and stages of this empirical research. The empirical research is constructed in the way that would allow to test the raised hypotheses. The stages of the analysis are based on previous researches practices which were breathily disused in the literature review.

The logics and stages of the research are presented in Figure 2. As can be seen from the Figure 2, the empirical research has four main stages and one preparatory stage. The aim of Stage 1 is to identify the benchmarks necessary for the performance of further research stages. Therefore, this stage is crucial. As discussed in the literature review, in the previous researches most often two types of benchmarks were used: (1) a control firm selected according to the specific criteria and (2) a market ratio. The market ratio is chosen as the benchmark in this research while the analysis of EU IPOs market provides the wide sample and this approach is simplified what allows to deal with the wide sample.

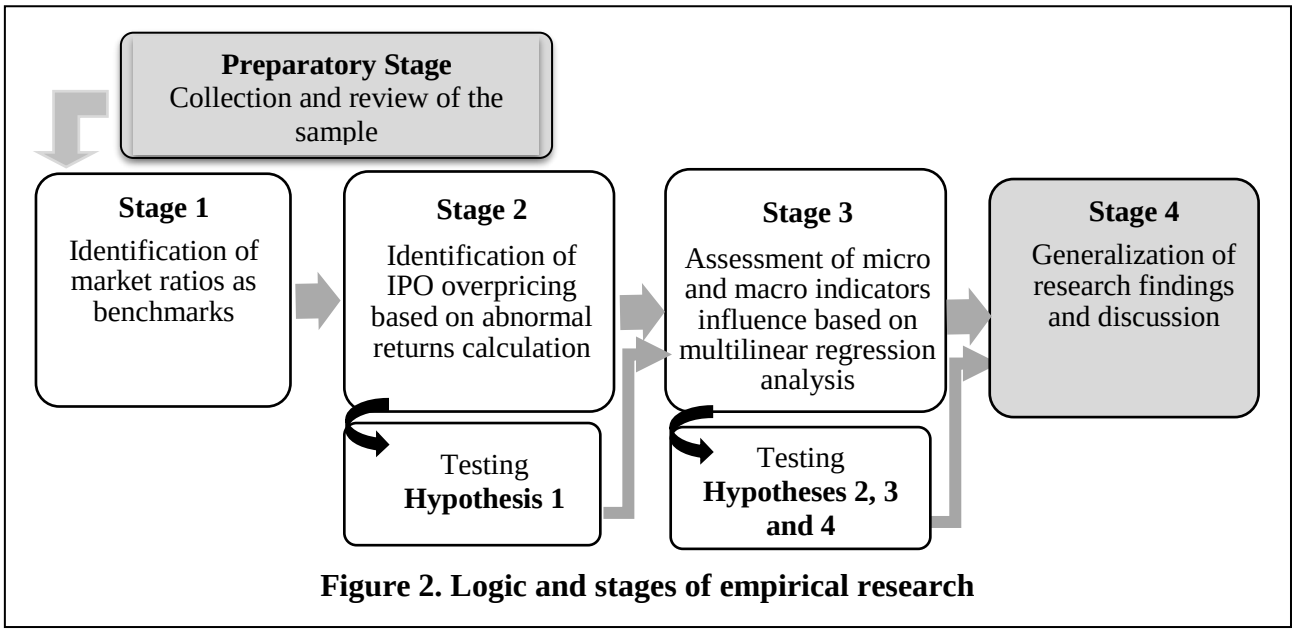


**Figure 2. Logic and stages of empirical research**

*Note: compiled by author.*

When the benchmarks for research are identified, the abnormal returns can be calculated for different time periods. This is realized in Stage 2. The abnormal returns are the base for identification of the IPO overpricing existence and its levels. Therefore, results of this stage provide possibility to test *Hypothesis 1*, which checks if IPO overpricing exists in the EU IPOs market. In the case if no IPO overpricing is identified, the analysis of this research must be finished in Stage 2. Otherwise, the research is developed further and only the cases of overpriced IPOs are used for further analysis in Stage 3. This creates a data pool of dependent variables.

The first two stages provide the necessary data for multilinear regression models construction and testing in Stage 3. The models are built on dependent variable data collected in Stage 2 and independent variables data collected additionally based on identified IPO overpricing cases in Stage 2. Independent variables are discussed latter in this research. The constructed multilinear regression models allow to identify the relationship between dependent variable – IPO overpricing, and independent variables - micro and macro indicators and to test the hypothesis 2, 3 and 4. Firstly, the *Hypothesis 2* about macro indicators importance ahead the micro indicators for IPO overpricing is tested. Then *Hypothesis 3* and *Hypothesis 4* are tested. These hypothesis are focused on changes in importance of micro and macro indicators on IPO overpricing after the global financial crisis.

Additionally to these main stages described above, two supplementary stages are necessary for full analysis. The preparatory stage in which the sample is collected and reviewed. It provides the general understanding about the situation in the EU IPOs market. In the Stage 4 the findings and discussion are provided. This stage allows to deepen the empirical research by looking closer to the general results and hypothesis which were accepted or rejected. The comments and discussion of the research results are provided in this stage with confirmed and do not confirmed expected relations.

## 2.4. Empirical Research Data Sample

This empirical research is based on the EU IPOs market case. Therefore, the sample includes all IPO markets in European Union countries.

The empirical research covers the period from 2001 till 2016 in order to include time horizon adequate for long-term assessment and necessary to evaluate changes before and after the global financial crisis. The more detail description about the sample is provided further.

Looking to EU IPOs market through the global perspective, the last few years EMEA (Europe, the Middle East and Africa) region was the second largest IPO market in the globe by leaving the Americans region behind (see Figure 3). EU IPOs market compound more than 90 % of EMEA region IPOs value. EU IPOs market was highest in last two years compared with other largest IPO markets: US, Honk Kong, China. This shows the importance of the EU IPOs market in the global IPO activities.

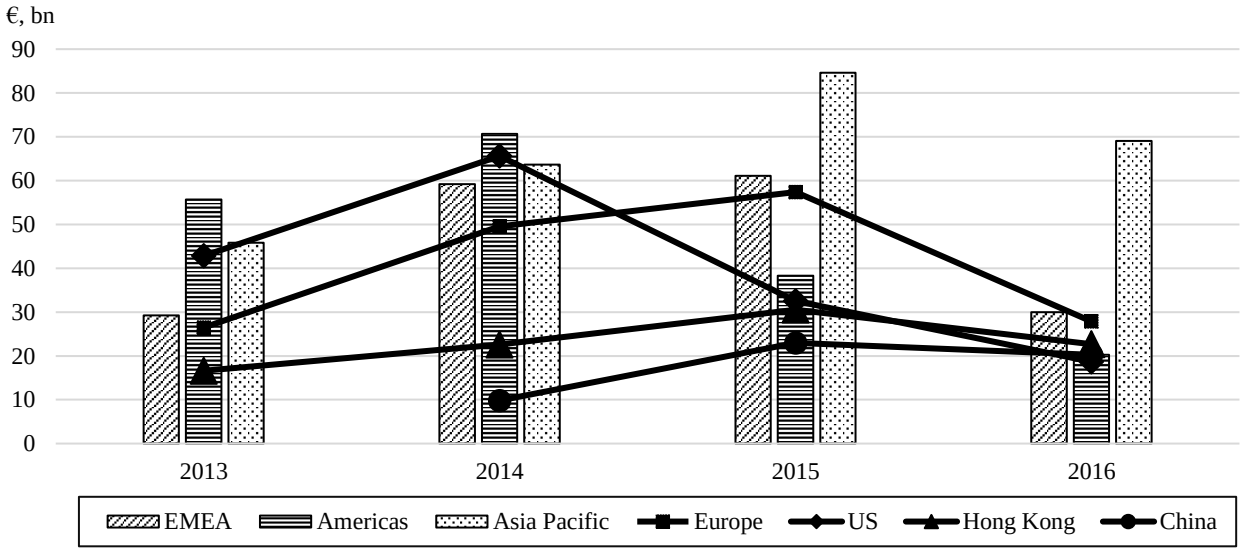


**Figure 3. Global IPO activity by region 2013-2016**

*Note: compiled by author based on PWC reports: IPO Watch Europe 2016, 2017; IPO Watch Europe 2014, 2015.*

EU IPO market includes many IPO markets located in different EU member states. These markets can be divided into two groups: an EU-regulated and an Exchange-regulated (see Table 4). These markets differ from each other in terms of features and requirements. The EU- regulated market has an external regulator and issuers are subject to the EU member states Prospectus Directive (Guide to listing of debt on European stock exchanges, 2012). Meanwhile, the exchange-regulated market can be defined as a stock exchange market which "does not have an external regulator and that falls outside the scope of the relevant EU Directives" (Guide to listing of debt on European stock exchanges, 2012, pp. 3). This means that the regime of regulations are not so strict and even does not require that financial information would be prepared under IFRS.

**Table 4**

**Grouping of EU member states IPOs markets**

| EU-regulated | Exchange-regulated |
|---|---|
| London Main | London AIM |
| NasdaqNordic (Main) | Nasdaq Nordic (First North) |
| Deutsche Börse (Prime and General Standard) | BorsaItaliana (AIM) |
| Euronext | BME (Spanish Exchange) (MAB) |
| BME (Spanish Exchange) (Main) | Oslo Axess |
| BorsaItaliana (Main) | Euronext (Alternext) |
| SIX Swiss Exchange | Borsa Istanbul |
| Prague | Deutsche Börse (Entry Standard) |
| Oslo Børs | Warsaw (NewConnect) |
| Warsaw (Main) | Bucharest (AeRO) |
| Bucharest | Luxembourg (MTF) |
| Sofia | Wiener Borse (MTF) |
| Budapest | Irish StockExchange (ESM) |
| Wiener Börse | |
| Irish Stock Exchange (Main) | |
| Zagreb Stock Exchange | |
| Athens Stock Exchange | |

*Note: compiled by author based on IPO Watch Europe 2016, 2017.*

Historically, the biggest EU member states IPO market in terms of value was London stock exchange market (see Figure 4). Despite that its share was slightly decreasing during the 2003-2016 years period, it still has around 20 % share of total EU IPOs market. Other most active IPO markets are Nasdaq Nordic, Spanish Exchanges (BME), Deutsche Börse, Euronext. The Nasdaq Nordic exchange market share in total EU IPOs market significantly increased in 2016. This happened due to the fact that the second and third largest IPOs in EU IPOs market in 2016 (Dong A/S and Nets) were performed in this market.

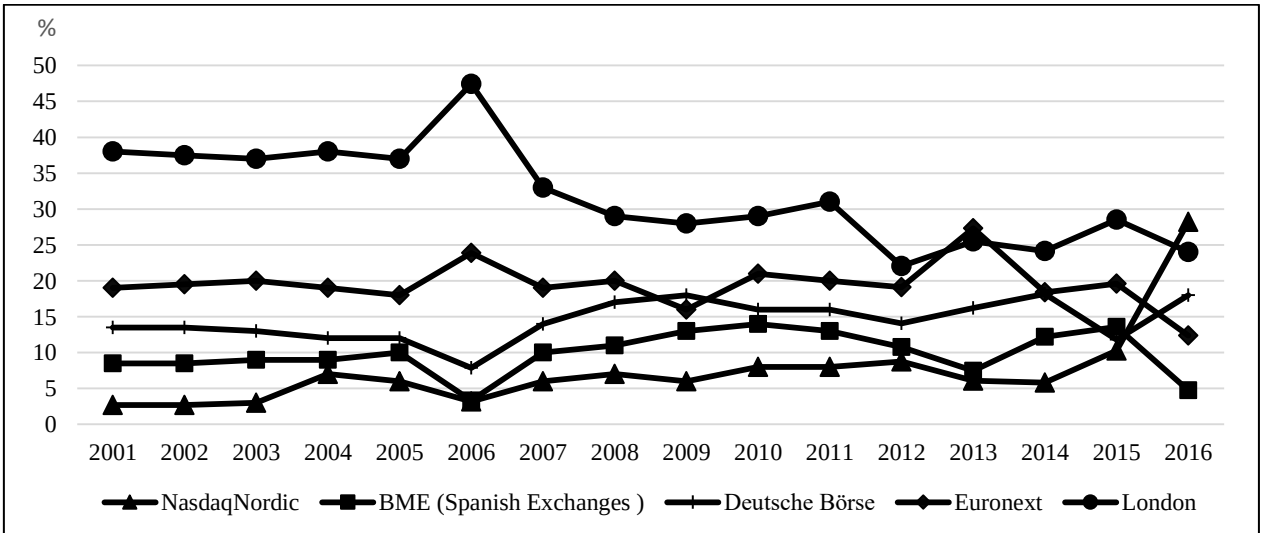


**Figure 4. Share of the biggest EU member states IPO markets by value in total EU IPO market**

*Note: compiled by author based on PWC reports: IPO Watch Europe 2016, 2017; IPO Watch Europe 2014, 2015*

In the Figure 5 the distribution of the IPO during the period of 2001-2016 is presented. It can be seen that after the global financial crisis in 2007 the activity of IPO decreased. The lowest activity point was in 2009 by both criteria used: the number of IPO and offering value. After it, markets started to recover. This already shows the cyclicality of IPO markets. In the period 2012-2015 the number of IPOs was stable but the total offering value was increasing, meaning that average of one IPO offering value was becoming higher. In 2016 the number of IPOs decreased by 51 % and IPOs offering value – by 27 % in comparison with 2015. This can be explained by the political uncertainty, falling prices of oil and commodities and concerns over a slowdown in the Chinese economy (IPO Watch Europe 2016, 2017).

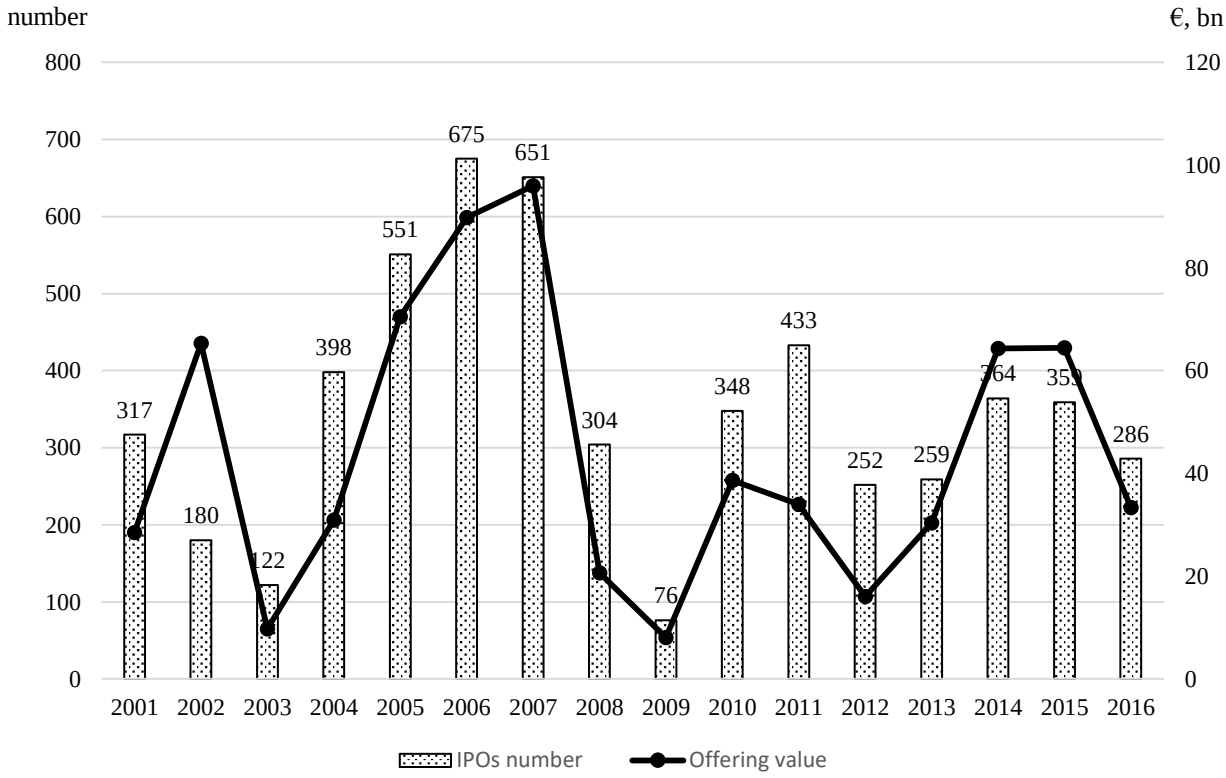


**Figure 5. Dynamics of IPOs over 2001-2016 period in EU IPO markets**

*Note: compiled by author based on Bloomberg (2017)*

EU IPOs market was highest in last two years compared with other largest IPO markets: US, Hon Kong, China. EU IPOs market includes many IPO markets located in different EU member states and are divided into two groups: the EU-regulated and the Exchange-regulated. Historically, biggest EU member states IPO market in terms of value was London stock exchange market. After the global financial crisis in 2007 the activity of IPO decreased. The lowest activity point was in 2009.

## 2.5. Methods of empirical research

As presented in the literature review, event study methods are most often used in IPO pricing analysis. These methods analyze the behavior of firms' stock prices around the particular event which in this case is IPO issue event. Therefore, the same method and logics are used in this research. For each stage of the research determined in the previous chapter, the methods used are presented and described further.

The aim of Stage 1 is to identify benchmarks for further calculations. The benchmarks identification was made based on market indexes approach. Market indexes are broad measures. In order to be more accurate, a particular industry index as a benchmark was used. For each IPO firm, the index of industry to which IPO firm belongs is chosen and returns of this index is identified. An industry is determined according to the Bloomberg (2017) classification.

The aim of Stage 2 is to calculate the abnormal returns and test *Hypothesis 1* if the IPO overpricing exists. The methods used in previous researches for the performance of abnormal returns measurement were presented in Table 3. The most often used method is the Buy-and-Hold-Abnormal-Returns (BHAR) method. This method is simplified in comparison with Fama and French(1993) three-factor model & Carhart (1997) four factors model but includes the long-term aspect. While the analysis of EU IPOs market provides broad sample, the BHAR method is considered as the reasonable method and is used in empirical research for abnormal returns calculations. BHAR is calculated by subtracting the return of the benchmark from the return of the IPO firm as follows:

$$BHAR_T = \prod_{t=1}^{T}(1 + ER_{it}) - \prod_{t=1}^{T}\left(1 + CR_{jt}\right) \quad (3)$$

where:

$BHAR_T$ is the buy-and-hold abnormal returns;

$ER_{it}$ is the buy-and-hold investment return for the IPO firm *i* at month *t*;

$CR_{jt}$ is the buy-and-hold investment return for the industry index at month *t*.

$BHAR_T$ are calculated for 3 years and 5 years holding periods. This allows to evaluate the IPO returns performance during the long-term period in which IPO overpricing could be identified. If $BHAR_T$ is lower than zero it can be made a conclusion that shares of IPO firm were overpriced. Respectively, $BHAR_T$ equal to zero or greater than zero means that IPO overpricing does not exist.

Stage 3 is dedicated to testing the hypothesis 2, 3 and 4. *Hypothesis 2* test macro indicators stronger influence than micro indicators on IPO overpricing, *Hypothesis 3* and *Hypothesis 4* test changes of macro and micro indicators' influence on IPOs overpricing before and after the global financial crisis. The multilinear regression models are constructed and used for hypothesis 3 and 4 testing.

IPO overpricing is calculated based on BHAR returns. Negative returns calculated according to the formula (3) show the IPO overpricing. Other returns are eliminated from the further analysis in order to focus on the IPO overpricing phenomenon. Therefore, the dependent variable - IPO overpricing - is defined as negative BHAR returns with an opposite sign.

The independent variables were chosen according to the summary of the overview of micro and macro indicators influencing IPO overpricing distinguished in the literature (Figure 1). The following independent variables representing the micro indicators influencing IPO overpricing are selected for analysis: *entrepreneur firm, VC-backed firm, technology firm, applied sustainability policy* (see Table 5). The independent variables *entrepreneurial firm* and *VC-backed firm* represent the governance indicator, the independent variable *technology firm* represents the IPO firm dependence on technology sector indicator, the independent variable *applied sustainability policy* stands for social responsibility policy used in IPO firm indicator.

**Table 5**

**Micro indicators of IPO overpricing included in multilinear regressions**

| Indicator | Description | Measurement | Expected influence | Symbol |
|---|---|---|---|---|
| Entrepreneur firm | Indicator if a firm was an entrepreneur before the IPO | Dummy variable where 1 stands for an entrepreneur firm and 0 otherwise. | Negative | priv_eq_b |
| VC-backed firm | Indicator if a firm was a VC-backed before the IPO | Dummy variable where 1 stands for a VC-backed firm and 0 otherwise. | Positive | vc_b |
| Technology firm | Indicator which represents the firm belongingness to high-technology, including the biotechnology, sector | Dummy variable where 1 stands for a high-technology firm and 0 otherwise. Sector identified according the Bloomberg (2017) provided classification. | Positive | techn |
| Sustainability policy | Indicator if a firm implies the sustainability policies | Dummy variable where 1 stands for a firm which implies at least one of these sustainability policies: Investments in Sustainability, Green Building Policy, Business Ethics Policy, Health and Safety Policy, and 0 otherwise. | Positive | sustain_pol |

*Note: compiled by author, based on X. Li (2010), A. Dorsman & D. Gounopoulos (2013).*

The following independent variables representing the macro indicators influencing IPO overpricing are selected for analysis: *alternative market, GDP growth, investors' sentiments, underwriter's reputation, IPO volatility*. These indicators are presented and described in Table 6. The independent variable *alternative market* represents the type of IPO market indicator. The independent variable *GDP growth* is considered as indicator representing the economy cyclicality where positive *GDP growth* represents the expansion periods of the economy and negative *GDP growth* represents the recession periods of the economy. The independent variables *investors' sentiments* and

*underwriter's reputation* represent respectively investors' sentiment indicator and underwriters reputation indicator. The independent variable *IPO volatility* represents the IPO market conditions where the higher value of *IPO volatility* indicates "hotter" market conditions in the IPO market.

**Table 6**

**Macro indicators of IPO overpricing included in multilinear regressions**

| Indicator | Description | Measure | Expected influence | Symbol |
|---|---|---|---|---|
| Alternative market | Indicator if a firm issue IPO in alternative market | Dummy variable where 1 stands for IPO issued in alternative market and 0 otherwise. | Positive | alrtern_m |
| GDP growth | Indicator of economic growth | The quarterly gross domestic product at market prices percentage change compared to same period in previous year. | Positive | gdp |
| Investors' sentiments | Indicator of investors' sentiment level | Eurozone Economic Sentiment Indicator (Bloomberg EUESEMU Index). | Positive | sentiment |
| Underwriter's reputation | Qualitative measure of underwriter reputation | Dummy variable where 1 stands for a high reputation underwriter and 0 otherwise. The underwriters are grouped according to the provided findings of the top ten underwriters of IPOs in Paris, Frankfurt, Milan, and London, and differentiates Paris Marché Libre and London AIM by K. Migliorati, S. Vismara (2014) | Positive | reputation |
| IPO volatility | Indicator which represents the cyclicality of IPO market | IPO volume in the market calculated as the moving average of the number of IPOs completed during a 3-month period centered on the IPO date. | Positive | volume |

*Note: compiled by author, based on S. Neupanea & C. Thapa, C. (2013), S. Saade (2015)*

When the independent variables were identified, the multilinear regression models were built. The multilinear regression models were built based on dependent variables $IPO\_OVERPRICING\_3y$ and $IPO\_OVERPRICING\_5y$ calculated as BHAR returns respectively based on 3 years and 5 years holding periods. The multilinear regression models are:

$$\mathrm{IPO}_{\mathrm{OVERPRICING\_3y}} = \beta_0 + \beta_1 * \mathrm{priv\_eq\_b}_i + \beta_2 * \mathrm{vc\_b}_i + \beta_3 * \mathrm{techn}_i + \beta_4 * \mathrm{sustain\_pol}_i + \beta_5 * alrtern\_m_i + \beta_6 * \mathrm{gdp}_i + \beta_7 * \mathrm{sentiment}_i + \beta_8 * reputation_i + \beta_9 * \mathrm{volume}_i + \varepsilon \quad (4)$$

$$\mathrm{IPO}_{\mathrm{OVERPRICING\_5y}} = \beta_0 + \beta_1 * \mathrm{priv\_eq\_b}_i + \beta_2 * \mathrm{vc\_b}_i + \beta_3 * \mathrm{techn}_i + \beta_4 * \mathrm{sustain\_pol}_i + \beta_5 * alrtern\_m_i + \beta_6 * \mathrm{gdp}_i + \beta_7 * \mathrm{sentiment}_i + \beta_8 * reputation_i + \beta_9 * \mathrm{volume}_i + \varepsilon \quad (5)$$

Checking of the multilinear regression model is based on following methods:

1. Linear relationship checked based on scatter plots analysis.
2. Multivariate normality checked based on the Q-Q-Plots analysis.

3. No or little multicollinearity checked based on Variance Inflation Factor (VIF) statistics. The values of VIF < 10 show no multicollinearity.
4. No auto-correlation checked based on Durbin-Watson test. The values of 1.5 < d < 2.5 show that there is no auto-correlation in the data.
5. Homoscedasticity test is based on a normal P-P plot analysis. The points generally followed the normal line with no strong deviations indicate that the residuals are normally distributed.

The multilinear regression models developed and presented above allow to evaluate the indicators effect of related IPO overpricing. This research focuses to answer the question how micro and macro indicators change in periods before and after the global financial crisis. As was mentioned during the sample review, the high drop of IPO volume was in 2008 (see Figure 5). This year can be taken the year of the financial crisis event. The same data was chosen by A. Dorsman & D. Gounopoulos (2013). In order to test *Hypothesis 3* and *4* about the macro and micro indicators influence on IPO overpricing changes before and after the global financial crisis, the multilinear regressions have to be tested based on different period data. Therefore, there are three different period analysis (see Figure 6): first period analysis covers the all period data from January 1st 2001 to December 31st 2016 (16 years); second period analysis include data from January 1st 2001 to December 31st 2007 (7 years); third period analysis includes data from January 1st 2008 to December 31st 2016 (9 years). Testing of *Hypothesis 2* is based on full period data, testing of *Hypothesis 3 and 4 use* second and third period data.

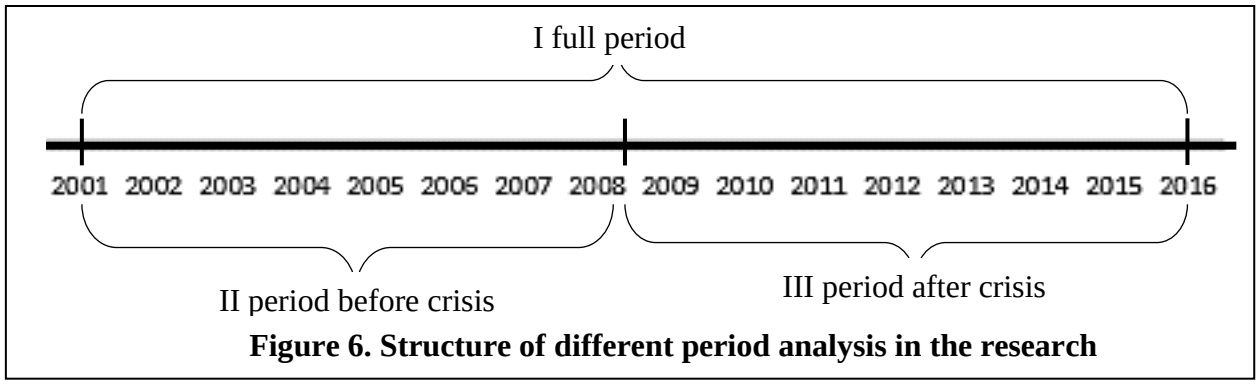


**Figure 6. Structure of different period analysis in the research**

*Note: compiled by author.*

In summarizing, the key aspects of research methods and techniques used are: the Buy-and-Hold-Abnormal-Returns (BHAR) method; the benchmarks are chosen according to market indexes approach by using particular industry index; the time horizon for analysis is 3 and 5 years holding periods; finally, the multilinear regression models, which include micro and macro indicators of IPO overpricing, are built in order to test the hypothesis.

## 2.6 Limitations of the methodology and the empirical research

The methodology built for identification of IPO overpricing cases and assessment of micro and macro indicators influence on IPO overpricing before and after the global financial crisis are reliable. However, the methodology and empirical research provided in this Master thesis have limitations where the most important are presented in this chapter.

The abnormal returns calculations for long-term period are complicated and require to take into consideration these issues: "1) include risk adjustment and expected/abnormal return modeling; 2) the aggregation of security-specific abnormal returns and 3) the calibration of the statistical significance of abnormal returns" (Khotari & Warner, 2006, pp. 24). Therefore, the abnormal returns calculations are sensitive to the used method. In this research Buy-and-Hold-Abnormal-Returns (BHAR) method is used. In order to support the reliability of the results, next to BHAR method other methods could be used like the Fama–French three-indicator method, the Carhart (1997) four factors method.

The most appropriate benchmark selection is crucial for further stages' results. In this research, the benchmark is selected according to the market indexes approach. This approach is more simplified and less accurate than the control firm approach. However, the analysis of EU IPOs market provides a big sample where market indexes approach becames the reasonable method for IPO overpricing identification.

Another limitation is related to the assumption that EU IPOs market is homogenous. However, it consists of the number of different IPO markets as was presented during the review of the research sample (see Table 4). These markets differ in some specific characteristics, requirements. This can have the slight effect on the levels of IPO overpricing from country to country. However, in this research, the focus is on the overall EU IPOs market.

Institutional indicators, such as participation of foreign investors, participation of other institutional investors, cultural differences in specific countries and markets are not included in this research. Currently, not necessary data are available for the analysis of these indicators. Also, some indicators which were identified during the literature review are not included in the empirical research.

Summarizing the research limitations, the following are most important. Only one method – BHAR method – is used for the empirical research. The benchmarks identification are based only on market indexes approach. Institutional indicators were not included in this research. The assumption about the EU IPOs market homogeneity is taken.

# III. EMPIRICAL RESEARCH RESULTS OF THE MICRO AND MACRO INDICATORS INFLUENCE ON IPO OVERPRICING BEFORE AND AFTER THE GLOBAL FINANCIAL CRISIS ASSESSMENT

The aim of this part is to provide the empirical analysis and results of the assessment of micro and macro indicators influencing IPO overpricing before and after the global financial crisis event based on the methodology discussed in the previous part of the Master thesis. The analysis of characteristics of IPO overpricing is presented in chapter 3.1. The results of assessment of micro and macro indicators influence on IPO overpricing before and after the global financial crisis are presented in chapter 3.2. In chapter 3.3. the empirical research hypothesis testing results are provided. In chapters 3.4. and 3.5. the limitations and discussion of the empirical research results are provided.

## 3.1. Overview of collected sample characteristics and dynamics

The sources and the methods of data collection are presented in this chapter. Also, the overview of collected sample characteristics and dynamics are provided.

All data used in the empirical research were collected from the Bloomberg (2017) database. The data collected from this database are: number of IPO, investment sentiment index in Europe, GDP by the country, each IPO firm monthly closing price average, IPO firm characteristics: VC-backed, private equity backed, sector, country, IPO underwriter, sustainability policy usage, sector indexes. This database is the reliable source of information.

As presented in previous part of the thesis, the empirical research is based on three-period analysis: I full period, II period before the crisis and III period after the crisis (see Figure 6). Also, overpricing of IPO analysis is based on two holding periods BHAR returns 3 years holding period and 5 years holding period. The research covers data of the 2001-2016 year period. Therefore, analysis of IPO overpricing based on 3 years BHAR returns includes cases of IPO issued in the period of 2001-2013 and analysis based on 5 years BHAR returns includes cases of IPO issued in the period of 2001-2011.

During the period 2001-2016, the number of IPO proposals was 4711 with the yearly average of 294 proposals (see Appendix 2). During the period before the crisis (2001-2007 years) the number of IPO proposals was 2498, with the yearly average of 357. It is higher than the number of IPO proposals after the global financial crisis: 2213 (246 yearly average). However, during all analyzed

period 13,3 % of IPO proposals were withdrawn, pended or postponed (see Figure 7). The average of yearly withdraws after the financial crisis was 42,1 (in comparison to 35,4 before the crisis).

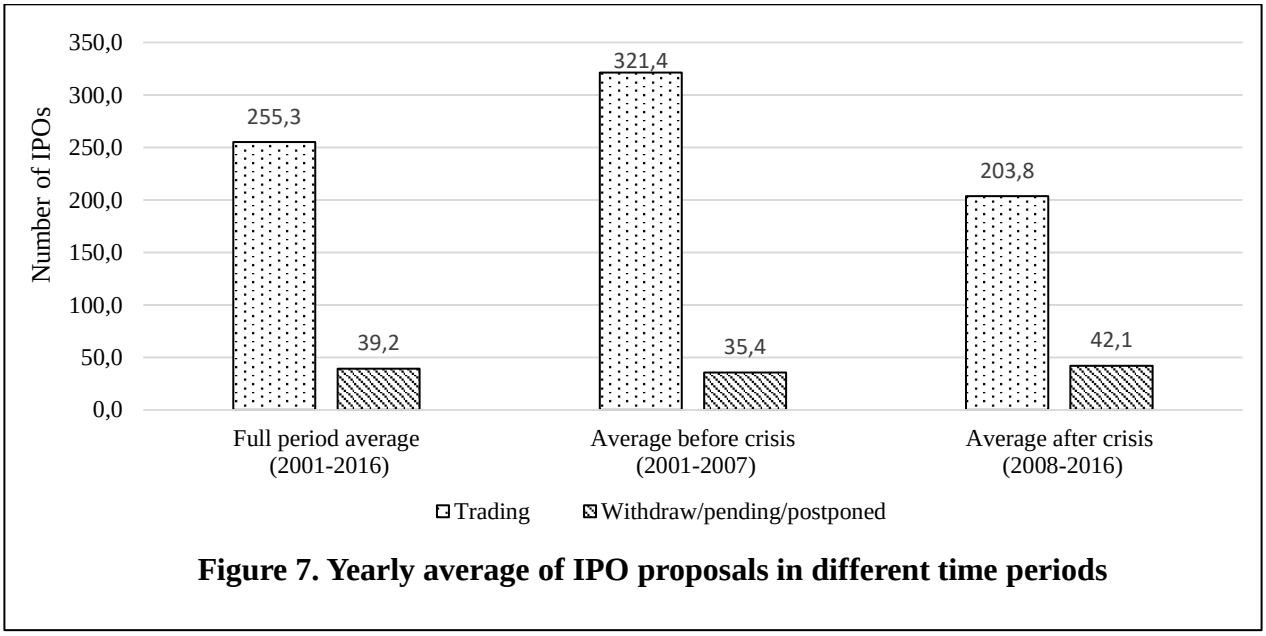


**Figure 7. Yearly average of IPO proposals in different time periods**

*Note: compiled by author based on Bloomberg (2017)*

Figure 8 shows that the lowest number of IPOs' withdraws was before the global financial crisis in 2005-2006 while the number of withdraws sharply increase in 2008-2009 after the global financial crisis. The contrast between these periods shows the cyclicality of the IPOs market. The higher number of withdraws after the global financial crisis indicates the IPOs firms decisions to stop the offering of securities because of unfavorable conditions in the IPO market.

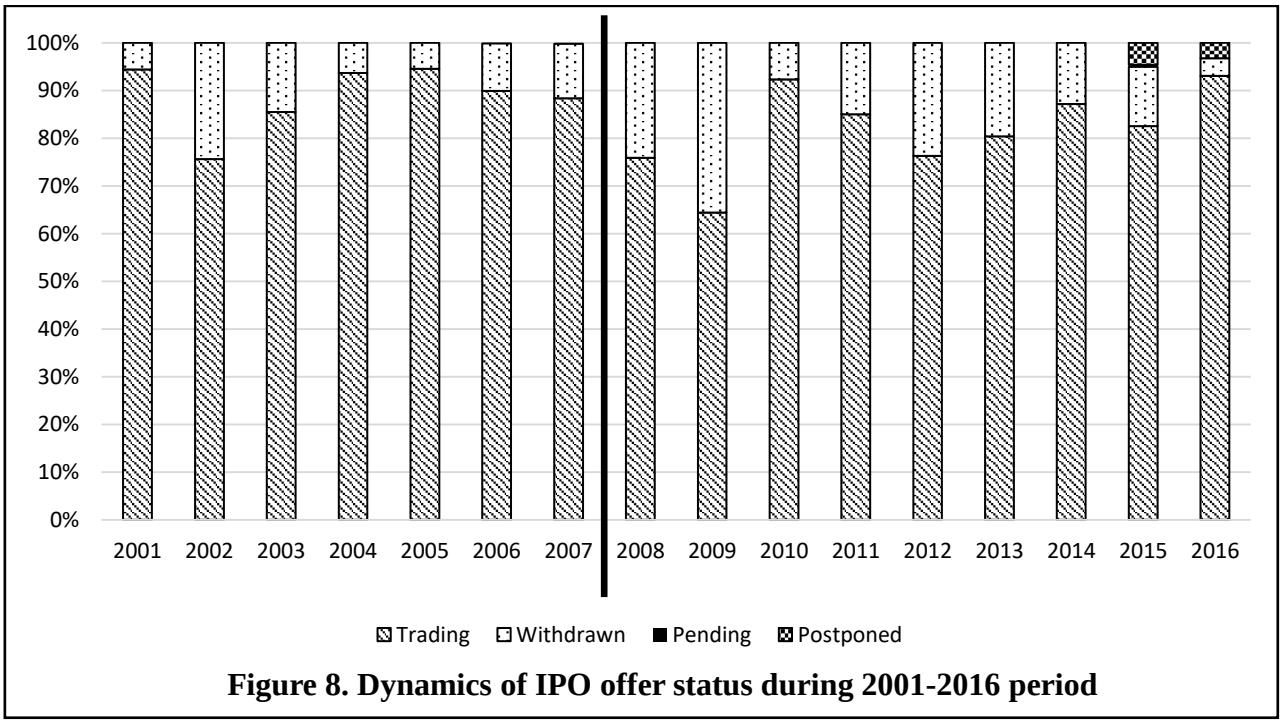


**Figure 8. Dynamics of IPO offer status during 2001-2016 period**

*Note: compiled by author based on Bloomberg (2017)*

During the analysis, the high number of acquisitions and delisting cases during 3 years and 5 years period after the listing were identified (see Figure 9). This number was increasing before the global financial crisis and in 2005 reached the highest number resulting that 29 % of IPOs issued in 2005 were acquired or delisted in 3 or 5 years periods after the IPO event. The proportion of IPO acquisitions and delisting cases after 3 and 5 years of issuing of all issued IPOs significantly decreased to 11 % in 2008, just after the global financial crisis event. This indicates that the higher number of firms which issue the IPOs during the unfavorable economic conditions have the stronger financial position. This confirmed the statement raised in the literature review that *God* firms, wich seek the cash for the projects, accepts the costs of the unfavorable conditions and issue IPOs even during the economy slowdown. While *Bad* firms wait for more favorable conditions in the economy. The analysis disclosed that the number of acquisitions after the global financial crisis significantly decreased. This allows to argue that existing firms are not willing to acquire IPOs in economic slowdowns.

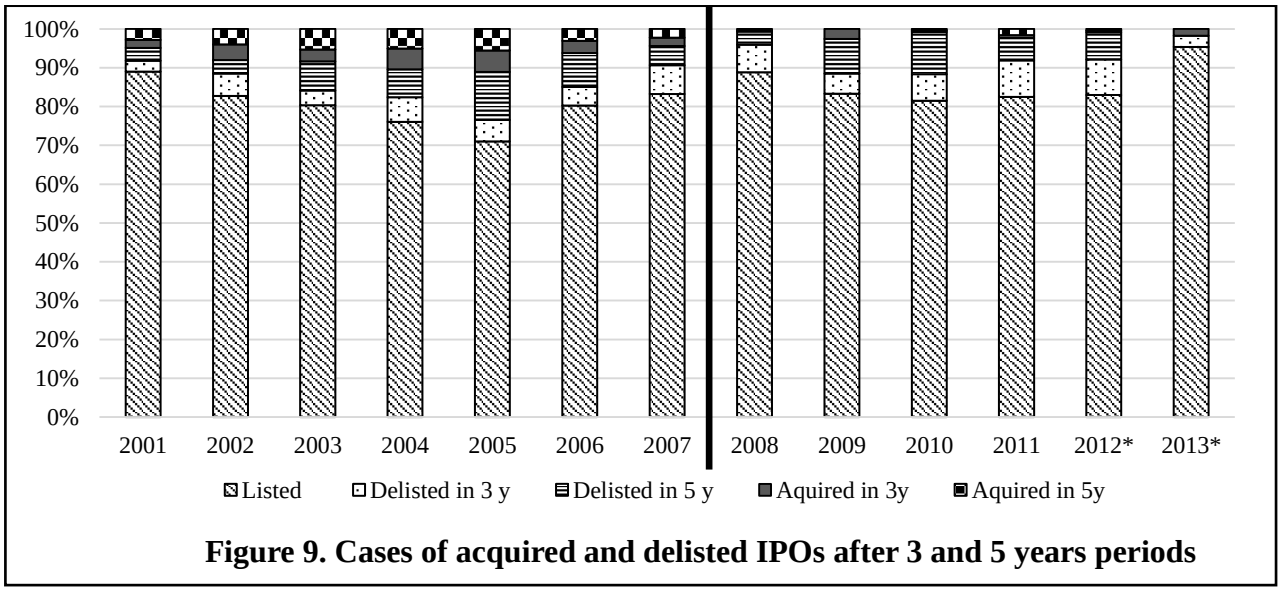


**Figure 9. Cases of acquired and delisted IPOs after 3 and 5 years periods**

**Not included delisting and acquiring cases in 5 years period*
*Note: compiled by author based on Bloomberg (2017)*

During the period of 2001-2016 4711 IPO proposals were issued. For this research purposes the withdrawn, suspended and postponed IPOs were extracted from this number. Additionally, IPOs which were acquired or delisted during 3 and/or 5 years period (depending on the analysis: 3 or 5 years holding period analysis) were extracted from the sample of this empirical research. After the elimination of IPOs which lacked any necessary information for analysis, the formed sample for 3 years holding period was 2921 IPOs, and sample for 5 years holding period analysis was 2104 IPOs. The distribution of the sample over the analyzed period is provided in Figure 10. The number of IPOs in the sample is highest just before the global financial crisis event. This represents the earlier overlooked tendencies of all IPOs population.

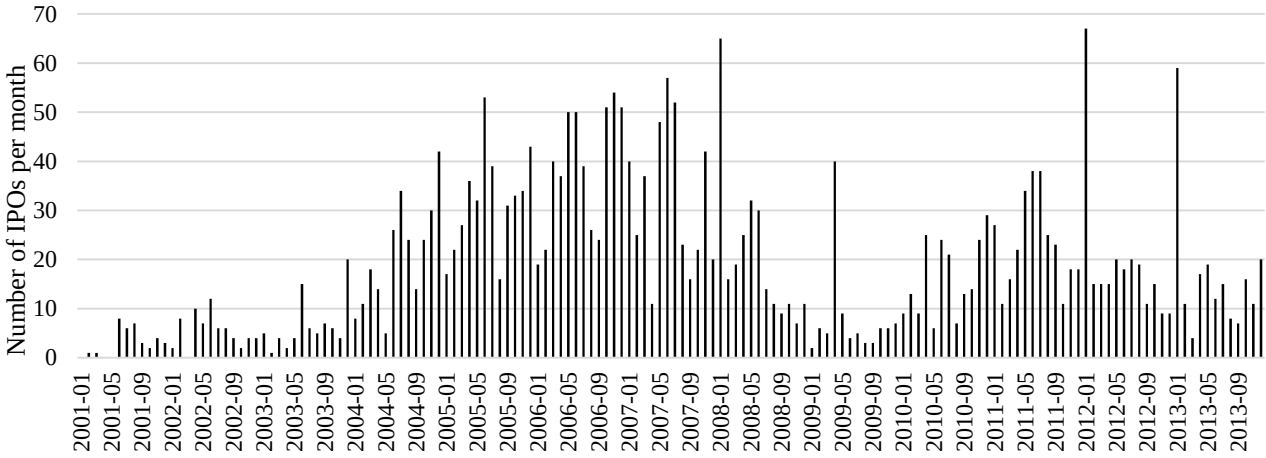


**Figure 10. Distribution of the sample (number of IPOs) during the 2001-2013 period**

*Note: compiled by author based on Bloomberg (2017)*

In summarizing, the sample of the empirical research for 3 years holding period is 2921 IPOs and sample for 5 years holding period analysis is 2104 IPOs. The sample distribution over the analyzed period reflects all population tendencies. In the following chapter, using the sample, IPO overpricing in EU IPOs market is analyzed.

## 3.2. Identification of IPO overpricing in EU IPOs market

The goal of this chapter is to identify if IPO overpricing exists in EU IPOs market. Following the empirical research logics presented earlier in Figure 2, benchmarks based on market ratios approach are identified (Stage 1). These ratios are used for IPO overpricing calculations and identification (Stage 2). The results allow to test *Hypothesis 1*.

All the data of issued IPOs in EU IPOs market during the period of 2001-2016 are collected from the Bloomberg database. Based on this data the sector classification is used as given by the Bloomberg (2017). All IPOs in the research sample are classified into eleven sectors (see Table 6). For each sector index representing the movements in the sector as a benchmark was chosen. The main criteria used for the sector index selection was the representativeness of the EU member states stock exchange markets. Therefore, the available STOXX sector indexes for Europe was chosen: SXBSCE Index, SX8E Index, SXFE Index, SXIDUE Index, SX6E Index which represent respectively Basic Materials, Technology, Financial, Industrial and Utilities sectors. The STOXX sector indexes for Europe for the Consumer, Non-cyclical, Consumer, Cyclical, Energy sectors are not provided therefore the Bloomberg indexes for these European sectors were chosen: BECNCY Index, BECCYC Index, BEENRG Index. The Communications, Diversified, Funds sectors are not provided by any of these two types of indexes for this reason other indexes were chosen to represent

these sectors: S12COMM Index, MXEU0DF Index, BET-FI Index. The detail description of all indexes chosen as the benchmarks for the research is provided in Appendix 3.

In Table 7 average monthly changes of different sectors indexes during three periods: 2001-2016, 2001-2007, 2008-2016 are provided. These changes represent the summary of monthly sector indexes returns used for BHAR returns calculations while identifying the IPO overpricing. The monthly returns of each sector are provided in Appendix 5

The monthly sector indexes (benchmark) changes for each sector as the buy-and-hold investment returns ($CR_{jt}$ ) were calculated during the period of 2001-2016. Also, the monthly buy-and-hold investment returns ($ER_{it}$) for each IPO issued by the firm during the period of 2001-2016 were calculated. According to the formula (4) and formula (5) provided earlier, BHAR returns were calculated for 3 years and 5 years holding periods. The cases of negative values of BHAR represent the IPO overpricing. The results are presented in Figure 10 and Figure 11 (the full data are respectively presented in Appendix 6 and Appendix 7).

**Table 7**

**Chosen benchmarks based on sector indexes**

| Sector | Number of IPOs | Benchmark | Benchmark average monthly change (%) | | |
|---|---|---|---|---|---|
| | | | 2001-2016 | 2001-2007 | 2008-2016 |
| Basic Materials | 231 | SXBSCE Index | 0,61 | 0,88 | 0,40 |
| Technology | 342 | SX8E Index | 0,02 | -0,27 | 0,24 |
| Financial | 847 | SXFE Index | 0,25 | 0,63 | -0,04 |
| Industrial | 591 | SXIDUE Index | 0,39 | 0,47 | 0,32 |
| Consumer, Non-Cyclical | 805 | BECNCY Index | 0,36 | 0,14 | 0,54 |
| Consumer, Cycl. | 473 | BECCYC Index | 0,21 | -0,17 | 0,51 |
| Communications | 426 | S12COMM Index | 0,25 | 0,58 | 0,10 |
| Energy | 284 | BEENRG Index | 0,11 | 0,46 | -0,16 |
| Diversified | 34 | MXEU0DF Index | -0,26 | -0,18 | -0,31 |
| Funds | 5 | BET-FI Index | 2,37 | 5,63 | -0,14 |
| Utilities | 48 | SX6E Index | -0,01 | 0,94 | -0,73 |

*Note: based on authors calculations, using Bloomberg (2017) data*

According to diagram presented in Figure 11, IPO overpricing phenomenon in the EU IPOs market existed during all period of 2001-2016. Also, the number of overpriced IPOs were higher than not overpriced IPOs. The number of overpriced IPOs were increasing since 2001 till 2006 together with increasing number of IPOs overall. The peak of 332 overpriced IPOs was in 2006, few years before the crisis event in 2008. In this year the highest amplitude (201 IPOs) between the number of overpriced and not overpriced IPOs are identified as well. During the period around the global financial crisis (2006-2009) the number of overpriced IPOs was decreasing from 332 till 79. However, after this period the number of overpriced IPOs started to increase while the number of not overpriced IPOs remained stable. Interesting insight that percentage share of overpriced IPOs from total issued IPOs has the tendency to increase since 2001: from 54 % in 2001 till 83 % in 2013. That

percentage share of overpriced IPOs has the drop only in period 2005-2007 just before the global financial crisis.

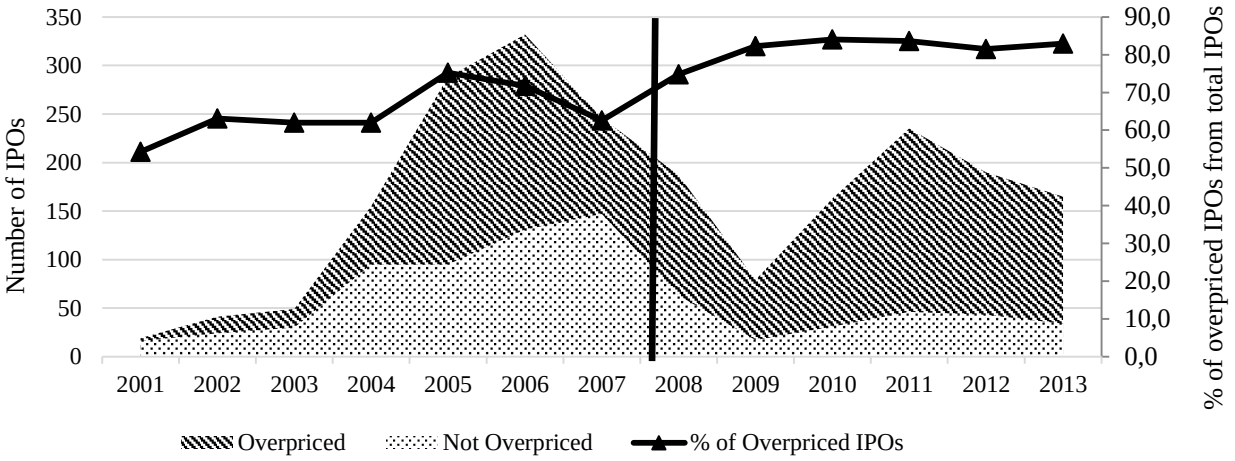


**Figure 11. IPO overpricing cases in EU IPO market based on 3 year holding period**

*Note: based on authors calculations, using Bloomberg (2017) data*

The similar tendencies can be seen in Figure 11 which represents the IPO overpricing cases in EU market based on 5 years holding period. The number of overpriced IPOs were increasing since 2001 till 2006 with the peak of 258 overpriced IPOs in 2006. In this year the highest amplitude (137 IPOs) between the number of overpriced and not overpriced IPOs are identified as well. During the period around the global financial crisis (2006-2009) the number of overpriced IPOs was decreasing from 258 till 78. However, after this period the number of overpriced IPOs started to increase. The main difference from results based on 3 years holding period (see Figure 12) can be seen that the amplitude between the numbers of overpriced and not overpriced IPOs are lower and vary less.

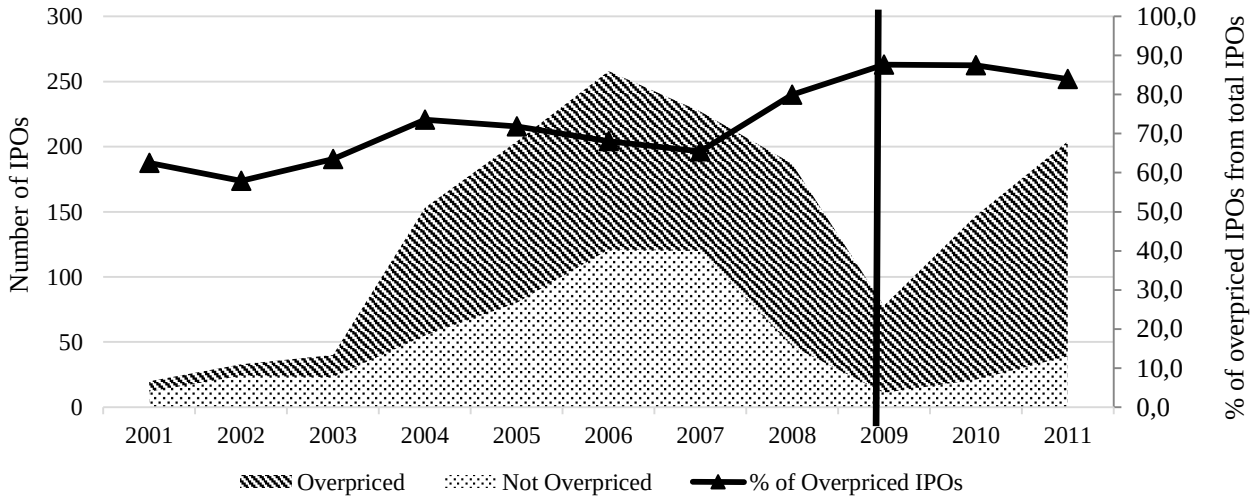


**Figure 12. IPO overpricing cases in EU IPO market based on 5 year holding period**

*Note: based on authors calculations, using Bloomberg (2017) data*

Both 3 year and 5 year holding period analysis in the EU IPOs market showed that during all analyzed period of 2001-2016 overpricing phenomena exists. Therefore, the *Hypothesis 1, that IPO overpricing phenomenon exists in EU IPO markets*, is accepted. This allows to asses the IPO overpricing the micro and macro indicators influence on IPO overpricing in the EU IPOs market before and after the global financial crisis. This analysis is presented in the following chapter.

## 3.3. Assessment of micro and macro indicators influence on IPO overpricing before and after the global financial crisis

Assessment of micro and macro indicators influence on IPO overpricing in EU IPOs market before and after the global financial crisis is provided in this chapter. Based on the results, *Hypothesis 2, Hypothesis 3* and *Hypothesis 4* are tested. Firstly, 3 years holding period is analyzed, then 5 years holding period analysis is provided.

### 3.3.1. Assessment of micro and macro indicators influence on IPO overpricing based on 3 years holding period

In this sub-chapter assessment of micro and macro indicators influence on IPO overpricing based on 3 years holding period are provided. Three periods are included in this analysis: full period (2001-2016), the period before the global financial crisis (2001-2007) and the period after the global financial crisis (2008-2016). Micro and macro indicators influence on IPO overpricing is analyzed separately in each of these three periods, assessment is based on multilinear regression analysis.

Firstly, the assessment of multilinear regression assumptions was made (see Appendix 7). Three independent variables: *gdp*, *sentiment* and *volume* are scalar variables. According to the scatter plots, these independent variables have linear relationship with the dependent variable. Rest of assumptions: multivariate normality, no multicollinearity, no auto-correlation and homoscedasticity are confirmed based on the methods discussed earlier in the methodology, presented in the second part of thesis. All independent variables are included in multilinear regression and analyzed further.

The fitness of the models built based on 3 year holding period is provided in Table 8. The F-tests is highly significant for each model analyzing different periods showing that the models explain a significant amount of the variance in IPO overpricing. According to the R Square values, the chosen independent variables the best explain the variance of the IPO overpricing before the global financial crisis: 23,6 % of total variance. However, the same independent variables explain only 4,4 % of IPO overpricing volatility after the global financial crisis. Independent variables explain 14,1 % of IPO overpricing volatility during all analyzed period.

**Table 8**

**Summary of multilinear regression model fitness based on 3 year holding period**

| Period | R | R Square | Adjusted R Square | Std. Error of the Estimate | F-tests | |
|---|---|---|---|---|---|---|
| | | | | | F | Sig. |
| 2001-2016 | 0,375 | 0,141 | 0,137 | 0,3896016 | 38,879 | 0,000 |
| 2001-2007 | 0,486 | 0,236 | 0,230 | 0,3637449 | 38,443 | 0,000 |
| 2007-2016 | 0,210 | 0,044 | 0,036 | 0,3962256 | 5,188 | 0,000 |

*Note: compiled by author*

The results of multilinear regression based on 3 years holding period during the full period (2001-2016) are provided in Table 9. The highly significant predictors are alternative market (*alrtern_m*), GDP growth (*gdp*), investors sentiment (*sentiment*), underwriters reputation (*reputation*), IPO volume (*volume*). All these independent variables are macro indicators. All and only micro variables are non-significant. The highest impact on IPO overpricing has the IPO volumes which represent the hot IPO market conditions. Investors sentiment, underwriters reputation, IPO volume have the positive influence while alternative market and GDP growth have the negative influence. The opposite effect than expected has GDP growth. The equation of the linear regression analysis is:

$$\boldsymbol{IPO_{overpricing3y} = -1,579 - 0,111 * alrtern_m - 0,014 * gdp + 0,007 * sentiment + } \\ \boldsymbol{+0,072 * reputation + 0,006 * volume} \quad (6)$$

**Table 9**

**Results of multilinear regression based on 3 years holding period during the period of 2001-2016**

| Independent variable | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -1,579 | 0,137 | - | -11,540 | 0,000 |
| alrtern_m | -0,111 | 0,020 | -0,119 | -5,618 | 0,000 |
| priv_eq_b | 0,020 | 0,053 | 0,008 | 0,373 | 0,709 |
| vc_b | -0,031 | 0,088 | -0,007 | -0,351 | 0,725 |
| techn | 0,054 | 0,033 | 0,033 | 1,642 | 0,101 |
| gdp | -0,014 | 0,003 | -0,092 | -4,017 | 0,000 |
| sentiment | 0,007 | 0,002 | 0,151 | 4,591 | 0,000 |
| sustain_pol | 0,074 | 0,057 | 0,026 | 1,294 | 0,196 |
| reputation | 0,072 | 0,020 | 0,075 | 3,601 | 0,000 |
| volume | 0,006 | 0,001 | 0,252 | 7,764 | 0,000 |

*Note: compiled by author*

The results of the multilinear regression based on 3 years holding period during the full period (2001-2016) show that micro indicators do not have the significant influence on IPO

overpricing while all macro indicators have a significant influence. Therefore, the hypothesis: *Hypothesis 2: Macro indicators have the higher influence on IPO overpricing than micro indicators in EU IPOs market*, is accepted based on 3 years holding period analysis.

The results of multilinear regression based on 3 years holding period during the period before the global financial crisis (2001-2007) are provided in Table 10. The highly significant predictors are alternative market (*alrtern_m*), technology sector (*tech*), investors sentiment (*sentiment*) and IPO volume (*volume*). Between these independent variables, the technology sector is the micro indicator. Also, the sustainable policy independent variable is significant at 0,1 level of significance which represent the micro indicator as well. Two macro indicators: GDP growth (*gdp*), underwriters reputation (*reputation*) are not significant important during the period before the global financial crisis. So, the difference from the full period analysis is that few micro indicators became significant important for IPO overpricing while some of the macro indicators had no effect on IPO overpricing before the global financial crisis.

**Table 10**

**Results of multilinear regression based on 3 years holding period during the period of 2001-2007**

| Independent variable | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -3,143 | 0,266 | - | -11,814 | 0,000 |
| alrtern_m | -0,105 | 0,024 | -0,125 | -4,395 | 0,000 |
| priv_eq_b | -0,003 | 0,061 | -0,001 | -0,043 | 0,966 |
| vc_b | -0,018 | 0,095 | -0,005 | -0,184 | 0,854 |
| techn | 0,121 | 0,041 | 0,078 | 2,976 | 0,003 |
| gdp | -0,002 | 0,004 | -0,012 | -0,417 | 0,677 |
| sentiment | 0,023 | 0,003 | 0,300 | 8,048 | 0,000 |
| sustain_pol | 0,118 | 0,065 | 0,048 | 1,811 | 0,070 |
| reputation | 0,025 | 0,024 | 0,029 | 1,059 | 0,290 |
| volume | 0,005 | 0,001 | 0,180 | 4,918 | 0,000 |

*Note: compiled by author*

The highest impact on IPO overpricing had the investors sentiment. Significant important independent variables had effect as expected: investors sentiment, IPO volume, technology sector and sustainable policy had the positive effect while the alternative market had the negative influence on IPO overpricing. The equation of the linear regression analysis is:

$$\boldsymbol{IPO\_overpricing3y = -3,143 - 0,105 * alrtern_m + 0,121 * techn + } \\ \boldsymbol{+0,023 * sentiment + 0,005 * volume} \quad (7)$$

The results of multilinear regression based on 3 years holding period during the period after the global financial crisis (2008-2016) are provided in Table 11**.** The highly significant predictors are GDP growth (*gdp*), investors sentiment (*sentiment*) and underwriters reputation (*reputation*). As in the full period analysis, these independent variables represent only macro indicators. However, not all of them are significant (alternative market (*alrtern_m*) and IPO volume (*volume*)). The differences between the period before and the period after the global financial crisis are that no one micro indicator has the influence on IPO overpricing after the global financial crisis. Also, investors sentiment is the only macro indicator which is significantly important during both periods. Other macro indicators differ in these two periods. The highest impact on IPO overpricing had the investors sentiment. Investors sentiment and underwriters reputation had the positive effect while GDP growth had the negative influence on IPO overpricing. Later was expected the opposite. The equation of the linear regression analysis is:

$$\boldsymbol{IPO_{overpricing3y} = -1,447 - 0,017 * gdp + +0,008 * sentiment + 0,146 * reputation} \quad (8)$$

**Table 11**

**Results of multilinear regression based on 3 years holding period during the period 2008-2016**

| Independent variable | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -1,447 | 0,178 | - | -8,123 | 0,000 |
| alrtern_m | -0,052 | 0,039 | -0,042 | -1,325 | 0,186 |
| priv_eq_b | -0,020 | 0,097 | -0,006 | -0,202 | 0,840 |
| vc_b | -0,097 | 0,182 | -0,017 | -0,531 | 0,595 |
| techn | -0,057 | 0,051 | -0,035 | -1,121 | 0,263 |
| gdp | -0,017 | 0,005 | -0,120 | -3,197 | 0,001 |
| sentiment | 0,008 | 0,002 | 0,177 | 3,590 | 0,000 |
| sustain_pol | 0,023 | 0,101 | 0,007 | 0,227 | 0,820 |
| reputation | 0,146 | 0,035 | 0,132 | 4,120 | 0,000 |
| volume | -0,001 | 0,002 | -0,037 | -0,759 | 0,448 |

*Note: compiled by author*

Two independent variables: technology sector and sustainable policy (at 0,1 level of significance) representing the micro indicators had the significant influence on IPO overpricing before the global financial crisis. However, no one micro indicator was significant during the period after the global financial crisis. Two micro indicators: private equity based and VC-based were not significant important in any period analyzed. As a result, the *Hypothesis 3, that Influence of micro indicators on IPO overpricing increased in EU IPOs market after the global financial crisis,* was rejected.

Macro indicators which had the significant importance on IPO overpricing were the alternative market, investors sentiment and IPO volume. While, after the global financial crisis the significantly important independent variables were GDP growth, investors sentiment and underwriters reputation. Investors sentiment is the only macro indicator which had significant importance during the both periods. This indicator had the higher influence on IPO overpricing before the global financial crisis. As a result, the *Hypothesis 4, that Influence of macro indicators on IPO overpricing decreased in EU IPOs market after the global financial crisis* was accepted.

Assessment of micro and macro indicators influence on IPO overpricing based on 3 years holding period allowed to accept three hypotheses of four. The *Hypothesis 3* that the Influence of micro indicators on IPO overpricing increased in EU IPOs market after the global financial crisis was rejected**.**

### 3.3.2. Assessment of micro and macro indicators influence on IPO overpricing based on 5 years holding period

In this sub-chapter assessment of micro and macro indicators influence on IPO overpricing based on 5 years holding period are provided. As well as in 3 years holding period analysis, three periods were analyzed: full period (2001-2016), the period before the global financial crisis (2001-2007) and the period after the global financial crisis (2008-2016). Each period is analyzed separately based on multilinear regression analysis.

The assessment of multilinear regression assumptions is provided in Appendix 8. According to the scatter plots, independent variables have linear relationship with the dependent variable. Other assumptions: multivariate normality, no multicollinearity, no auto-correlation and homoscedasticity are confirmed based on the methods discussed earlier in the methodology part. Therefore, all independent variables are included in multilinear regression and analyzed further.

The fitness of the models built based on 5 years holding period is provided in Table 12. The F-tests is highly significant for each model analyzing different periods showing that the models explain a significant amount of the variance in IPO overpricing. According to the R Square values, the chosen independent variables the best explain the variance of the IPO overpricing during the full period analysis: 26,3 % of total variance. Similarly to the 3 years holding period analysis, the same independent variables explain the lowest amount of IPO overpricing volatility after the global financial crisis: only 9,8 %. However, both period analysis based on 5 year holding period analysis explains higher amount of IPO overpricing volatility. The independent variables explain 22,2 % of IPO overpricing volatility before the global financial crisis.

**Table 12**

**Summary of multilinear regression model fitness based on 5 year holding period**

| Period | R | R Square | Adjusted R Square | Std. Error of the Estimate | F-tests | |
|---|---|---|---|---|---|---|
| | | | | | F | Sig. |
| 2001-2016 | 0,513 | 0,263 | 0,258 | 0,4023510 | 61,000 | 0,000 |
| 2001-2007 | 0,471 | 0,222 | 0,214 | 0,3187444 | 29,296 | 0,000 |
| 2007-2016 | 0,313 | 0,098 | 0,085 | 0,4780735 | 7,333 | 0,000 |

*Note: compiled by author*

The results of multilinear regression based on 5 years holding period during the full period (2001-2016) are provided in Table 13. The highly significant predictors of IPO overpricing are technology sector (*techn*), investors sentiment (*sentiment*), underwriters reputation (*reputation*), IPO volume (*volume*). The technology sector is the only indicator which represents the micro indicators. The difference from 3 years holding period analysis results is that in 5 years holding period case not all macro indicators have significant importance and one of the significant dependent variables is the micro indicator. The highest impact on IPO overpricing has the IPO volumes which represent the hot IPO market conditions. The same results were received in 3 years holding period analysis. All significantly important independent variables have the positive influence on IPO overpricing as expected. The equation of the linear regression analysis is:

$$IPO_{overpricing5y} = -2,280 + 0,251 * \text{tech} + 0,011 * \text{sentiment} + \\ +0,069 * \text{reputation} + 0,009 * \text{volume} \quad (9)$$

**Table 13**

**Results of multilinear regression based on 5 years holding period during the period of 2001-2016**

| Independent variable | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -2,280 | 0,167 | - | -13,673 | 0,000 |
| alrtern_m | 0,000 | 0,023 | 0,000 | -0,020 | 0,984 |
| priv_eq_b | 0,008 | 0,062 | 0,003 | 0,126 | 0,900 |
| vc_b | -0,144 | 0,105 | -0,032 | -1,367 | 0,172 |
| techn | 0,251 | 0,040 | 0,139 | 6,339 | 0,000 |
| gdp | -0,001 | 0,003 | -0,009 | -0,355 | 0,723 |
| sentiment | 0,011 | 0,002 | 0,206 | 5,729 | 0,000 |
| sustain_pol | 0,084 | 0,064 | 0,029 | 1,310 | 0,190 |
| reputation | 0,069 | 0,024 | 0,065 | 2,907 | 0,004 |
| volume | 0,009 | 0,001 | 0,308 | 8,930 | 0,000 |

*Note: compiled by author*

The results show that the only micro indicator which has significant importance is technology sector. Also, two of three macro indicators with significant importance have the higher influence on the IPO overpricing than technology sector indicator. As a result, the *Hypothesis 2 that macro indicators have the higher influence on IPO overpricing than micro indicators in EU IPOs market,* was accepted based on 5 years holding period analysis.

The results of multilinear regression based on 5 years holding period during the period before the global financial crisis (2001-2007) are provided in Table 14**.** The highly significant predictors of IPO overpricing are alternative market (*alrtern_m*), technology sector (*techn*), investors sentiment (*sentiment*) and IPO volume (*volume*). Also, the VC-backed independent variable (*vc_b*) is significant important at 0,1 level of significance. So, two micro indicators: technology sector and VC-backed indicators had the significant influence on the IPO overpricing before the global financial crisis. The same as in 3 years holding period analysis, two macro indicators: GDP growth (*gdp*), underwriters reputation (*reputation*), were not significant important during the period before the global financial crisis. The highest impact on IPO overpricing had the IPO volume. Significant important independent variables: investors sentiment, IPO volume and technology sector had positive effect while the alternative market had the negative influence on IPO overpricing, as expected in the literature overview. The VC-backed indicator had the negative influence on IPO overpricing which is opposite than expected. The equation of the linear regression analysis is:

$$\boldsymbol{IPO_{overpricing5y} = -2,205 - 0,092 * alrtern_m - 0,17,1 * vc_b + 0,252 * techn + +0,013 * sentiment + 0,005 * volume} \quad (10)$$

**Table 14**

**Results of multilinear regression based on 5 years holding period during the period of 2001-2007**

| Independent variable | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -2,205 | 0,265 | - | -8,324 | 0,000 |
| alrtern_m | -0,092 | 0,022 | -0,124 | -4,109 | 0,000 |
| priv_eq_b | -0,023 | 0,055 | -0,014 | -0,425 | 0,671 |
| vc_b | -0,171 | 0,094 | -0,058 | -1,826 | 0,068 |
| techn | 0,252 | 0,038 | 0,194 | 6,643 | 0,000 |
| gdp | 0,001 | 0,004 | 0,009 | 0,292 | 0,770 |
| sentiment | 0,013 | 0,003 | 0,198 | 4,562 | 0,000 |
| sustain_pol | 0,084 | 0,059 | 0,042 | 1,424 | 0,155 |
| reputation | 0,026 | 0,023 | 0,034 | 1,150 | 0,251 |
| volume | 0,005 | 0,001 | 0,214 | 5,049 | 0,000 |

*Note: compiled by author*

The results of multilinear regression based on 5 years holding period during the period after the global financial crisis (2008-2016) are provided in Table 15**.** The highly significant predictors of IPO overpricing are investors sentiment (sentiment) and IPO volume. The independent variable technology sector (tech) is significant at 0,1 level of significance. These three indicators were significant during the all three analyzed periods while in 3 years holding period analysis only investors sentiment had significance importance during different time periods. The highest impact on IPO overpricing had the investors sentiment. All three independent variables which were significant important had the positive effect on IPO overpricing as expected. The equation of the linear regression analysis is:

$$\boldsymbol{IPO_{overpricing5y} = -2,049 + 0,155 * techn + 0,008 * sentiment + 0,006 * volume} \quad (11)$$

The technology sector indicator was the only micro indicator which was significant during all period (at 0,1 level of significance). This indicator had higher influence on IPO overpricing before the global financial crisis. Also, VC-backed indicator the had the significant important influence on IPO overpricing only before the global financial crisis (at 0,1 level of significance). As a result the *Hypothesis 3 that Influence of micro indicators on IPO overpricing increased in EU IPOs market after the global financial crisis,* was rejected.

**Table 15**

**Results of multilinear regression based on 5 years holding period during the period of 2008-2016**

| Independent variable | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -2,049 | 0,254 | - | -8,053 | 0,000 |
| alrtern_m | 0,018 | 0,058 | 0,012 | 0,315 | 0,753 |
| priv_eq_b | -0,024 | 0,178 | -0,005 | -0,132 | 0,895 |
| vc_b | -0,002 | 0,283 | 0,000 | -0,007 | 0,995 |
| techn | 0,155 | 0,085 | 0,071 | 1,818 | 0,070 |
| gdp | -0,006 | 0,006 | -0,045 | -0,973 | 0,331 |
| sentiment | 0,008 | 0,003 | 0,176 | 2,674 | 0,008 |
| sustain_pol | -0,023 | 0,154 | -0,006 | -0,148 | 0,882 |
| reputation | 0,047 | 0,053 | 0,035 | 0,873 | 0,383 |
| volume | 0,006 | 0,002 | 0,172 | 2,650 | 0,008 |

*Note: compiled by author*

Macro indicators which had the significant importance on IPO overpricing during both periods: before and after the global financial crisis, were investors sentiment and IPO volume. Both of them had higher influence on IPO overpricing before the global financial crisis. Moreover,

alternative market was significant important only before the global financial crisis. As a result, the *Hypothesis 4, that Influence of macro indicators on IPO overpricing decreased in EU IPOs market after the global financial crisis* was accepted.

Assessment of micro and macro indicators influence on IPO overpricing based on 5 years holding period allowed to accept three hypotheses of four. *Hypothesis 3* was rejected. The same results of hypotheses testing were received from the 3 years holding period analysis.

## 3.4. Limitations and reliability of the empirical research results

The aim of this chapter is to overlook the reliability of the empirical research results received from the linear regression analysis. Also, the limitations of this empirical research are presented further.

The empirical analysis is based on multilinear regression analysis. The built multilinear regression fulfilled the necessary assumptions and according to F-test all built multilinear regressions were significant important by explaining the IPO overpricing volatility. However, the determination coefficient in all built multilinear regression models are relatively low showing that chosen independent variables: alternative market, private equity backed, VC-backed, technology sector, sustainability policy, GDP growth, investors sentiment, underwriter reputation, IPO volumes, explained low proportion of IPO overpricing volatility. The multilinear regression models built for 3 years holding period explained 14,1 % of IPO overpricing level in full period analysis, 23,6 % - in the period before the global financial crisis analysis and 4,4 % - in the period after the global financial crisis analysis. The same independent variables for 5 years holding period explained 26,3 % of IPO overpricing level in full period analysis, 22,2 % in the period before the global financial crisis analysis and 9,8 % in the period after the global financial crisis analysis. These results show that chosen independent variables - micro and macro indicators - best explain the IPO overpricing in the period before the global financial crisis, while in the period after the global financial crisis they explain IPO overpricing poorly.

Therefore, one of the limitations identified in this empirical research is the low explanatory power of chosen micro and macro indicators after the global financial crisis. This identifies the risk that chosen indicators for the analysis are proper only for the IPO overpricing phenomena analysis before the crisis event. The identification of other micro and macro indicators which potentially are more important after crisis event could allow to increase the reliability of the research. Also, micro indicators, chosen for the empirical analysis, had lower explanatory power than macro indicators. This empirical analysis did not include the financial performance data of the IPO firm. These micro factors implementation could increase the explanatory power of the micro indicators.

Another limitation is related to the benchmark identification technique. The benchmark for the abnormal returns calculations in this empirical research was chosen based on market ratio approach. This lead to a high number of IPO overpricing cases. It is rational to test if the benchmark identification based on peer company approach would provide more accurate results.

The results and conclusions of this empirical research are based only on the EU IPOs market case. Therefore, the findings of the IPO overpricing are relevant only for this market and cannot be assigned to the situation in other IPO markets. Nevertheless, the research methodology for identification of IPOs overpricing phenomena and analysis of micro and macro indicators influence on IPOs levels could be used as a base for analysis of the other IPOs markets.

## 3.5. Discussion of the empirical research results in the context of the previous research on this problem

The aim of this chapter is to present the summarized results of the empirical analysis and provide the discussion. The results are discussed and compared in the context of the previous research on this problem.

The empirical research of micro and macro indicators influence on IPOs overpricing in EU IPOs market before and after the global financial crisis was based on 3 years and 5 years holding period analysis. Both analyses provided similar results. The empirical research tested four raised hypothesis from which three were accepted. The summarized findings of the conducted empirical research are provided in Table 16**.**

**Table 16**

**Summarized findings of the empirical research**

| Holding period | Period | Significant important indicators | | Acceptance of hypothesis |
|---|---|---|---|---|
| | | Micro | Macro | |
| 3 years | Full period (2001-2016) | - | alrtern_m, gdp, sentiment, reputation, volume | Accepted: H1, H2, H3 Rejected: H4 |
| | Before crisis (2001-2007) | tech, sustain_pol (0,1 sig) | alrtern_m, sentiment, volume | |
| | After crisis (2008-2016) | - | gdp, sentiment, reputation, | |
| 5 years | Full period (2001-2016) | tech | sentiment, reputation, volume | Accepted: H1, H2, H3 Rejected: H4 |
| | Before crisis (2001-2007) | tech, vc_b (0,1 sig.) | alrtern_m, sentiment, volume | |
| | After crisis (2008-2016) | tech (0,1 sig.) | sentiment, volume | |

*Note: compiled by author*

The *Hypothesis 1: IPO overpricing phenomenon exists in EU IPOs market*, was accepted. Both 3 years and 5 years holding period analysis confirmed that IPO prices in EU IPOs market underperform in long-run. The same findings were found by other authors who analyzed separate EU member countries: A. Dorsman, D. Gounopoulos (2013) analyzed the Dutch case, W. Bessler, S. Thies (2007) – Germany case, M. Goergen, A. Khurshed, R. Mudambi (2007) – U.K. case. Also, IPO overpricing were confirmed in the other markets: China (Gao, 2010; Shen et al.), 2013, New Zealand (Locke, Gupta, 2008),
U. S. (Amor, Koolib, 2016; Chan, 2013); Japan (Kirkulak, 2008) and etc.

The *Hypothesis 2: Macro indicators have the higher influence on IPO overpricing than micro indicators in EU IPOs market*, was accepted. The analysis showed that most of the chosen macro indicators during the full period 2001-2016 are not significant. Only indicator that company is operating in the technology sector were significant important for IPO overpricing level based on 5 years holding period. Meanwhile, most of the macro indicators were significant. The macro indicators: investors sentiment, high underwriters reputation, and IPO volume had significant importance on IPO overpricing level based on both 3 and 5 years holding period. The findings are similar in comparison to Y. Gao (2010) analysis. The author confirmed that market sentiment and trading volume variables have a significant influence on the IPO overpricing. However, opposite from this empirical research results, Y. Gao (2010) found that underwriter reputation was not significantly important. Other authors' researches confirm that three macro indicators which in this empirical research were identified as having the highest influence on IPO overpricing level: investors sentiment, high underwriters reputation and IPO volume, had significant importance on IPO overpricing level (Shu, Chiang, Lin, 2012; Chan, 2013; Saade, 2015; Amor, Koolib, 2016). All this allows to conclude, that macro indicators have the significant influence on IPO overpricing and that these findings are confirmed in EU IPOs market as well as in other IPO markets.

This research disclosed that technology sector indicator is only one micro indicator which remains important during whole analyzed period. The same findings were provided by C. Chan (2013) and B. Kirkulak (2008). Other two micro indicators: VC-backed firms and implementation of sustainability policy had the significant influence on IPO overpricing only before the global financial crisis. The findings of other authors differ. S. B. Amor, M. Koolib, (2016) and B. Kirkulak (2008) found that VC-backed IPOs do not differ from the non-VC-backed IPOs in terms of influence on IPO overpricing. Meanwhile, C. B. Barry, V. T. Mihov (2015) and S. Saade (2015) found opposite situation. S. M. Locke, K. Gupta (2008) provided evidence that entrepreneurial IPO firms are overpriced. However, this indicator was not significantly important in this empirical research. These different findings show that in comparison with macro indicators, micro indicators are not equally important in different markets and has the lower influence on IPOs overpricing levels.

The *Hypothesis 3: Influence of micro indicators on IPO overpricing increased in EU IPOs market after the global financial crisis,* was rejected. However, the *Hypothesis 4: Influence of macro indicators on IPO overpricing decreased in EU IPOs market after the global financial crisis,* was accepted. Therefore, this empirical research confirms IPO overpricing dependence on the cyclicality of the economy conditions discussed by V. Ivanov, C. M. Lewis, C (2008). Also, macro indicators, such as investors sentiment, high volumes of IPO, creating the speculative atmosphere, had lower impotence after the global financial crisis. This is recognized by other authors who analyze the hot versus cold market conditions. However, according to the results of this empirical research, the importance of micro indicators explaining the IPO overpricing also decreased. F. Wang, X. Dong (2015) discussed that investors during the stock market recession are more cautious in the IPO selections what leads to more rational behavior. In this research was argued that micro indicators are more rational predictors and expected that importance of them would increase after the global financial crisis but that was not confirmed. The important aspect is that micro and macro indicators influence on IPO overpricing is different in different economic conditions. The analysis showed that chosen indicators in the multilinear regression model had poor explanatory power after the global financial crisis event. This could be interpreted in several ways. Other indicators which were less important before the global financial crisis become more important after the global financial crisis but are not so well analyzed in the literature and not included in this empirical research. On the other hand, the period after the global financial crisis is more uncertain, as a result, prediction of this period became more difficult.

Summarizing, the empirical research confirmed that IPO overpricing phenomenon exists in EU IPOs market. The macro indicators have the higher influence on the IPO overpricing level than micro indicators. The importance of the indicators during the periods before and after the global financial crisis differ. The prediction of IPO overpricing is harder after the crisis event.

# CONCLUSIONS AND RECOMMENDATIONS

The object of this Master thesis was IPO overpricing and indicators influencing it and the aim of this Master thesis was to identify micro and macro indicators and to assess their influence on IPO overpricing before and after the global financial crisis in EU IPOs market. After the theoretical aspects and previous researches analysis and empirical analysis based on the constructed methodology the following conclusions and recommendations are provided:

- An overpricing can be defined as a situation when the IPO shares "offer price substantially exceeds the corresponding intrinsic value computed using multiples of firms in the peer group of the issuing firm" (Gao, 2010). IPO overpricing phenomenon is proved by other researchers in different IPO markets (Chan, 2013; Saade 2015, Gao, 2010; Locke & Gupta 2008, etc.). This phenomenon is explained by different theories, which mostly are based on information asymmetry between IPO firm and investors in the IPO transaction.
- Different indicators are influencing IPO overpricing. These indicators can be distinguished into micro and macro indicators based on IPO firm ability to influence them. Micro indicators are related to the specific IPO firm characteristics and can be influenced by IPO firm. Other researchers exclude these micro indicators: size, age, governance, sustainability policies, financial data of the IPO firm, firm's dependence on the particular sector. Macro indicators represent environment conditions surrounding the IPO firm and cannot be influenced by the IPO firm. Most often discussed macro indicators in the theory are underwriter's reputation, IPOs market cycle period, investors' sentiments, the economy conditions.
- IPO market is highly cyclical and that can explained from two perspectives: the stock exchange market cyclicality and the economy cyclicality as a whole. Hot periods in stock exchanges are followed by the higher sentiments and over-optimism of investors what leads to IPO overpricing. Meanwhile, recessions in the economy are led by high volatility and information asymmetry, investors are tended to overestimate the likelihood of the recession event and became passive in terms of investing into IPOs.
- This empirical research is based on the EU IPOs market case. Therefore, the sample includes all IPO markets in European Union countries. The empirical research covers the period from 2001 till 2016. In order to analyze the differences between the periods before and after the global financial crisis, three different period analysis were done: 1) all period analysis (2001-2016), 2) the period before the global financial crisis analysis (2001-2007); 3) the period after the global financial crisis analysis (2008-2016). The empirical research has four main stages. The benchmarks were identified based on the market ratio approach in Stage 1. The benchmark was

chosen as a particular sector index for IPO firm performing in that particular sector. In Stage 2 abnormal returns were calculated for different time periods based on Buy-and-Hold-Abnormal-Returns (BHAR) method. Holding periods for BHAR returns calculations were chosen 3 years and 5 years periods. The abnormal returns are the base for identification of the IPO overpricing existence and its levels. The multilinear regression models construction and testing were provided in Stage 3. The models are built on the dependent variable (IPO overpricing) data collected in Stage 2 and independent variables data: micro indicators (entrepreneur firm, VC-backed firm, technology firm, applied sustainability policy) and macro indicators (alternative market, GDP growth, investors' sentiments, underwriter's reputation, IPO volatility). The constructed multilinear regression models allowed to identify the micro and macro indicators influence on IPO overpricing. In Stage 4 the findings and discussion were provided.

- The formed sample for 3 years holding period was 2921 IPOs, and sample for 5 years holding period analysis was 2104 IPOs. The results of empirical research provided evidence that IPO overpricing phenomenon existed in the EU IPOs market during the all period of 2001-2016 based on both 3 years and 5 years investment holding periods. The findings between 3 years and 5 years holding periods were similar. The number of overpriced IPOs were increasing since 2001 till 2006 together with increasing number of IPOs overall. The peak of 332 overpriced IPOs based on 3 years holding period analysis and the peak of 258 overpriced IPOs based on 5 years holding period analysis was in 2006. During the period around the global financial crisis (2006-2009) the number of overpriced IPOs was decreasing from 332 till 79 based on 3 years holding period analysis and from 258 till 78 based on 5 years holding period analysis. However, after this period the number of overpriced IPOs started to increase while the number of not overpriced IPOs remained stable. Based on these findings *Hypothesis 1*, that *IPO overpricing phenomenon exists in EU IPOs market*, was accepted.
- The evidence of IPO overpricing existence in the EU IPOs market allowed to continue the research on micro and macro indicators influence on IPO overpricing. The multilinear regression models built based on 3 years and 5 years holding periods were highly significant for all three analyzed periods. The analysis of the full period (2001-2016) based on both 3 years and 5 years holding periods showed that micro indicators do not have the significant influence or have low influence on IPO overpricing while most of the macro indicators have a significant influence. Therefore, *Hypothesis 2*, that *Macro indicators have the higher influence on IPO overpricing than micro indicators in EU IPOs market*, was accepted. The analysis of micro indicators on IPO overpricing based on 3 years holding period showed that micro indicators had the significant influence on IPO overpricing only before the global financial crisis. According to the results of 5 years holding period analysis, the micro indicators had the higher influence on IPO overpricing

before the global financial crisis. Based on results from both 3 years and 5 years holding period analysis the *Hypothesis 3,* that *Influence of micro indicators on IPO overpricing increased in EU IPOs market after the global financial crisis*, was rejected. The analysis of macro indicators on IPO overpricing based on both 3 years and 5 years holding periods showed that macro indicators had the higher importance on IPO overpricing before the global financial crisis. Based on these results *Hypothesis 4,* that *Influence of macro indicators on IPO overpricing decreased in EU IPOs market after the global financial crisis* was accepted.

- The important limitations of empirical analysis are that the benchmark identification for IPO overpricing calculations was based only on market ratio approach. Also, the built multilinear regression models had poor explanatory power after the global financial crisis event. The chosen micro indicators had lower explanatory power in comparison to macro indicators. This shows that other macro and especially micro indicators could be included in the empirical analysis.
- The novelty of Master thesis is that it is focused on comparable aspects of micro and macro indicators impact on IPOs, what was not addressed in the previous researches. The attention is put on the global financial crisis influence on the IPOs' pricing based on the most recent historical data. Also, this Master thesis analyzed all IPOs cases in EU member states as in one market during the selected period while other researches addressed only separate EU member states IPO markets.
- The recommendations based on the Master thesis findings can be provided to the investors. The investor who is willing to invest in the IPO firm in the EU IPOs market should pay attention to the IPO market cycle while hot market conditions could mean the high number of overpriced IPO firms. The recognition of overpriced IPOs can be hard because of general optimism in the market. Also, investors should pay attention to the IPO firms which belong to the technology sector and be conscious of the possibility of fads in this sector IPOs markets.
- The research can be further implemented towards different directions. The benchmark identification for IPO overpricing in the EU IPOs market can be based on peer company approach. Also, other abnormal returns calculations can be implemented instead or parallelly to BHAR method, e. g. Fama and French(1993) three-factor model, Carhart (1997) four factors model. The further reseraches could address the question about the micro and macro indicators which were not included in this research and potentially have the higher influence on IPO overpricing after the global financial crisis.

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