St. Petersburg State University

Graduate School of Management

Master in Corporate Finance Program

Investors behavioral peculiarities and IPO underpricing when companies go public

Master Thesis

by the 2nd year student:

Albina Rasputnyaya

Research Advisor

Associate Professor

Irina V. Berezinets

St Petersburg

2021

ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

Я, Распутняя Альбина Петровна_____, студент второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему « Особенности поведения инвесторов и недооценка акций при выходе компании на IPO», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

Все прямые заимствования из печатных и электронных источников, а также из защищенных ранее выпускных квалификационных работ, кандидатских и докторских диссертаций имеют соответствующие ссылки.

Мне известно содержание п. 9.7.1 Правил обучения по основным образовательным программам высшего и среднего профессионального образования в СПбГУ о том, что «ВКР выполняется индивидуально каждым студентом под руководством назначенного ему научного руководителя», и п. 51 Устава федерального государственного бюджетного образовательного учреждения высшего образования «Санкт-Петербургский государственный университет» о том, что «студент подлежит отчислению из Санкт-Петербургского университета за представление курсовой или выпускной квалификационной работы, выполненной другим лицом (лицами)».

__ _____ (Подпись студента)

_07.07.2021_____ (Дата)

STATEMENT ABOUT THE INDEPENDENT CHARACTER OF THE MASTER THESIS

I, _Albina Rasputniaia_____, (second) year master student, _____program «Management», state that my master thesis on the topic «Investors Behavioral Peculiarities and IPO Underpricing when Companies Go Public», which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

All direct borrowings from printed and electronic sources, as well as from master theses, PhD and doctorate theses which were defended earlier, have appropriate references.

I am aware that according to paragraph 9.7.1. of Guidelines for instruction in major curriculum programs of higher and secondary professional education at St.Petersburg University «A master thesis must be completed by each of the degree candidates individually under the supervision of his or her advisor», and according to paragraph 51 of Charter of the Federal State Institution of Higher Education Saint-Petersburg State University «a student can be expelled from St.Petersburg University for submitting of the course or graduation qualification work developed by other person (persons)».

__ _____(Student’s signature)

__07.07.2021_____ (Date

Table of contents

Introduction 4
Chapter 1. IPO phenomenon overview....7
1.1. Ways of financing....7
1.2. IPO fundamentals 10
1.2.1. Types of offerings....12
1.3 Review of reasons for companies to go public 13
1.3.1 Advantages of going public 16
1.3.2 Disadvantages 18
1.4 IPO process key components: preparation evaluation....20
1.4.1 Key steps in the IPO process and the role of an underwriter....22
1.5 IPO underpricing and its theoretical explanations....24
Chapter 2. Peculiarities of investor behavior....30
2.1 Theories of individual investors behavior irrationality....30
2.1.1 Miller's hypothesis....31
2.2 Investor sentiment....33
2.3 Empirical validation of investor behavior influence on IPO underpricing....35
2.4 Prospect theory 38
Chapter 3. Empirical research on investor sentiment influence on IPO underpricing 40
3.1 Research hypothesis statement 40
3.2 Research methodology....47
3.3 Sample construction and descriptive statistics....49
3.4 Regression Analysis....59
3.5 Statement and justification of expected theoretical and practical contribution. 62
Conclusion 66
References....69
Appendix 72

Introduction

The process of going public as well as phenomenon of underpricing have been under close attention of the scholars during decades, still there is not a unified commonly accepted explanation for it. Even though numerous works have been already devoted to the matter, the research gap stays solid.

Among the major explanation to existence of underpricing the theory of behavioral finance is rather new but extremely fast developing area of studies, that analyzes two subjects of study: individual investors and managers (firms) investment behavior. While the first approach is based on the idea that investors are less than fully rational and views managerial financing and investment decisions as rational responses to securities market mispricing. The second approach emphasizes that managers are less than fully rational and analyzes the effect of nonstandard preferences as well as judgmental biases on managerial decisions. Although, a complete explanation of financing and investment patterns requires an understanding of the beliefs and preferences of these two sets of agents: individual investors and CEOs (managers), the analysis of the first category is prevalent. However, an issue of the management investing related decisions is of great importance from the practical implementation point of view (the findings on this matter probably will allow a company to increase profit) as well as from theoretical perspective.

The research gap regarding the matter exists in several dimensions; first, there is no accord on weather behavioral factors do contribute to underpricing in general – so this is the first facet that requires clarification, then direction of the behavioral factors influence is debatable. Hence, the research goal of the Master Thesis is to establish relationship between amount of IPO underpricing companies going public face and investors sentiment.

As there is still no accord in a scientific community regarding the fact weather behavioral factors at least partially determine the pricing on the first day of trading, the main idea here is to help to fill in the research gap. However, as the question of investors sentiment has already been approached by numerous scholars, the distinctive feature of the work lies in the idea of not evaluating separate behavioral characteristics influence but trying to capture the sentiment from the broader perspective by construction a measure that will reflect various investor behavioral peculiarities, thus, allowing to model the real-world situation more precisely.

The question whether investor sentiment has an impact on stock prices is of foremost importance due to several reasons: first, as was shown by several scholars that irrational investor behavior can be one of the causes of stock market crisis, market bubbles and consecutive negative effects

such as significant devaluation. Two most severe crisis in the beginning of the 21 century demonstrated negative consequences of investor sentiment influence on asset prices. Second, some papers have proven that there are certain trading strategies that are based on investors behavioral peculiarities, hence, this point represents interest and attracts close attention.

The reasoning mentioned justifies the broader picture of the interest to behavioral aspects influence on the financial market, besides the IPO side has its specifics, thus, the sentiment here is important from the overall idea of losses a company may suffer from, so called amount of money left on the table. The issue is important for all parties included in the IPO process realization: for investors it is valuable to have an idea of how beneficial for them can be acquiring of the new issue; a company going public needs to understand a scale of potential detrimental effect caused by investor sentiment, an underwriter has to have this influence in mind as well to manage the listing process in a more effective way.

The overall idea of investor sentiment measurement is complicated in its nature the previous literature showed numerous sentiment proxies. While all these proxies are likely to capture some aspect of sentiment, they also contain an idiosyncratic, non-sentiment related, component. Thus, it is difficult to choose a single "best" proxy out of the individual proxies suggested in the research.

It is widely utilized practice in the literature to concentrate on a limited number of factors that partially describe the behavioral peculiarities, however, this situation forces a researcher to choose one investment sentiment measure in favor of the other as their simultaneous influence is not always possible to analyze. Besides, many researchers do not put an emphasis on picking up the characteristics that would describe an investor from different perspectives, they make a choice of the indicators based on the country stock market specifics or available indicators in place as this is a challenging task to find a suitable reflection of the behavioral aspects. While market determinants that are indirectly show the investor sentiment (so called implicit determinants) are employed more often, the characteristics of explicit influence due to the fact of their far lesser availability are analyzed to significantly less extent. The aim of the Master Thesis is to try to capture this influence as well. While the availability of data will be a key determinant here, some previous works show that this is still possible to accomplish, hence, an attempt will be undertaken. This factor will also be a turning point for a country choice. Therefore, two main things determining the sample are the activity of an IPO market and existence of direct investor behavioral measure for a country (special indices are calculated for some European countries).

Overall, the method of that will be employed for research goal achievement is econometric analysis (classical OLS approach) with principal component analysis (a standard tool in modern data analysis applied in diverse fields, that is a simple, non-parametric method allowing to extract relevant information from extended data sets) usage for the behavior indicator construction. The justification of the idea to employ the latter method was already given, however, several words regarding the analysis and its potential limitations will be further given. Even though the proposed methodology may seem rather basic, however, it exactly corresponds with the goal stated and will allow to achieve it in a comparatively straightforward way.

The main research question the Master thesis will concentrate on is whether the amount of IPO underpricing in related to the investor sentiment.

Besides, additional concerns a researcher should have in mind when dealing with the research gap investigation are numerous. For example, the combination of which behavioral traits is primarily accountable for decisions investors undertake that influence the pricing of a company; how individual investors can influence a company underperformance at all, what mechanisms stay behind that; is there a possibility for a firm to mitigate the underpricing by somehow adjusting investors behavior and whether they should do it at all, what factors make an investor a threat to a company short term performance and to what extent they can be controlled by the investors themselves. Or why the phenomenon of IPO underpricing exists and what are the prime determinants of this issue; what is the evidence behind the opposing scientific opinions on the behavioral finance application to IPO underpricing, whether explaining the IPO underpricing phenomenon from the behavioral aspect contradicts any other explanation theory.

All the concerns mentioned above represent interest from both practical and theoretical aspect as by receiving answers to them managerial implication can be influenced significantly as well as the existing research gap clarified. Initially, some of the questions seem hard to be answered especially those connected to behavioral aspects, but the empirical analysis is expected to shed light on them, while other part of the questions stated relies heavily on the literature review thorough analysis.

In general, each of the concerns stated allows paying closer attention to different aspects of the problem under consideration. One of them, for example, is concentrated on the sentiment measures choice that is a crucial milestone that needs to be decided on when designing empirical part of the analysis. The main thing here is whether availability of data allows the research to stand out by inclusion of explicit investors' characteristics and, thus capturing investment sentiment traits in a more thorough manner.

Another important concern is about the overall mechanism that is stated behind the behavioral aspects influence on the underpricing phenomenon. This point represents not only the basis for the overall research canvas, but also builds understanding of the future results obtained and reality, as it is easy to get lost in numbers and loose the connection to the underlying phenomenon. Then it is for sure impossible to study a subject without immersing into its functioning, regulating laws and peculiarities. The following concern is connected to the opposing scientific branches that see the issue from different scopes and have the evidence to back them up. Here the problem of which of the points of view to share arises, for sure, there are numerous factors that determine the results obtained by different scholars: starting from sample specifics represented by time period, country peculiarities, industries under consideration to indicators usage and justification of the mechanisms underlying.

In general, all the research questions stated allow clarifying the order of steps the research will follow and raise concern on the important matters that are needed to be kept in mind while performing each stage. However, it is necessary to emphasize that some of the research questions are formulated in a broad manner so this is possible that not every aspect of them will be covered ultimately, nevertheless, it is better to still try giving attention to them as it is important to cover these subjects of concern at least partially for covering the research goal in a more thorough and appropriate manner.

1. IPO phenomenon overview

1.1. Ways of financing

Equity capital represents a basis on which owners start building their company, it is a common practice to rely on proper funds or that of immediate family for initial capital formation (money that one invests into a business). But this type of financing has its limits and can be exhausted relatively fast, this leads to necessity of attracting outer resources, growth almost always requires outside capital. To acquire outer capital a private company should seek for the resources suitable, but also needs to consider requirement that outside investors have and an influence this capital injection is going to make.

The first choice a company faces when determining future financing plans is weather to address equity or debt capital. Both have their advantages and drawbacks. The overall idea a manager faces is to optimize a capital structure (the mix of debt and equity that maximizes the firm's intrinsic value. The intrinsic value of a business is the present value of all expected future cash flows, discounted at the appropriate discount rate or in other words stock price a rational investor is ready to pay (CFI). Finding this optimal mixture is a complicated task, many theories are trying to

explain and facilitate to (Modigliani and Miller, Trade-Off Theory, Signaling Theory, The Pecking Order Hypothesis e t.c.) (Brigham, 2016). While rising debt capital has its advantages such as tax savings, for the purposes of the current study equity capital is going to be analyzed in more details. The common ways of private company equity funds attracting include angel investors, venture capital funds, private equity firms, institutional and corporate investors.

Start-ups at the beginning of their life cycle strive for external funds due to the high growth rates they experience, however, the period is very often characterized by the negative free cash flow at the same time. For majority of start-ups first round of external financing starts with addressing so called "business angels" – individual investors who invests into small private firms (DeMarzo, 2014). Business angels play a crucial role in providing funds for small to medium-size companies, especially innovative ones with high growth potential. (Ramadani, 2009). They bridge a critical funding gap between the demand and supply for early-stage equity capital, when founders, their families and close inner circle funds are already exhausted, and external institutional financing is not yet available. This type of financing is also characterized by relatively low transaction costs in comparison venture capital. (White, Dumay 2017).

The rules of the game here are the following: in return for their money provided they receive a share of company stocks (because the capital investment is often large enough in comparison to the previously attracted capital, their equity share is as a result sizable). Moreover, angels frequently get a seat in the board of directors and, hence, acquire substantial influence in business decisions. (DeMarzo, 2014). The research on business angels progresses and have shifted from analysis of the angels characteristics and the informal risk capital market, towards an analysis of the investment process itself and the influence it has on companies performance (Ughetto, 2018).

Therefore, a thing a company receives apart from the money obtained is sometimes additional experience and expertise angels bring on the table that may be of high value and other non-monetary resources such as industrial knowledge, management experience, counselling, and networking (Bonini, 2018). Finding a business angel may be a hard thing to do that very often depends on networking and how well an owner may establish social connections. Very often at a starting point founders lack necessary relationships that prevents them from addressing business angels and stimulates finding other ways of financing. (Brigham, 2016)

Next source of funds a company may use when individual investors financing is not already sufficient is venture capital. Venture capital fund is a private limited partnership, which typically raises funds from a relatively small group of primarily institutional investors, including pension funds and corporations. (Brigham, 2016) Some authors point out that venture capital represents a

key source of capital that fuels innovation and development. While this type of investment is risky, it is accompanied with a prospective high return as well. (Drover, 2017) There are two groups of partners who participate in venture capital funds – general and limited. While the former run the partnership, invest relatively small amount, and are authorized to undertake decisions, the latter invest money but lack permission of being involved in the decision-making process. Because of their limited participation, they are not held liable for any of the partnership's liabilities, except to the extent of their original investment. General partners are called venture capitalists, they usually have expertise and knowledge of a particular industry and form a board of directors (Gompers, 2016).

Venture capital funds provide their limited partners with several advantages in comparison with investing in start-ups directly. First, as funds eventually select for investment around a dozen of companies (portfolio companies) out of many more analyzed, as a result they make investment diversified and reduce a risk limited partners are to undertake. Another benefit is expertise venture capitalists bring not only in selecting the ultimate investment goals, but also managing a fund in general (Wright F, 2017). Nevertheless, the advantages come at their cost – general partners charge substantial fees to run the firm, in addition, they take a share of any positive return generated by the fund (carried interest) (DeMarzo, 2014). The venture capital fund usually has a limited life of around 10 years, after which it is dissolved, either by selling the portfolio companies' stock and distributing the proceeds to the funds' investors or by directly distributing the stock to the investors.

Venture capital provides substantial capital for private companies, but in return often demand sufficient control over an entity. According to PWC report, in 2020 318 mega-rounds worth $100M or more were completed in the USA during the year, while global deal activity fell, funding increased. Generally, companies' owners that acquire venture capital consider the required degree of control justified, it can even be perceived as a benefit. Venture capitalists aim at protecting their investment, thus, monitor the companies' activities and overall situation closely, that can be exploited by firm owners as a part of their responsibilities is practically delegated to the professionals (Caselli, 2018). Kaplan and Lerner (2010) estimate that roughly one-half of all true IPOs are VC-backed even though far less than 1% of companies receive venture financing.

Another funding resource that can be taken use of are private equity firms, that are in principle are similar to venture capital funds. The firms in this case usually invest in existing privately owned companies rather than in start-ups. (DeMarzo, 2014) Private equity funds often constitute institutional investors such as investment and pension funds, banks, insurance companies, e t.c in conjunction with the fund managers themselves. They determine identify and research private

companies, a further prospective investment, that is risky by the nature. The funds generate capital profits from sale of investment, rather than dividends or interest payments. Private equity investment is aimed at generating capital gains, that is a prime interest of potential investors. The underlying mechanism is to buy equity stakes in businesses, actively managing those businesses and then realizing the value created by selling or floating the business (Gilligan, 2020) Private equity firms also very often participate in leveraged buyouts, it means that they buy back shares of publicly traded companies, hence, transforming them back to private entities. These type of financing shares the advantages of venture capital but is characterized by the high remuneration required to attract the funding. However, venture capital and private equity differ in the magnitude of investment, with the level being higher for the latter. PE European market, for instance, is in general at rise, accounting for 2515 deals at a combined value of €260 bn in 2019. (Private Equity Trend report 2019, PWC)

Apart from the mentioned ways of financing, institutional entities engaged in investment activities provide their offer to the private companies as well. An investment may be direct or indirect through means of venture capital finds or private equity firms. It is also a common practice in established corporations to purchase equity of promising private entities. Corporate investors, by contrast to other mentioned investors who are primarily interested in financial results, might invest for a different reason such as corporate strategic objectives in addition to investment returns.

1.2. IPO fundamentals

A fundamental component underlying the phenomenon (underpricing) analyzed in the Master Thesis is the process of companies going public (IPO). The definition of initial public offering has been put by scholars in different words, for example, IPO is the process of selling stock to the public for the first time (DeMarzo, 2014, Brigham, 2016). IPOs involve selling securities, on which prior information is extremely limited, to many investors, including institutional and retail investors and employees. IPO occurs when private company uses an underwriter or investment bank to become a public company (Investing.com). An initial public offering (IPO) is the process of offering shares of a private corporation to the public in a new stock issuance (Investopedia). The Initial Public Offering is a process where a previously unlisted company sells new or existing securities and offers them to the public for the first time (Corporate Finance Institute). Brealey and Myers, 2003 mention two sides of the definition, as IPO may be a primary offering, in which new shares are sold to raise additional cash for the company. Or it may be a secondary offering, where the existing shareholders decide to cash in by selling part of their holdings. According to EY definition, an IPO is the first sale of a company's shares to the public, the listing of shares on a

stock exchange. It allows a company to raise capital to build its business by creating newly issued shares and selling existing shares. (EY Guide to going public, 2018)

Overall, the process allows a company to attract additional capital it needs from outside the organization. Before it goes public, a company is considered to be private – there are indeed shareholders who provided funds for its functioning, but their number is limited to accredited investors (like angel investors/venture capitalists and high net worth individuals) and/or early investors (the founder, his family and friends).

Listing on an exchange provides access to considerable financial resources that firms normally use to facilitate growth, reconcile their current obligations, invest in new projects and equipment, and hire new personnel and managers. Going public makes companies in general stand out, hence, more visible, perceived as more legitimate, they get access to additional capital at less cost, and are often perceived as more attracting acquisition targets. Moreover, IPOs allow founders to diversify their portfolios through cashing-in - converting their equity into cash. An IPO provides the first opportunity to observe stock market reactions, observing evidence by share pricing adjustment on the first day of trading to publicly available information about a firm's strategy and structure. (Allison S. et al, 2008).

The global statistics demonstrates that listing is a popular way of new funds generation all over the world with the amount of capital raised and number of IPOs continuing to beat the previous records, thus, the economic significance of this process only progresses (PWC Global IPO Watch, 2020), that is why the heated debate is only strengthened in studying this multifaceted activity.

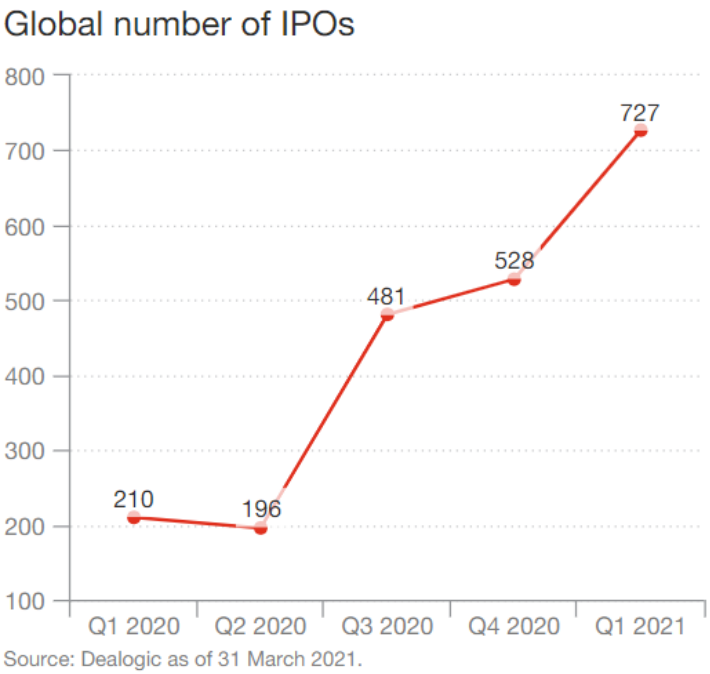

Fig. 1.2 Global number of IPOs

Source: [PWC Global IPO Watch, 2020, p.1]

An IPO provides the first opportunity to observe stock market reactions, reflecting on evidence by share pricing adjustment on the first day of trading to publicly available information about a firm's strategy and structure. The global statistics demonstrates that listing is a popular way of new funds generation all over the world with the amount of capital raised and number of IPOs continuing to beat the previous records, thus, the economic significance of this process only progresses, that is why the heated debate is only strengthened in studying this multifaceted activity.

1.2.1. Types of offerings

The IPO definitions provided a first glance at the fact that the process may be of various types, the major factors according to which categories are set include types of shares that will be offered and the mechanism a financial intermediary will use to sell the stock. According to the former criteria, an IPO offering may be primary (when newly issued shares are supplied) or secondary (when existing shares are sold be current shareholders, that include founders, business angels, venture capitalists e t.c.). Among the large number of variables that might affect the way shares are priced and sold in new offerings, the role of previous relationships between key participants in the listing process is important to consider. Existing mixed evidence suggests that repeated interactions among the major players could influence the IPO results in two ways: either by reducing asymmetric information problems or by determining opportunistic behaviors which can be seen in secondary market price anomalies (Severini, 2020).

An underwriter may approach the deal differently, that is why several kinds of IPOs corresponding to an underwriter commitment can be distinguished. Generally, for smaller IPOs an underwriter offers best-efforts basis (in this case best-efforts IPO type is in place), that means that the underwriter does not guarantee that the offering will be sold but attempts to reach best possible price for the sale. Hence, a bank sells as many shares as possible and earns a percentage of the offer proceed. This kind of deal is rare in a formal documented offer, as investor confidence could plummet if there is no formal pledge that the deal will go through. (Vernimmen, 2005). When best efforts are made the investment bank receives a prearranged commission off the offer proceed. A crucial feature of this offer is the Minimum Sales Constraint which specifies a minimum threshold for sale. (Kim, 2020) In this case an offer often has all-or-none clause: either being sold completely or called-off. Sometimes the best efforts can be suggested to be undertaken by an underwriter if a deal is perceived to be highly risky. (Brealey Miers, 2003).

More widely spread type an underwriter suggests is firm commitment IPO when they guarantee to sell the entire issue. In this situation underwriter purchases the entire issue (at a slightly lower price than the offer price) and then resells it at the offer price. Thus, a bank buys all shares from the issuing company for a negotiated discount, assumes the risk and guarantees sale. If for some reason shares are not sold, an underwriter will have to deal with it, and sell remaining at the lower price, thus undertaking a loss.

In contrast to traditional IPO types, auction IPO mechanism allows market to set the price of shares by auctioning off the company. In this case investors place their bids over determined period of time; an auction IPO then sets the highest price such that the number of bids at or above that price equals the number of offered shares. All winning bidders pay this price, even if their bid was higher. But although the auction IPO mechanism seems to represent a viable alternative to traditional IPO procedures, it has not been widely adopted (DeMarzo, 2014).

1.3 Review of reasons for companies to go public

When starting to study an IPO process one of the first questions that arises is the reasoning behind the whole idea, or why exactly business chooses to go public rather than staying private. Probably, the most evident fundamental idea behind is the demand for new funding a firm decides to attract through equity capital and further public market creation that will allow the founders and other shareholders to convert their wealth into cash at a future date. Financial reasons primarily include new projects financing, debt retirement, overall liquidity increase, lower capital costs attracting, and increase liquidity for founders and pre-IPO investors. There exist nonfinancial reasons as well, such as increased publicity and prestige, for instance. However, it is still not clear why the motivation to perform an IPO is stronger in some situations as many entrepreneurs still prefer to

solely run their firms rather than engage in the complex public market process. There are several possible theoretical explanations that can shed light on the query.

Life Cycle Theories. The reasoning of this theoretical branch relates to the increase of acquisition probability through going public as it is much easier for a potential acquirer to spot a potential acquisition target when it is public and, as a result, more visible. Another concern company owners have in mind in this case is related to gaining the most out of the deal, they realize that acquirers can pressure targets on pricing concessions for greater extent than outside investors. By going public, owners thus, help to facilitate the acquisition of their company for a higher value than what they would get from an outright sale and, hence, get more favorable personal benefits (Zingales (1995).

Other authors even find that less innovative firms that face financial constraints seek public equity in earlier stage of an industry's life cycle. Moreover, when more private capital flows to the industry early in its growth phase average profitability of such an early IPOs is lower. Hence, according to the obtained results, availability of private capital enables better-performing firms to avoid early public issuance without incurring a long-term product market disadvantage. At the same time, delayed IPOs carry a cost for public investors. When late issuers enter public markets, it is too late as the period of high market-share growth and high returns for equity investors has gone (Nain, 2018).

According to the theory, an optimal ownership structure of a company changes over the life of a company, when the comparative advantage edge of insiders regarding company activities and prospects fades away, owners initialize IPO process. In other words, the state of being a private company benefits its owners to a certain moment in time, when they can use the insider information for their good, however, when a company moves to a different stage in its life cycle, this advantage does no longer exist, hence, it becomes optimal to go public. Issuers benefit from the IPO, since it stimulates new investors to acquire and reveal information that can be used for future investment projects evaluation, thus, the monitoring costs may be reduced as investors reveal the information needed (Maug, 2000).

Market-Timing Theories. This branch holds several rational and semi rational postulates of the motivation to list on a stock exchange. The first idea was stated by Lucas and McDonald (1990), they develop an asymmetric information model, which implies that firms postpone their equity issue if they know they are currently undervalued. If issuers for some reason are sure that currently market is bear and, thus, places too low value on the firm, they will delay their IPOs until a bull market offers more favorable pricing conditions. However, another important point here is a

conventional wisdom among both academics and practitioners that the quality of firms going public deteriorates as a period of high issuing volume progresses.

The evidence shows that firms go public in response to favorable market conditions, but only if they reached beyond a certain stage in their life cycle. Scholars prove that firms time their equity issues to exploit opportunities in favorable equity markets, in other words, hot-market firms issue more equity and experience a larger decrease in their leverage ratios in comparison with cold-market firms. The effect is however temporary in nature and does not influence leverage levels in the long run significantly (Gonçalves, 2019). Apart from that, firms avoid issuing in periods where few other good-quality companies issue, so they are avoid complicating a process of listing even more by additional competition for funding (Choe, Masulis, 1993). Other theories have argued that markets provide valuable information to entrepreneurs ("information spillovers"), who respond to increased growth opportunities signaled by higher prices (Schultz, 2000).

Market-timing theories prove to be working in different market settings, for example, for Indonesian market, the results suggest that firms tend to issue equities when their market valuations are relatively higher than their book values and their past market values are high as well. The results of long-term measurement on equity market timing, however, do not appear to affect the firms' capital structure decisions due to the relatively quick reaction and following adjustments of optimal capital structures. The conclusion here is that equity market timing is an important element in the short run but not in the long run (Ratih, 2019).

Another explanation for cycles in issuing activities is provided by semi rational theory without asymmetric information, it assumes that owners' enterprise value is based more on their internal perspective, their day-to-day involvement in the operations, rather than on the market outside signals. As a result, abrupt changes in the value of publicly traded firms are absorbed into the private sense of value held by entrepreneurs with a lag. Therefore, even if the market price is driven by irrational public or private sentiment, entrepreneurs reject the idea of listing even after valuations in the public markets have increased, because their inner perception has not adjusted yet.

Practical considerations. Despite of the fact that there is a broad theoretical fundamental basis explaining the motivation of companies to go public, scholars attempt to find some empirical evidence to support their speculations. For instance, Skalická M. et al. (2019) designed and applied a set of composite indicators the values of which may be understood as an indication of the extent to which IPO launch motives originate in the zone of the issuing company's needs or in the zone of interest of its owner, that allow to assess not only the predominant IPO motive zone, but also

measure the intensity of the motives. The results obtained demonstrated that in the last decade, the IPOs carried out in Prague mainly served for the exit of investors, usually selling minority stakes through the IPO, while maintaining control over the issuers.

1.3.1 Advantages of going public

The reasoning of a company behind a decision of going public represents a significant interest for both scientific and practical point of view, because on the one hand, the set of criteria seems to be multifaceted and, thus, puts on the table a hot topic for discussion. On the other hand, the motives are of extreme use for organizations considering issuing stocks as the decision can heavily rely on the underlying pros and cons. It goes without saying that managers should pay close attention to the business peculiarities, analyze the relevant considerations and weight carefully all aspects at stake when making decision of going public; that's why the reasons should be analyzed in detail and will be further described. While there is still no accordance in the views of scholars, and each particular company motivation can differ substantially, there are some speculations on the reasoning that could in general provide explanation and will be further considered.

New way of financing. The probably most evident but at the same time reasonable advantage an IPO process facilitates acquiring is additional source of funding. The whole idea of going public undoubtedly rests on the necessity to attract new source of money into a company. This reason, in addition, in opinion of some theorists is accompanied by the other advantage – consequently improved prospects for growth. These prospects do not necessarily mean immediate expansion or subsequent scaling, but rather rising chances for it.

Ransley (1984) expanded the idea by providing a ranking of possible prospects for expansion issuers believe to take place; among them are growth by making acquisitions, increase in available funds for organic expansion and in means for covering outstanding debts. Another point of view on this positioning by Buckland (1989) puts capital investment first, followed by acquisitions and debt recovering. Overall, the option of further company expansion by acquiring another entity after conducting IPO is supported by numerous scholars as well as by practice. In fact, going public facilitates the subsequent acquisition because it gives the ability to use the company's stock as ''currency'' to acquire other companies as sellers are more willing to accept stock with a liquid public trading market than illiquid private company stock.

Entering IPO also facilitates raising subsequent and long-term funding including that on a capital market that is generally enables companies to raise money more quickly with less cost and more flexibility than the private markets in several ways. Firstly, going public strengthens equity capital base and reduces leverage, it also may as a result facilitate achieving optimal capital structure,

thus, allows to avoid or at least reduce several issues like agency problem or a position of being highly leveraged (Jelita, 2019).

Secondly, liquidity can serve as a prerequisite for the further capital attracting. This fact can be justified by the statement that equity price signals the company overall value, shows its activity and current market position to some extent. The explanation of it holds the theory that stock market comprehensively aggregates multiple source signals, however, as many agents operating on the market may disturb its activity or make it less accurate, it is not always a good idea to rely solely on this indicator. Overall, going public increases liquidity for investors and employees through the creation of a liquid public market and greatly expanded pool of potential purchasers to facilitate sales of stock. Moreover, it raises the market value for the company because the illiquidity discount applicable to private company stock is eliminated.

Enhanced corporate image and publicity. Many companies see the rise in potential clients or other market players awareness to be another key advantage of going public. This way not only stock market activity appears to be at rise, but also core operations of an organization are influenced significantly. The bigger attention is given, the higher growth in different aspects can be anticipated – from ordinary customers relationship to broadening supply chain and attracting more funds. Some authors empirically demonstrated the effect of increased public recognition by observing companies webpage visiting rate, the results showed that almost 90%in the sample experienced increase in the rate. Moreover, if a company was well-known beforehand or listed by a major underwriter public attention is even larger (in terms of web-page views). (Okada, 2018)

Another positive point may be a probable consequence of improved public image - hiring of talent and increased marketing. The situation in this case is straightforward, young talents tend to take into consideration strong brand and market positioning when choosing a place to work for, thus, additional attention to a company rises its chances to be picked up by the most prominent prospective employees. Current employees' satisfaction with a company and their overall opinion regarding it may also play an important role for IPO outcome. Researchers state that employees' pre-IPO views are informative: positive reviews of firm/manager quality predict stronger post-IPO stock performance, while dispersion in opinions correlates with post-IPO return volatility. Furthermore, positive initial-day stock returns enhance employees' views regarding firm quality, suggesting that IPO underpricing may bring a positive effect on employees' morale, and even long-term benefits in terms of employees' productivity and retention (Farhadi, 2021).

Exploiting mispricing and other benefits. A major scientific branch is devoted to the exploring the fact that issuers take advantage of overoptimistic investors, the phenomena called overpricing.

This concept is by itself represents a huge interest as holds many factors behind that are undoubtedly worth exploring. Thus, in accordance with the concept going public creates a potential of significant increase in wealth for founders and other pre-IPO stockholders. At the same time, a large body of literature analyses the opposite phenomena of underpricing - share prices of IPO firms increase on the first day of public trading, (Loughran & Ritter, 2004), thus, two fundamental ideas clash there, and it is an issue of huge concern of which of the two outweighs and for what reason (Rathnayake, 2019).

In addition, many managers faced unexpected but welcome side effects of conducting IPO such as establishment of closer working relationships with professional advisers including brokers, formulation of more precisely defined business development strategy, improvements in managerial, financial, and organizational structures. Another perk would include in some cases tax avoidance in the employee remuneration (Rydqvist, 1995).

1.3.2 Disadvantages

However, there is a flip side that every organization that decided to go public should take into consideration and further several negative sides will be explained. First, the process of going public is costly. The one-time payment includes both direct costs such as underwriters' discount and commissions, fees for a company's outside legal counsel and independent auditor, printing costs, stock exchange listing fees and indirect costs: of information disclosure, underpricing, constraints on the freedom of action in making business decisions, and tax implications.

The costs of going public can vary greatly. They are affected by numerous factors, starting from complexity of the IPO structure, company size and offering proceeds, as well as a company's readiness to operate as a public company. Regardless of the specifics of a deal, all IPOs share a common thread: a substantial investment of time and resources. To get an idea of the sum of money a company going public may spent, statistics will be addressed - in the 2011-2016, the aggregate expenses for an offering, excluding underwriters' discounts and commissions, have approached on average $4 million, with yearly averages from the low $3 million range to the low $4 million range in the US (Perkins, 2016).

Important idea that not every business may initially realize is that even after a company went public it will entail significant ongoing expenses. First thing is that public companies must comply with the reporting requirements and stock exchange rules - filing in annual, quarterly reports, a proxy statement, and any necessary current reports, as from that moment on the financial information should be more transparent and available for general public to provide it with an idea of what is going on inside the organization. The compliance with the requirements may call for additional

expenditure, incur legal and accounting fees and in some cases can demand a company to pay for printing and filing. The complementary expense provoked by the necessity to comply may include additional spending on maintaining adequate financial reporting, compliance, and legal staff whose focus is to make sure that the company follows all legal and regulatory obligations of being a listed company.

The post-IPO costs also are a subject of change in some countries due to altering in official legislation, as a result, they may increase due to the adoption of new rules in the future Therefore, one should have in mind that new funds will not flow in easily, huge spending will accompany almost every step in the process and this is by far not always reasonable to take on the idea as it just may not pay-off.

Another drawback listing on a stock exchange provides is a distress of control over company affairs and reduced management flexibility as there appears more constraints on their decision-making process. On average the controlling parties retain a sufficient majority of voting rights and continue controlling the business several years following the IPO. Ransley (1984) showed the following ranking of costs of conducting IPO starting with increased pressure on senior management due to closer public scrutiny, strict disclosure requirements, external investors inquiry, dividend pressure and increased probability of a hostile takeover, which is boosted when the insiders' ownership percentage is decreased by the IPO and large portions of the company's stock can change hands publicly.

After going public a company faces extensive public reporting and disclosure requirements, which invite scrutiny, that it must follow. This additional disclosure may disadvantage the company by providing valuable information to competitors, suppliers, customers and business partners, this way disrupting certain plans a business had and sometimes depriving it of a competitive advantage in a way.

Going public holds many potential hurdles for a management team. On the one hand, the IPO process represents a distraction of management's attention from the core activities both during and afterwards becoming public, when management must devote substantial time and effort to complying with different reporting standards and to investor relations demands. IPO firms often alter their strategies and structures to deal with these new investor expectations and the stringent reporting requirements. Furthermore, due to their novelty on the public market, IPO firms suffer a liability of being new on the market and, hence, unexperienced, as they have yet to demonstrate that they can cope effectively with the pressures of public trading (Certo, 2003). This situation may make overall business functionality insecure; thus, additional attention and wise careful

approach should be employed to handle a situation properly for a company not to fall into distress. On the other hand, IPO is accompanied with increase in complexity of corporate governance structure, regulations and demands of investors, these alters the amount of time and attention of directors that should be devoted to it; hence, management is influenced significantly and is put under a lot of pressure during the transition period. This point is vital to take into consideration as business is dependent on the management decisions that may be biased or just be less effective due such hard times.

Therefore, listing on a stock exchange is characterized by numerous positive and negative sides, therefore being well-informed about the process of going public will help the board and managers realize the whole picture and immerse into extensive preparation, planning and thoughtful execution in case they decide to take an idea of listing on—precisely the steps that should ensure a smooth, successful IPO and bring fruitful results.

1.4 IPO process key components: preparation evaluation

The process of going public preparation is for sure complicated and holds many aspects that should be covered, it requires a great deal of effort, expense and management concentration and attention. If a company decides to go public, it should beforehand understand the key points of preparation that need to be controlled. The list of requirements is considerable, the major aspects need to be covered properly.

To determine whether a company is prepared for an IPO, it should as one of its priorities evaluate profitability and growth prospects as this information may be crucial for potential investors, if the perspectives are favorable, the chances are an ordinary investor will consider buying a stock. Another thing is visibility and predictability of the future financial results – the process of listing requires a company to disclose its financial reports for several previous years so that investors and other market players could receive a full picture of business operations. The company's ability to articulate a clear, cohesive strategy and its competitive strengths that support its ability to succeed with its strategy should also be positioned explicitly to show to investors business credibility and comply with formal requirements.

Apart from that, the decision of going public should rest on the response to the question whether the management team and board of directors are able to transition into and succeed as a public company management. Because without this ability the whole idea is going to fail, the after-IPO period holds turbulent times that awaits skilled and reliable management, thus, managers should be flexible to adjust to new conditions for an IPO to be a success. As a part of this criteria management's ability to meet investor relations demands, including the need to deliver the

company's strategy and to create and preserve credibility with analysts' regulators, institutional stockholders and other players in the capital markets should be evaluated. These relationships not only provide a basis for overall smooth further interaction, but also assures next financing steps that could be undertaken.

Another major thing that needs to be checked is the overall stock markets condition and current state of the particular company's industry; the external factors influence the outcome of going public to the same extent as internal conditions do, hence, if the situation is extremely changeable or a sector is in recession, then it is not a good time to become a public company. This statement is rather clear and intuitive, however, market conditions evaluation may present a challenge, as economic situation is unpredictable, thus, the more factors are monitored the more reliable is a ground for decision-making. Apart from that, the company's competitive position and competitive barriers to entry are an indicator that is of extreme importance. Obviously, this criterion tells a lot about the success of a company main activity, how popular it is with the customers and as a result, strong and sustainable in general on the market. In addition, if competitors for some reasons declare the decision to list on an exchange closely in time, the market position is going to be one of major factors determining who or by larger extent will eventually succeed.

The IPO process is also demanding in terms of legal claims; hence, legal, accounting, and regulatory compliance obligations should also be checked precisely. Moreover, a company should in advance examine reporting and disclosure obligations and corporate governance rules to comply with all the requirements and develop knowledge or competences lacking as the legal side is one of a core supporting the operations that becomes even more complicated for public entities.

There are several other factors that a company should consider when contemplating an IPO. The list includes evaluation of whether the company qualifies as an emerging growth company (relevant for American Stock markets as special requirements are applicable in this case), restrictions on publicity before and during the offering - a company has to monitor closely what information it announces, as informational leakages during IPO preparation process may be fatal for the outcomes and, for example, result in the plummeting of expected financing.

Another crucial point is the selection of underwriters as they significantly influence the listing process and are believed to be one of fundamental determinants of the success. Different types of disclosures of related-party transactions, of executive compensation, prohibition on loans to directors and officers, structure and composition of the board and board committees, ethics and conduct codes and procedures, accounting and corporate law matters, and many other aspects are to be examined when deciding to go public.

All that mentioned, the prime conclusion arises – a company executives and board in particular should definitely weight all the points that require evaluation when considering going public, because enormous amount of patience, time and money need to be invested before any stream of funding may follow, but the outcome is still not guaranteed, thus, careful evaluation of all criteria needs to be done.

1.4.1 Key steps in the IPO process and the role of an underwriter

The first step each company considering going public should undertake is of course to finalize its decision – consider all pros and contras, thus giving a start to the complicated process. After a firm decides to sell equity shares in the public markets, owners and managers must adhere to the stringent rules that guide the IPO process (Ellis, Michaely, & O'Hara, 1999). The fundamental initial decision a company then has to make is to select and address an underwriter, an investment bank, offer it to serve as a lead side to perform underwriting functions in connection with the registration and sale of an issue. Theoretically a company could avoid employing an underwriter and go for an IPO by itself, but in practice this is hardly possible, and all the spending associated with the help of this party is worth doing.

The role of underwriters in the process of IPO is crucial because the quality of their work and faultlessness of marketing strategy and financial estimation are one of the keys to the success. The prime function an underwriter performs is managing the marketing and sale of the company's stock to public investors. The activities that allow to conduct this function include aiding in the IPO prospectus construction, running the road show, ''building the book'' of investor demand, agreeing with the company on the price per share for the IPO, determining the number of shares that co-managers may sell in the IPO and controlling the allocation of shares among purchasers during the listing process.

As can be seen from the operations an underwriter performs, a company should choose carefully a party to engage with. To properly conduct it such factors as track record (what IPOs a company conducted, were they successful, were among them the ones pertaining to the same industry), reputation and experience (how good are underwriters' relationships with the investors at the moment, whether an underwriter experience allows it to provide special insights and quality advice and research), commitment to the company (the current activity of an underwriter, whether it is going to make the company a priority, what are the offering schedules of other, possibly larger or more valuable, offerings the underwriter is working on), aftermarket support (what are conditions and terms of interaction after IPO was conducted), analyst coverage (does the underwriter have prominent analysts that cover the industry and similarly positioned companies), distribution

strength (does the underwriter have strong distribution capabilities with retail (individual) investors and institutional investors).

There can be distinguished two types of underwriting contract agreements: best-efforts commitment and firm commitment. The choice of agreement has a direct influence on the price performance of an issue, the number of shares sold during the offer period, and the level of uncertainty associated with the expected proceeds (Benveniste & Spindt, 1989). The latter type of contract stimulates the incentive to presell the issue, thus, it potentially motivates an underwriter to make higher allocations to "low-interest" investors, which may facilitate greater underpricing. Under a best-efforts commitment, the less common approach, the underwriter attempts to sell the stock but is under no obligation to purchase the stock if part of the issue remains unsold (Sherman, 1992). The lead underwriter considers this approach, which shifts the risk of the offering to the firm, when the underwriter percepts the issue risky.

A broad body of empirical literature suggests that many institutional investors are attracted to new shares issuance by the short-term gains associated with underpricing in IPO investments (Rock, 1986). However, long-run IPO underperformance is to less degree severe for IPOs handled by prestigious underwriters, the explanation behind is that prestigious investment banks protect their reputations by leading syndicates that place shares of high-quality IPO firms with the perspective for high levels of long-term performance. Another possible reason is that higher levels of long-term performance may reflect higher than expected level of prices in aftermarket for offerings that issuing firms originally sold at a discount, that were initially underpriced.

Then the process of tremendous paperwork filling in comes into place, as regulators force companies to stick to the strict disclosure rules. For example, in the United States the companies going public must provide a series of documents that contain details about the issuer, its financials, a description of its intended uses of the IPO proceeds, and profiles of its officers and board members to each buyer of the securities (Ellis et al., 1999). With the assistance of the investment bank, firm management prepares all the forms and documents required including the firm's prospectus. After the preliminary registration statement has been compiled, management promotes the offering in a series of road shows with potential investors to discuss the firm's operations, financials, products and services, prospects, and so on (Certo, 2003). This is the time when perspective investors rely heavily on the forms being presented as the scarcity of information forces them to doubt the words and rather trust documented statements.

Finally, before pricing the equity issue, investment bankers commonly "build a book". This process includes finalizing the indications of interest (bids) from investors as part of their effort to

factor information into the initial IPO offer price. Each bid contains a request for a quantity of shares and may as well include a limit price. This process reveals the level of institutional demand for a firm's equity and provides insight into the price that investors are willing to pay. The lead underwriter uses the information to construct a demand curve. If there is strong demand, the underwriter will set a higher offer price. If not, however, or if market conditions are unfavorable a placement problem may arise. In alliance with management, the underwriter sets the offer price, finalizes the number of shares the issuing firm will sell, determines the date of the offering, and decides how to allocate the shares.

The initial offer price is a subject of informational frictions of several kinds. On the one hand, the information asymmetry arises because issuers for obvious reasons are more aware of their business current situation – its frictions, hurdles it faces and hidden pains. A classic "lemons problem" may be presented here, thus, some investors tend to be afraid of it. Being aware of the problem, high-quality issuing firms may attempt to signal their quality by deliberately selling shares at a discount to discourage lower quality issuers from imitation and, as a result, mitigating the friction. This way the issuers deliberately refuse getting more proceeds now in hope for more successful future seasoned offerings financing that will compensate the current loss.

At the same time, investors are likely to be asymmetrically well informed about conditions outside an issuing firm that can affect the performance of an offering, such as information about competitors, market index returns, and industry performance (Loughran & Ritter, 2002). The well-informed investors have no incentive to reveal the information they have before the issuance; hence, it allows them to have an advantage. To compensate for this and induce investors to reveal pricing information, underwriters offer some combination of an increase in the number of shares they allocate to the investor and underpricing. Therefore, to mitigate the informational asymmetry problem the book building process is designed in a way so that the information from the investors could be extracted. All that said, it is important to highlight that the IPO process contains many critical decision points that affect the amount of funds that a firm will generate with the offering.

1.5 IPO underpricing and its theoretical explanations

No surprise that all parties included in the IPO process as well as external market players are interested in the performance of the offering, that is why certain group of indicators are being monitored to get an idea of it. One of the most popular short-term indicators of IPO performance is IPO underpricing, that can be determined as the difference between the per share offer price and the closing price on the first day of trading, expressed as a percentage of the offer price. The concept of underpricing is that the offer price of an IPO is lower than its market value, it indicates that the owners of the company sell their shares for less than what it is worth, leaving money on

the table, sacrificing the gains they could have received if the offer price reflected more accurately the value of the firm.

The theory regarding the phenomenon is extensive, it is considered that the likelihood of underpricing is strongest for issuing firms that face the greatest ex ante uncertainty about the quality of the offering (Rock, 1986). Another point of view suggests that underpricing facilitates publicity attracting, as the lower price may stimulate investors to take time to learn more about the firm (Chemmanur, 1993). Others suggest that underpricing represents a payment for analyst coverage by the IPO firm issuing the stock (Cliff & Denis, 2004). To some extent, in view of some researchers, underpricing represents a transfer of wealth from the pre-IPO owners to the investors on the first day of trading (Certo, Dalton, & Daily, 2001).

Theories on underpricing can be grouped under four broad categories: asymmetric information, institutional, control, and behavioral. Asymmetric information branch assumes that one of the IPO-related parties (underwriter, issuer, investors) knows more than the others, and that the resulting information frictions stimulate underpricing amount to increase in equilibrium. Institutional theories concentrate on three features of the marketplace: litigation, banks' price stabilizing activities when trading started, and taxes. Control theories argue that underpricing helps shape the shareholder base so that to reduce intervention by outside shareholders once the company gone public. Finally, behavioral theories assume the presence of 'irrational' investors who bid up the price of IPO shares beyond true value. The provided theoretical explanations will be further provided in more detail.

Asymmetric information theories

In accord with classic economic model of asymmetric information where one of the counterparts has superior information that he can use in his favor, the theory is based on the idea that one of the parties included in the IPO process "knows more" then the rest. The classic model that gave rise to the direction is that of Rock (1986), the winner's curse model. The model considers an information asymmetry between investors; thus, it assumes that there are 2 groups of investors, the informed and uninformed ones. The latter are the subject of a winner's curse in the sense that they have the access to the unattractive offerings, while they have restrictions in the access to the attractive offerings of underpriced IPOs, where the informed investors concentrate their bids and simply take advantage of the information they have in possession.

Consequently, uninformed investors only invest in overpriced IPOs which results in negative returns for them, hence they lose interest in IPOs whatsoever. At the same time, the market is characterized by insufficient demand, because if it is restricted to only informed investors. That is

the reason why to function properly the participation of uninformed investors is needed, to overcome the situation, the underwriters push issuers to price the IPOs at a discount to encourage uninformed investors to purchase the offering. Therefore, to attract the uninformed investors there must be the expectation that all IPOs are underpriced. Eventually, the uninformed investors will still be crowded out in the attractive offerings, but their expected loss will no longer be negative. Overall, underpricing is thus required to motivate the uninformed investors to participate in the market.

Beatty and Ritter (1986) used this asymmetric information model of Rock to formalize an empirical implication, that is the (expected) underpricing of an IPO is related to the ex-ante uncertainty. The greater the ex-ante uncertainty, the greater the (expected) underpricing. Numerous studies tested the hypothesis while the majority find the confirmation, others do not, for example, Korsten (2018) rejected the implication that there is a positive relationship between IPO underpricing and uncertainty for technological firms.

Still the theory was proven to be indispensable to account for, that is why several groups of indicators are acknowledged to be fundamental. The proxies used in the literature can be grouped into 3 branches: firm characteristics, offer characteristics, and market characteristics. The most used proxies for firm characteristic are age, market capitalization, log sales and industry type (Chan et al., 2004). The offer characteristics include gross proceeds, venture capitalists participation, number of underwriters and underwriter ranking/reputation (Lowry & Shu, 2002), while market ones are trading volume or volatility (Ritter, 1984).

As can be seen from the theory presented information asymmetry in general does more harm than good for opposing sides, hence, it is worthwhile put some effort in reducing it. By reducing the asymmetry between informed and uninformed investors, underpricing, which represents an involuntary cost to the issuer, could be reduced. This could be done by hiring a prestigious underwriter who certifies the quality of the offer. There were developed various underwriter reputation' proxies, the most famous one would be ranking by Carter and Manaster (1990) that have a negative relation with the underpricing. However, there was a shift in the opinion on the direction of influence of the underwriters' reputation, for instance, Beatty and Welch (1996) showed that the negative relation has reversed since the 1970s and 1980s and become positive.

Another well-known asymmetric information theory that describes the informational asymmetry between issuing firms and investors is signalling theory proposed by Ibbotson (1975). As companies are obviously better informed on the present value or risk of their future cash flows than investors are, underpricing may be used to signal the company's 'true' value. The signalling

is a costly means, but if successful may be rewarded to even greater extent by earning back the missed capital gains by returning to the market. The high-quality firms are able to cover the costs of underpricing, hence, the amount of underpricing represents/signals the quality of the firm. In other words, if, suppose, there are two types of firms high and low-quality, that cannot be correctly categorized by outside investors. These firms raise equity in two stages, via an IPO and later. High-quality firms have incentive to credibly signal their true higher quality, to raise capital on more advantageous terms later on by seasoned equity offerings. Low-quality firms have incentive to mimic whatever high-quality firms do but will fail due to the high costs they can't bear. The most common signal used in the literature is IPO underpricing.

Empirical testing of the theory is extensive as well, for instance, Albada (2019) examined the effect of information asymmetry on the relationship between the signalling variables (lock-up period, underwriter reputation, auditor reputation, and board reputation) and the initial returns of IPO on the Malaysian market. The results show that the effect of signalling variables is more pronounced on the initial performance of IPOs when in an environment of high information asymmetry, hence, confirming the theoretical premise. Arora (2019) also attempted to shed the light on the signalling role of prestigious auditors and underwriters and their interacted effects on IPO returns in India for small and medium enterprises. The results revealed that underwriter reputation helps in reducing information asymmetry and signals firm quality to investors.

Information revelation theories are as well as winner's curse are based on the idea that there are informed investors who have access to superior information. In the absence of inducements, revealing positive information to the underwriter is not something these investors would be up for doing. As revealing the information will, presumably, result in a higher offer price and so a lower profit to the informed investor. Therefore, there is a strong incentive to actively misrepresent information—that is, to claim that the issuer's future looks worse than it does in reality—aiming to induce the underwriter to set a lower offer price.

Meanwhile, the main problem is to design a mechanism that will incentivize the revelation of the true value of the stock. Underpricing is a way to compensate and maintain motivated those informed investors. The more favorable the information is, the more underpricing will exist to compensate them (Benveniste, 2003). Spatt and Srivastava (1991) show that if some investors are better informed than either the company or other investors, the underwriter has the incentive to design a mechanism through the process of book building which will induce investors to reveal their information truthfully by making it in their best interest to do so. To ensure truth-telling, the allocations have to involve underpriced stock. In this explanation, IPO underpricing serves as the cost of extracting the informed investors private information. Book building allows firms to extract

positive information and raise the offer.

It is necessary to point out that there is a growing body of asymmetric information theories that were empirically tested as well, however, for the purposes of the current study the most popular ones were addressed.

Institutional theories

One of the institutional explanations of the underpricing is the litigation risk hypothesis. The core idea behind it is that investment banks and issuers use underpricing as a means of insurance against future possible lawsuits. There may be the case that shareholders could be disappointed with the post-IPO performance and sue the issuing company. This explanation is more US-centric because some European countries are not characterized by significant risks of being sued (Ljungqvist, 1997). As an empirical test of the hypothesis Tinic (1988) compared underpricing before the 1933 Securities Act with underpricing after the act release. He discovered that underpricing is significantly higher in the later period which is consistent with the litigation risk hypothesis of underpricing. However, it cannot be claimed for sure that the obtained results were not influenced by other than litigation risk factors.

Another explanation would be price stabilization. Price stabilization of the underwriters after an IPO is legal in many countries. This results in fewer observations of overpricing and an upward shift in the mean initial returns. Price stabilization represents a mechanism that "bonds" the investors and underwriters. Fees are based on gross proceeds; hence this results in an incentive for the underwriters to raise the offer price. Rather than forming a symmetric distribution around some positive mean, underpricing returns typically peak sharply at zero and rarely fall below zero. In a controversial paper, Ruud (1993) takes these statistical regularities as her starting point to argue that IPOs are not deliberately underpriced. Instead, IPOs are priced at expected market value but offerings whose prices threaten to fall below the offer price are stabilized in after-market trading. Such price stabilization would tend to eliminate the left tail of the distribution of initial returns, and thus lead to the appearance of a positive average price jump.

The third institutional explanation has to do with the tax advantages of IPO underpricing. There is a trade-off between the tax benefit and the costs of underpricing. Differences, if any, between employment income taxes and capital gain taxes, can be exploited. Resulting in a payment for employees with appreciated assets instead of salaries (Rydqvist & Högholm, 1995).

Control theories

In private companies, the ownership and control responsibilities are not separated, however, when a company goes public, there arises a division of the ownership and control responsibilities.

Managers make the operating and investment decisions, and shareholders own the company The theories in this group explain underpricing from several perspectives. First, underpricing can be used to retain control. Brennan and Franks (1997), using a data of 69 IPOs in the UK, confirmed that underpricing lead to excess demand and to greater dispersion of ownership. However, to retain control and protect private benefits they discriminate large bids in favor of smaller bids. Another model my Stoughton and Zechner (1998) defended that, agency costs are reduced when there is an allocation of shares to a larger outside investor who has interest and capacity in monitoring the company. In this case agency costs will be reduced because the smaller institutions can free-ride on the monitor services. Underpricing creates an extra advantage for the large investors.

Conclusion

The IPO process itself is a complicated subject that still occupies many researchers' minds, it is accompanied by several phenomena that are being addressed from the different research directions. The IPO fundamentals analysis contributes to the research in many ways, first and foremost, it provides a ground for the key element of the study, IPO underpricing, better understanding, and represents a basis for the next discussion development. Second, it indirectly sheds light on some aspects that are crucial determinants for the empirical part of the study and, thus, need to be accounted for when determining the sample, concentrating the subject of research, and justifying the choice made. Third, it delineates a broader context of a study that allows to better grasp the gist of the subject under consideration.

2. Peculiarities of investor behavior

The explanation of IPO underpricing (price increase on the first day after IPO) from the viewpoint of behavioral finance theory is rather new but extremely promising field of study. The evidence available is generally consistent with the fact that the IPO parties behave irrationally, thus, both the overoptimistic investors unreasonable beliefs and behavioral peculiarities of the decision-makers responsible for firms that go public are being examined.

The IPO underpricing phenomena attracts such great attention because its presence weakens the prime function of the capital market which is to optimize the allocation of resources and accomplish it in the most effective way. As was pointed out in the previous chapter traditionally the are four main theoretical branches that are concerned with the explanation of IPOs being underpriced: asymmetric information, institutional, control, and behavioral. Asymmetric information models assume that one of key IPO parties (the issuing firm, the bank underwriting and marketing the deal or the new investors) possesses more information than the others, this inconsistency in information distribution leads to underpricing in equilibrium. Institutional theories are primarily concentrated on three characteristics of the market: lawsuits, banks' price stabilizing policy after the start of trading, and taxes. Control theories argue that underpricing phenomenon adjusts the shareholder base in such a way that will allow to reduce outside shareholders influence when the company becomes public. At last, behavioral theories consider 'irrational' investors whose behavior increases the price of IPO shares far beyond true value or mangers of IPO firm psychological biases influence on the decision-making process and their failure to make underwriting banks to reduce underpricing.

The behavioral perspective is an alternative to the more thoroughly examined asymmetric information and institutional approaches, but as a relatively young research direction it provokes considerable debate in the scientific community from both explanatory and methodological approaches. Regarding the latter, the fundamental basis of behavioral theories were tightly controlled laboratory experiments that comprised a starting point of the scientific direction. However, simple econometric analysis that is employed for more reliably examination of the existing relation between variables of interest, allowing to explain the underlying puzzle, and thorough control for the countless forces that are present in financial markets was not previously providing reliable results, that is why scientists questioned the approach.

2.1 Theories of individual investors behavior irrationality

There are several theories describing investors irrational behavior the first one is Informational cascades. According to the theory, investors make their investment decisions sequentially: those,

who decided to invest later base their decision primarily on the bids of earlier investors, disregarding their own information or judgements. Thus, if initial sales are successful it is viewed by investors that decide to invest later on as evidence that earlier players had private information in favor of making their investment, this, in turn, encourages those who buy shares later to invest without considering the proper information they hold. Otherwise, low initial share sales can dissuade later investors from investing notwithstanding their private signals. Therefore, demand either accumulates (snowballs) or remains at low level over time. The cascades existence gives significant power to early investors who can 'demand' more underpricing in return for committing to the IPO and thus giving a start for a positive cascade. The theory is, however, hard to check directly.

2.1.1 Miller's hypothesis

Miller (1977) formulated another investor attitude related hypothesis, which states that IPO underpricing arises due to the difference in key factors that determine initial and post IPO prices. While the issue price is based on the average opinion (mean of the underwriters' best estimates of the prices of comparable seasoned securities), the aftermarket price is set by a minority of optimistic investors who comprise the market for the shares offered. There are three intuitively appealing assumptions that build up the basis for the Miller's hypothesis, they include differences in investors opinions, short-sale restrictions, and the fact that the entire supply of the new issued stocks can be absorbed by a minority of potential investors (who are optimistic). At first, the hypothesis was purely theoretical, but later several scientific works were dedicated to verifying it empirically and some of them succeeded.

The main challenge in checking the Miller's hypothesis is data availability as knowledge of average and optimistic investors' valuations of the new issues is required for testing. The data on investors bids, if it exists, is generally proprietary and inaccessible to the public. However, some researchers find their ways of acquiring it, for example, Gao S. et al (2020) created a database of institutional bids for Chinese IPOs and using the information received verified the hypothesis directly. The work is useful for Master thesis preparation from the viewpoint of complicated process of own data collection demonstration and theoretical framework explanation that is useful for understanding of the overall perspective.

The existing scientific literature presents two competing perspectives on how issue prices should be determined: a market-clearing price and intrinsic value approaches. The market clearing price approach assumes that underwriters set IPO issue prices based on the relation between the investor demand curve and issuer supply curve. In contrast, the intrinsic value approach suggests that underwriters set IPO issue prices considering their assessment of the IPO firm's intrinsic value as

the main benchmark. The decision of underwriter in giving preference to the market clearing prices or intrinsic values when setting IPO issue prices primarily depend on the cost-benefit tradeoffs faced by an investment bank. Using the market clearing bid price is controversial as it can both maximize underwriting fees, and at the same time increase the expected costs of post-issue price support or reputation loss. Whereas, setting the issue price equal to the intrinsic value will tend to increase price efficiency and lower the cost of post-issue price support or reputation loss. But in this latter case, underwriters also lose the opportunity to earn higher underwriting fees.

To determine which approach is more suitable for the Chinese market, Gao S. et al regressed the IPO issue price on the quantity-weighted average bid price (weighted average of all bid prices submitted during the book building period, where the weights are equal to the number of shares demanded at each bid price) and the market-clearing bid price in the offline market. The regression showed that both the average bid price and the market-clearing bid price are positively related to the IPO issue price, but only the coefficient on the average bid price is statistically significant. This relation between the issue price and average bid price is also economically significant; the regression coefficient on the average bid price indicated an almost one-to-one relation between the average bid price and the final IPO issue price. Overall, the evidence is consistent with the intrinsic value hypothesis and Miller's (1977) conjecture that the IPO issue price is influenced primarily by the mean valuation of the typical investor.

The similar checking was conducted for the post-issue market price, the regression demonstrated that the coefficient on the average bid price is positive but statistically insignificant. In contrast, the coefficient on the market-clearing bid price is positive and statistically significant, that is consistent with Miller's prediction. This finding is robust to controlling for oversubscription, bid elasticity, the number of institutional bids, and year and industry fixed effects.

IPO underpricing was determined in accordance with previous literature as the percentage difference between the price at which the IPO shares were sold to the investors (the issue price) and the price at which the shares subsequently trade in the market (first-day market closing price). The authors identified that the first-day return is significantly and positively related to the difference between the market-clearing bid price and the average bid price (or the difference between the market-clearing bid price and the issue price)— that proved again to be consistent with Miller's (1977) predictions. Overall, the results provide strong support for Miller's (1977) explanation of IPO underpricing.

An important corollary to Miller's (1977) theory is that the aftermarket price is increasing in the degree of divergence of opinion. This proposition arises because ceteris paribus an increase in

divergence of opinion implies an increase in the valuation of the optimistic investors, thereby driving up the market price. It is important to note that, although the existence of differences of opinion is key to Miller's argument, it is the overvaluation by the optimistic investors, and not the degree of divergence of opinion, that directly impacts the extent of overpricing. Stated differently, the level of differences of opinion is merely a proxy for the overvaluation by the most optimistic investors. The above insight suggests that divergence of opinion (as measured by the dispersion of bid prices) should be positively related to the aftermarket price because it proxies for the optimists' opinion (as measured by the market-clearing bid price). However, the market-clearing bid price should subsume the predictive ability of the dispersion of bid prices when both are included in the regression, and the authors discovered and proved this relation to take place for Chinese IPO.

2.2 Investor sentiment

The next method of irrational investors behavior description is assuming that they can be characterized by optimistic or pessimistic sentiment, they expect a company performance to be much better or worse than rational investors. At first sight investors sentiment concept seems hardly quantitively measured, but the are several proxies that are employed in the existing scientific literature.

One of the indicators usually used in the literature is *market momentum* that is a market return over the one month before the IPO listing date. This proxy can be reasonable to use because according to the prospect theory underwriters only partially adjust offer price for public information on market momentum, and IPOs in high-momentum market have higher underpricing. Moreover, some researchers suppose that security prices can be driven away from their intrinsic values by over-optimistic investors since they neglect available public information. Hence, market momentum proxy can be applied to test the prospect theory on IPO deliberate underpricing.

The next proxy is *individual investor oversubscription,* recent research on investor sentiment focuses on individual investors, the prevalence of which is one of the factors underlying underpricing. Several researchers state that IPOs subject to high individual investor demand have higher initial returns and suffer lower long-term returns, indicating that these IPO are overvalued. Therefore, logarithm of the oversubscription ratio in the lottery can be used to indicate individual investor demand for an IPO.

Another indicator employed in previous literature is *first-day trading volume* that can be determined by the percentage of total shares outstanding. The existing works show that high initial returns occur when institutions sell IPO shares to retail investors on the first day. Total trading volume is an adequate indicator of individual investor behavior (as data on retail investors is hard

to obtain) for the markets that are largely driven by individual investors, this situation holds true for most cases.

As individual investors appear to be a subject to irrational behavior more often and, therefore, their decisions can be clouded by behavior biases. It would be interesting and informative at the same time to figure out whether individual investors judgements drive post- IPO prices. Cornelli F., Goldreich D. (2006) in their work aimed at examining weather first-day IPO prices are determined by smaller investors and whether they should be considered irrational. The data on small investors behavior is not easy to acquire that complicates the theory validation, however, the authors managed to find data on Europe's pre-IPO (or "grey") markets activity, which enable investors (who appear to be small) to speculate on the future stock prices of companies that are about to go public. The work is important for the Master thesis as it is a pioneer in small investor behavior inconsistencies demonstration on real data that was collected without addressing investors directly.

The authors assumed that if small investors are perfectly rational, then their assessment of IPO deal will not differ substantially from that of book building investors (from whom underwriters collect indications of interest before an IPO) and the relation between the grey market price and the first-day aftermarket price will be determined by the information each investor group follows. Otherwise, the small investors may be considered irrational and, thus, be overoptimistic or pessimistic sometimes. Consequently, when the grey market price is high (that indicates the fact that small investors are being overoptimistic and value the shares higher than the fundamental value is), the aftermarket price will be the small investors' reservation price and thus it will be highly correlated with the grey market price. In opposite case, when the grey market price is low (indicating that small investors are being excessively pessimistic and value the shares lower than the fundamental value is), book building investors will not sell their shares to small investors, and the correlation between the grey market price and the aftermarket price will be lower. Thus, small investors can cause the post-IPO price to be above the fundamental value but not below it.

Cornelli F., Goldreich D. checked their hypothesis by deriving the theoretical model based on the probabilistic approach and then tested it empirically. They found out that the grey market price is highly correlated with the aftermarket price when the grey market price is high, whereas the positive correlation is significantly smaller when the grey market price is low. Based on the finding, the authors concluded that small investors are irrational in that they overweight their information. Another result was that grey market investors' overoptimistic demand causes these IPOs to trade at first day prices that are 40.5% higher, on average, than they would have been in the absence of sentiment demand, thus, small investors indeed drive an IPO price up significantly.

2.3 Empirical validation of investor behavior influence on IPO underpricing

In spite of the fact that investor sentiment quantitative analysis of investors sentiment factors on IPO underpricing phenomena, on the first sight, seems more reasonable to address by organizing individual investors surveys, providing them with questionnaires, there is a number of factors that would complicate this process, and, thus, prevent future Master thesis research from employing the method. First, practice proves that minimum required for obtaining proper conclusion response rate is hardly ever met in the majority of cases when questionnaires are used, as the target audience may be unwilling to participate in the research or just be out of reach. Second, the process is highly time consuming but not reliable enough as no one can guarantee that respondents take the survey seriously and are not disrupted by external factors when filling up the form. Third, the technique of proper questionnaire constructing may be difficult, both from the point of view of respondents' engagement and obtaining desired quality data to perform the following analysis. All these factors considered, publicly available data will be used for Master thesis preparation, as it is more reliable and might be put in better use for obtaining more robust results and, thus, will allow in more proper way describe real world situation and come to more thorough conclusions.

Significant number of scientific papers use econometric analysis for justifying their hypothesis on individual investor behavior and its influence on first day IPO results. The most important component of these works is variable that are used for describing investors attitude based on available market indicators. Some of these proxies seem to be country specific, as sometimes they can be employed only for certain system existing on a market, but still there are also widely recognized and commonly used. The articles that will be mentioned further are of extremely importance for future research as they demonstrate the empirical research design application that can be used in Master thesis. The most crucial part is variables that were used as behavioral proxies and the reasoning behind employing them, the analysis of these articles will allow to shape own empirical approach, accounting for the challenges that may appear.

For example, when conducting analysis of Chinese IPO market, Xiong Y. A. P., Wang T. T. (2019) employed turnover rate, the opening rate of return and online lottery rate (proxies both stage of continuous trading and of collective bidding were included) as investor sentiment indicators. Their goal was to evaluate whether this behavior factor influences IPO underpricing in three market segments (Main-board, SME Board and GEM) in order to provide the corresponding policy recommendations for the system of the country stock market IPO pricing improvement.

The authors stated several hypotheses on analyzed relation, in particular, they were aimed at checking whether investor sentiment affects IPO underpricing, and if this influence is positive, they also supposed that the size of the IPO market segment (determined by the size of the offering)

is negatively correlated with the IPO underpricing rate. OLS method implication proved that the investor sentiment in all three markets has impact on the IPO underpricing, moreover, the influence of the investor sentiment in the stage of continuous trading on SME board and the growth enterprise market is higher than that on the main-board market. The obtained result seems reasonable as small and medium-sized, and the growth enterprise markets share prices are more likely to be manipulated or influenced by hype and speculative funds for arbitrage purposes.

However, investor sentiment is not the only behavioral irregularity that influences individual investors demeanor, their expectations may be also irrational (heterogeneous). Li Y., Wang J., Liu J. (2011) considered both individual sentiment and heterogeneous factors influence on IPO underpricing in SME and GEM Chinese stock markets. Heterogeneous expectations are hard to unambiguously determine, in their work the authors used the average IPO underpricing of 10 new issues before offering (that can be regarded as a subscription of new issues expectation underpricing due to the anchoring effect -higher expectation mean highs investors' optimism, which can spread from the primary to the secondary market) and turnover (the higher the turnover of IPO on the first trading-day, the greater degree of the heterogeneity due to the existing difference in investors opinion). And investors sentiment proxies included closed-end fund discount (the lower the closed-end fund discount, the higher investor sentiment and IPO underpricing degree), average of market return (the lower average of market return, the lower investor sentiment) and successive rate of IPO subscription (the lower the rate the higher IPO underpricing).

Sequent regression approach demonstrated that heterogeneous expectations affect IPO underpricing in both markets, while investor sentiment is only significant in SME market. The lack of investment sentiment influence on GEM can be explained by the fact that two types of investors present on this market: professional investors, who cannot be easily influenced by outsiders and, thus, their sentiment is not in the picture, and risk-aversive investors, who are characterized by heterogeneous expectations, thus this component identifies underpricing, not their sentiment.

Skewness Preference and IPO Underpricing

The development of irrationality theory led to considering the phenomena of IPO underpricing from new perspective, to prove the basis of this framework new indicator that is considered to reflect the existence of preferences for lottery-type stocks or skewness was introduced. This way preference for skewness in the behavioral finance context, and IPO underpricing was documented in several theoretical works. For example, Cho E., Kim W. (2019) proved that the relation exists in international financial markets.

The authors contributed to the previous literature by identifying skewness preference as a key determinant of IPO underpricing in a global context, and then examining the role of culture as a moderating factor that may affect the sensitivity of the relationship between skewness preference and underpricing. This work is valuable for the Master Thesis as it both uses behavioral finance basis for determining the prime variable of interest (independent variable) and introduces other behavioral measures as a mediator to the relation under consideration. This way a more thorough description of real world is reached and an example of the concept allowing to reach this more reality precise approach is provided.

Skewness in this work was determined as:

$$\mathrm{SKEW}_{k,i,t} = \frac{(P_{100-h} - P_{50}) - (P_{50} - P_h)}{(P_{100-h} - P_h)} \quad (1)$$

where P_j represents the jth percentile of the daily return distribution pooled across all stocks within the Fama and French (1997) 17-industry classification (FF17) of IPO,

i is a number of stock,

k is a country index,

t is a month a company went public,

h denotes an arbitrary threshold percentile reflecting the tail of the distribution.

The multistage empirical analysis (by applying Wilcoxon rank-sums, checking the relation for various economic regions) proved that expected skewness measure may explain IPO underpricing, and investors pay a high price for IPOs with relatively large expected skewness proxied by lagged industry skewness. Moreover, the results indicate that differences in both the raw and the market-adjusted initial returns between the high and low skewness portfolios are statistically significant across all economic regions, regardless of the level of economic development or geographic location.

The mediator indicators that may result in determining the relationship included the number of gambling properties, atheist population, the degree of individualism (versus collectivism), and newspaper circulation. The third one is the most interesting from the perspective of behavioral finance, the authors used Hofstede's (2001) individualism index as a proxy for overconfidence. Previous studies suggest that individualism may lead to overconfidence, resulting in excessive over-optimism towards future returns. The econometric approach demonstrated that all mediator

indicators affect relationship between expected skewness and underpricing. Skewness preference in the IPO markets seems to be stronger in countries where there are more gambling properties, and people are less religious, more individualistic, and read more newspapers.

2.4 Prospect theory

Another theoretical approach is concerned with issuing firm (preissue shareholders) behavior towards IPO underpricing. Due to the phenomenon issuing firms and its owners in particular lose in many cases significant amount of money, but the previous experience (of other companies going public) and sometimes intimidating statistics on the size of "money left on the table" do not stop them from going IPO. This peculiar fact can be explained from the point of Prospect theory (Kahneman and Tversky, 1979) (a descriptive theory of choice under uncertainty). The basic assumption of the theory is that each individual has a value function, which is similar to a classic rationing theory utility function, but that is defined in terms of gains and losses rather than levels (the function is concave in gains and convex in losses). The theory suggests that the wealth gain for preissue shareholder i from the revaluation is greater than his or her share of the money left on the table.

The main conclusion of the prospect theory applied to owners behavior is that issuers not solely consider the opportunity cost of underpricing by itself (in this case they would be more resistant to severe underpricing), but a combination of these costs and good news of an increase in wealth, and due to that the resistance is less. Overall, the key concept there is the covariance of money left on the table and wealth gains accruing to the issuer, that is hard to check empirically.

In line with the proposed by the Prospect theory inequality that reflects issuing firm managers or CEO satisfaction, Ljungqvist A., Wilhelm Jr W. J. (2005) transformed this inequality into a Behavioral Measure of Decision-Maker's Satisfaction with Underwriter Performance. The binary indicator in this case equals to 1 if condition (the inequality) is true—that is, if the perceived gain arising from the positive revision to the reference point exceeds the actual underpricing loss—and 0 otherwise. The dollar-valued measure computes the net perceived gain, that is, the left-hand side of the inequality less the right-hand side. Although the work was not devoted to examining directly whether behavioral deviations from expected utility maximization determine patterns in IPO initial returns, it does shed light on the plausibility of the underlying structure necessary for such a linkage to exist. An explicit characterization and test of this linkage remains a significant challenge for future research.

However, some empirical findings are not consistent with the Prospect theory and, in fact, demonstrate a reverse influence of investor sentiment measure on underpricing dependent variable.

For example, Gao (2010) aimed at explaining the controversy on underpricing or overpricing phenomena existence argued in the studies (as there is still no consensus on whether IPO initial return represents rational underpricing or irrational sentiment in the market or both), thus, he supposed that both concepts can be explained and found their prove on the real data if their influence is distinguished. Thus, the work is valuable for future research as it demonstrates the research gap existing in the literature on over or underpricing of IPO presence, this way it provides an example of clearly identifying the problem and covering it in the research. To accomplish it the author decided to separate deliberately underpriced and optimistically overpriced components in an IPO initial return. That would basically mean that there is no controversy as both under and overpricing take place. To achieve this separation, the author estimated the fair value (or intrinsic value) for an IPO issue by using comparable firm P/E ratio (the method widely applied in the literature).

The result demonstrated that the IPO offer price is less than its intrinsic value, which itself is less than the IPO first-day market price. This way the author determined that there is both deliberate underpricing and irrational overpricing in China's IPO initial returns. Further regressions conducted on both the underpricing and overpricing components were aimed at figuring out which factors drive them.

In the author's opinion, clear separation allowed to explain underpricing based on rational theory and overpricing based on behavioral theory, this way eliminating the ambiguity problem often encountered in IPO research. Nevertheless, when analyzing the underpricing phenomenon Gao included the investment sentiment (behavioral indicator) measure as well. The regression revealed an interesting result for behavioral variable influence on the underpricing measure, defined as the difference between IPO intrinsic value and IPO offer price - pre-market sentiment turned to be significant but had an opposite sign in comparison with the regression on IPO initial return. The finding was interesting because a large bulk of existing literature proposes that high pre-IPO market returns have a positive impact on IPO initial returns (Prospect theory).

The obtained result and disruption of the Prospect theory can probably be explained by the fact that underpricing measure was "cleaner" (overpricing component was excluded) than that employed by different authors. The argument for the negative sign on pre-market momentum is as follows: when market goes up and investors get more optimistic, the issuer seems to take the window of opportunity and increase IPO offer price, leading to lower underpricing. Therefore, the well documented positive relationship between pre-IPO market return and IPO initial return can only be explained by investor irrational sentiment.

3. Empirical research on investor sentiment influence on IPO underpricing

After the theoretical background of the topic was thoroughly analyzed, general overview of the behavioral aspects, IPO constituents and milestones presented as well as the key components of interest were determined, the next step of the research will be conducting an empirical examination of the investor sentiment influence on the amount of IPO underpricing. To start off the research hypothesis will be defined, then methodology and data collection process steps will be presented, and the results of analysis demonstrated.

3.1 Research hypothesis statement

The literature review revealed the contradiction regarding the direction investor sentiment has on the IPO underpricing, however, the current research preliminary finds the research brunch in favor of positive influence of the matter more compelling for several reasons. First, in the very core of the behavioral finance lays a premise that economic agents are not rationale, hence their decisions are biased by the certain behavioral peculiarities they have. As a result, the agents can't correctly estimate the market situation, or they simply overestimate themselves.

At the same time, it is important to point out that share price of the newly issued company is driven by the individual investors who comprise the market for the shares offered, while the offer price is set based on the underwriter opinion that can't a priori take into consideration the retail investors response precisely. Considering the fact, that the vast majority or even all investors are prone to the psychological biases even if they are aware of them, the potential scale of skewed decisions implementation is ample. Hence, non-rationale investors may overshoot their estimations of the gains an investment might bring, thus, pushing the first day closing share price higher than it should be if all the factors were accounted for in a rational manner.

To emphasize, there is a number of unconscious biases that lead to improper estimation of the facts and, hence, biased perceptions and decisions, one of them being overoptimism. But it deserves to be pointed out as several theories suggest that overoptimistic investors contribute to the market anomalies one of them being price jump as investors expect the future to be favorable and economic prospects to be positive. As a result, a mismatch between reality and high hopes brings disparity and contributes to underpricing increase.

Another reasoning in favor of positive investor sentiment influence on underpricing that is out of the focus of the current research is irrational managers, or the other side of the deal who also have "irrational" beliefs. As Prospect theory suggests managers tend to consider the outcome of the placement as a sum of both immediate consequences as well as "aftermarket" gains or losses. This wholesome picture approach explains why managers let the underpricing happen, as they expect

the loss to be followed by even greater gain. As a result, investor sentiment the managers have does increase the amount of money left on the table. Therefore, the reasoning suggested brings the first research hypothesis.

Research hypothesis

Investor behavioral peculiarities make the amount of underpricing higher when a company goes public.

The hypothesis stated is two-dimensional, and each direction should be analysed separately. The first dimension assumes using the classic approach of analyzing whether any behavior measure serves as a determinant for the phenomenon; this way the question under consideration is stated in broader terms – weather the behavioral components influence the amount of underpricing at all. Whereas crucial, the answer received may be perceived as not fulfilling because doubts of whether the influence determined (if any) is purely behavioral still arise. Moreover, extensive body of scientific literature on the matter demonstrated the presence of a link between investors behavior peculiarities and amount of IPO underpricing, this dimension will not be a center of the further research. This is the time when the second dimension comes into place – constructing the measure that will concentrate in its nature the investor sentiment features and allow eliminating the previous concern of non-behavioral components influence of the composite measure. The hypothesis here holds the same core idea but the angle of approaching the research is adjusted, this way some problem areas are mitigated.

As was pointed out some researchers however stand for the negative impact investor sentiment has on IPO underpricing bringing into the picture the third party included in the going public process – the underwriter. As the party is interested in the offer being sold out, it may lower the offer price in order to secure the required result, but if investor sentiment is high an underwriter can afford to lower the price to a lesser extent, thus, more prevalent investor sentiment leads to less money left on the table. The reasoning presented may as well be sound, that is why for the purpose of the current research it may be interesting to trace weather such an influence exists on the country levels, or it appears dependent on the timing of uncertainty prevailing. As a result, there may be the case that on some markets due to their specifics such as lower retail investors activity and, thus, lower interest in the stock market, or higher power underwriters possess due to some legal aspects investor sentiment, in fact, does not contribute into amount of underpricing positively, but in some cases may even lower it.

Research hypothesis presented will help to close the research gap existent from different angles. The first hypothesis is there to continue the line of well-established scientific research direction

with a rather rarely used method of sentiment index construction on a newer data analyzed for several stock markets. Al in all, the hypothesis stated will be used as a guidance for the following part of empirical research.

Variables use justification

Underpricing amount (UNDERPRICING)

The amount of money left on the table when a company goes public can be measured in different ways, the classical approach employed is to compute first-day initial return that was applied in the current research. If UNDERPRICINGi <0 the overpricing is, in fact, present. However, some authors make certain adjustments to the indicator usually to account for the situation when there is a gap in time the prices were chosen at. In that case significant market moves may influence the amount of underpricing, however for the first-day return the risk of such events to take place is noticeably lower, hence, no adjustments were made (Ritter, 2003).

Investor sentiment (LINDEXSENT)

As was pointed out earlier the concept of investor sentiment is multifaceted, it generally can be described as a set of behavioral characteristics display on the decisions economic agents undertake (Baker and Wurgler, 2007). In other words, the concept represents the deviations from the "rational" decision making provoked by the human nature and psychological biases people have. To capture the essence of investor sentiment various measure can be employed, to build the described indicator a set of explicit and implicit behavioral measures was used. The justification of each component as well as detailed description of the methodology in use will follow in the next section (Loughran T., 2004).

Gross proceeds (GROSSPROCEEDS)

The measure is a part of baseline model employed to grasp ex-ante uncertainty investors face regarding the offer. Gross proceeds represent a size measure of an IPO, the intuition behind it is clear, smaller offers may be perceived as a higher potential for speculation, whereas larger amounts needed for well-established more reliable firms signify less risk associated with an offer. While smaller offerings may be a subject of less transparent information at place as well as higher chance of buying a less secure asset, higher risk in general; larger offers usually come from more well-known market players, thus, are inherently more trustworthy (Beatty and Ritter, 1986). Hence, the indicator is used to indicate the associated amount of risk. The higher gross proceeds are associated with lower risk, hence, less amount of underpricing, as investors are more assured of the offering quality and perceive it less risky. But as amount of money offered may vary greatly, the log -

transformation was applied for the purpose of scaling. Therefore, the expected effect of the inverted measure on the amount of underpricing is negative (Quintana, et al., 2005).

Company age (AGE)

Another measure for uncertainty effect introduced as a control variable is defined by a company age that allows a potential investor to understand how mature a company is, how established and well-known it is on the market, how trustworthy and assured in its prospects an issuer is. Overall, it is assumed that older, more mature companies are characterized by less uncertainty as they have already found their way of doing business, have strategy of resolving issues they face on the way, are in general more experienced in terms of financial planning and main activity performance e t.c. (Ritter, 1991). All the mentioned criteria make investors doubt less a quality of their investment and expect more sound future and higher value of their stakes. While newer younger companies are still in the process of finding their place on the market and adjusting to harsh earlier phases of a life cycle, their future is even more unclear, that brings in additional risks and uncertainty for future investors. Another point here is that older companies are more informationally transparent, for one thing they simply have more financial information, for another, it is far more easily reachable, hence, the information asymmetry regarding the IPO is reduced for them. Therefore, the higher age associated with less uncertainty is expected to have a negative influence on the amount of money left on the table and vice versa for logged variable the relation between the indicators is anticipated to be positive (Ritter, 2003).

Technology industry (TECH)

With the development of technology nowadays, the industry has been growing on an outrageously high pace, this growth rate has showed to be rocketing that is why the technology industry is perceived to be extremely volatile and unstable. As a result, economic agents expectations regarding investment in such a company on the one side, are elevated, as previously this kind of investing turned to be a success, but still the matter is questionable, as extreme volatility is not in favor of risk-averse agents who presumably comprise a typical population. Therefore, the indicator captures a higher risk incorporated in a technology entity, because they are younger when go public and much harder to evaluate precisely. This leads to a negative expected relation between the indicator and amount of underpricing. To group the companies by the required criteria SIC codes classification was utilized in accord with (Loughran and Ritter (2004) and Ritter (2016)), who identified a list of 36 SIC codes representing technology industries.

Underwriter reputation (UNDERWRITER)

The existing literature provides two persistent patterns regarding prestigious underwriters influence on IPO underpricing (Carter and Manaster, 1990). In 1980s the scientific perspective of the negative influence prevailed, however, starting from 90s in reversed. Overall, the reasoning behind the positive contribution into underpricing is following – IPOs supervised by more prestigious underwriters benefit of both superior certification and public image as investors tend to put more trust in the deals handled by more trustworthy well-known underwriters. Hence, investors do not require higher discounts on deals they are confident about (Ritter, 2003).

Market condition (MARKETCONDITION)

It is known from the literature that market condition (also known as investor attention or market sentiment) is the general prevailing attitude of investors as to anticipated price development in a market. This attitude is the accumulation of a variety of fundamental and technical factors, including price history, economic reports, seasonal factors, and national and world events (Schultz, 2003). Basically, market and investor sentiment seem to be connected, as both factors are driven by investors, in particular their anticipations, beliefs, attitudes or biases. They do go hand in hand, both are result of what people think, how they evaluate and perceive, but market sentiment reflects opinions of investor aggregate on general market movement, it's a macro perspective, while investor sentiment is a term that reflects how investors behave on a smaller level, what they actually do, driven by their beliefs. In fact, investor sentiment drives the market and the other way around.

Market sentiment indicator reflected in a work in a traditional way by indicating weather a market is bullish or bearish, weather the overall market went up or down. Generally, it is said that a market is bullish when an index rises 20% of its low and a bear market when it falls 20% of its peak. Thus, when market is bullish the measure is equal to 1, in opposite case when the market is bearish it equals 0.

Investor sentiment index: fundamentals

There is no accord in the sphere of behavioral finance on the indicators that best capture irrationalities investors demonstrate. Scholars have proposed an array of measures, each of them captures one side of investors behavior while missing others. The fundamental idea behind construction of the index rather than using one or several measures separately is that market data available lacks an indicator that would allow to capture investor behavioral peculiarities in a clear and concise manner, rather they partially reflect the effect of interest. While index will allow to cover multiple dimensions and concentrate behavioral peculiarities that in turn is expected to bring more fruitful and at the same time truthful results.

Sentiment proxies

4 components were decided to be taken on as index constituencies for several reasons. For one thing, a combination of explicit (survey-based) and implicit (market) measures is taken. Secondly, the indicators are versatile enough to cover different dimensions of behavioral peculiarities and receive a fuller indicator, covering different dimensions.

Consumer confidence index

To capture behavioral component more fully two groups of measures will be employed. The explicit measure (survey-based) available for the chosen markets is Consumer confidence index (CCI) that provides an indication of future developments of households' consumption and saving, based upon answers regarding their expected financial situation, their sentiment about the general economic situation, unemployment, and capability of savings (Fisher K. L, 2003). An indicator above 100 signals a boost in the consumers' confidence towards the future economic situation, because of which they are less prone to save, and more inclined to spend money on major purchases in the next 12 months. Values below 100 indicate a pessimistic attitude towards future developments in the economy, possibly resulting in a tendency to save more and consume less. The data is available at OECD data source and will be utilized accordingly to quantify investors' behavior.

Aggregate trading volume

Some authors argue that this indicator is a good proxy for investor sentiment. In a market with short-sale constraints, investors only participate when they are optimistic (Joseph K, 2011). Especially individual investors tend to overreact to new information and have a tendency to trade in concert. Thus, trading volume increases when investor sentiment is high. High turnover forecasts low aggregate market returns (Lei Y. C., 2005). Therefore, the use of trading volume defined as trading turnover volume in a given month as an implicit sentiment proxy in PCA is justified. The monthly proxy values - trading volume of stock exchanges index - were retrieved from DataStream. VO demonstrates the aggregation of the number of shares traded for each stock in the index, in thousands, and represents monthly market share turnover by volume.

IPO Activity

As a sentiment proxy IPO Activity was proposed by Baker and Wurgler (2006). IPO activity is strongly correlated with market conditions. For example, Loughran and Ritter (1995) state that corporate executives time their IPOs to take advantage of fluctuations in investor sentiment, so called window of opportunity. Thus, the higher number of IPOs indicates higher sentiment, as

when investors are overly optimistic, the number of IPOs is greater and the market itself is hot, as a result. (Ibbotson and Jaffe, 1975) To measure the IPO activity the number of IPOs in a 6-month period prior to it is utilized. The number of IPOs was retrieved from stock exchanges official sites.

Volatility premium

The volatility premium is another proxy utilized for investor sentiment indicator construction since it was demonstrated in several to correspond with the valuation of dividend- and non-dividend-paying stocks. These two variables are highly inversely related. Small stocks with low growth potential and non-dividend-paying stocks tend to be highly volatile. This type of stocks is less attractive to arbitrageurs since they are more affected by noise trader sentiment and are riskier to trade (Baker and Wurgler, 2004). Hence, the higher volatility indicates higher sentiment exposure of the stocks. To calculate the proxy the difference between the expected volatility and the realized volatility was taken. The expected volatility is given by the stock exchange index option volatility that was retrieved from Datastream. The realized volatility was calculated from the closing prices of the indexes, hence, the monthly volatility premium was obtained.

Investor Sentiment index construction

As it is of extremely high probability that some of the sentiment proxies that are projected to be used are related to the current economic situation and explicit economic events including business cycle decline, some prior data adjustment is needed. Thus, to mitigate an excessive influence of fluctuations in macroeconomic variables and rather concentrate on sentiment dynamics, sentiment indicators should be corrected for the influence of business cycle fluctuations following the methodology of Baker and Wurgler (2006). In the benchmark work the macroeconomic data on growth rates in industrial production, inventory orders, factory orders, retail sales, and employment levels were employed for the adjustment. To get rid of seasonal trends, authors computed the monthly growth rate of the 12 month moving averages of the indicators and used this transformation in further analysis. Then each indicator was orthogonized using the regression, where independent variables included inventory orders, monthly factory orders, retail sales and employment levels at their respective lags that are determined beforehand by checking sentiment proxy correlation with lags and leads (the highest one is then selected). Thus, the macro factors adjusted sentiment variables are obtained.

The various sentiment proxies described above are all plausible candidates to measure some aspect of sentiment—but even after macro-adjusting they still also have an idiosyncratic, non-sentiment related component. To circumvent the problem that all proxies partially capture other aspects of investor behavior, the principal components of the sentiment proxies are needed to be extracted,

so as the main sentiment indicators will be taken the first principal components of macro-adjusted variables. And for the robustness check unadjusted measures will be employed.

Principal Components Analysis as a means of the behavioral indicator construction

To reach the main goal of the research – to examine weather investor sentiment presence enlarges the amount of IPO underpricing, it is necessary to construct a behavioral measure, that will capture the required characteristics in the most suitable way out of existing market and consumer-confidence related indicators. To extract more prominent behavior part out of available market measures the Principal Component Analysis method will be applied. The main purpose of principal-components analysis is to reduce the dimensionality of multivariate data to make its structure clearer. The way by which the effect is achieved is by constructing the linear combination of the variables which accounts for the maximum part possible of the total variation in the data. After identifying the first the mechanism then goes on to look for a second combination, uncorrelated with the first, which accounts for as much of the remaining variation as possible – then the process continues. If the greater part of the variation is accounted for by a small number of components, they may be used in place of the original variables. The mechanism described will help to get rid of the major part of other then behavioral constituent an indicator may contain, this is extremely relevant for implicit measures, the influence of which may be considered from different perspectives, thus, allowing for not solely sentiment effect.

The applicability of PCA is limited by certain assumptions made in its derivation. In particular, PCA can capture linear correlations between the features but fails when this assumption is violated. In some cases, coordinate transformations can restore the linearity assumption and PCA can then be applied (kernel PCA method). This fact should also be kept in mind if for some reason individual sentiment effect, for example, will be detected to be present, while composed one will not be found.

All that said the baseline form of the investor sentiment index will be as following:

$$IndexSent = \alpha_1 CCI_i + \alpha_2 deltacall_i + \alpha_3 N6_i + \alpha_4 VO_i \qquad (2)$$

3.2 Research methodology

To conduct an econometric study and identify the nature of the relationship of various determinants and the amount of IPO underpricing, an extended regression model was specified in the following way.

The baseline model following Ritter (2003) was considered as a starting point:

$$UNDERPRICING_i = \beta_0 + \beta_1 GROSSPROCEEDS_i + \beta_2 AGE_i + \beta_3 TECH_i + +\beta_4 UNDERWRITER_i + +\varepsilon_i \quad (3)$$

was extended with the behavioral measure ($INDEXSENT_i$) and several components to account for the market conditions and interaction with the variable of interest

$$UNDERPRICING_i = \beta_0 + \beta_1 GROSSPROCEEDS_i + \beta_2 AGE_i + \beta_3 TECH_i + \beta_4 UNDERWRITER_i + \beta_5 INDEXSENT_i + +\beta_6 MARKETCONDITION_i + \beta_7 TECH_i * LINDEXSENT_i + \beta_{10} COVID_i + \varepsilon_i \quad (4)$$

Table presents a description of the variables that were employed for the model.

Table 1. The variables used in the models, the way they are calculated and the data sources for their calculation.

Variable	Description
Dependent variable	
UNDERPRICING	The amount of the IPO underpricing is calculated by the following formula: $UNDERPRICING_i = \frac{P_{1i} - P_{0i}}{P_{0i}}$; Where P_{0i} – IPO offer price, P_{1i} – 1-day closing share price.
LINDEXSENT	Normalized standardized investor sentiment index, that captures investors irrationalities constructed by implementing Principal components analysis method.
GROSSPROCEEDS	The size of the attracted funds during the IPO that is equal to the product of the number of shares on the offer price of the placement. $GROSSPROCEEDS_i = ln\,(P_{oi} * N\ shares\ offered_i)$ Where P_{0i} – IPO offer price, $N\ shares\ offered_i$ – number of shares offered on the IPO.
AGE	The age of the company at the time of its IPO issue date. It equals to the difference between the date of incorporation of the company and the date of going public in years. $Age_i = ln(Issue\ date_i - Incorporation\ date_i)$ [1] Where $Issue\ date_i$ – the date a company went public at, $Incorporation\ date_i$ – the date a company has been registered.
TECH	Dummy variable that signifies weather a company represents the technology industry. 1- the company is technological; 0 – otherwise.
UNDERWRITER	Dummy variable describing weather the top-ranking (based on a country-specific rating) was facilitating the deal, if yes it equals 1; 0 otherwise.
MARKETCONDITION	Dummy variable describing market condition, weather a market index price was at rise (Bull market) or at fall

[1] Two versions of the indicator (logged and not) were used for different markets depending on the variance of the indicator for companies in the sample.

	(Bear). 1 – Bull market (20% rise of the price local lowest), 0 – Bear market (at least 20% fall of the price local highest)
TECH*LINDEXSENT	Interaction term of TECH dummy and investor sentiment index
COVID	Dummy variable reflecting weather an IPO took place during the COVID pandemic, 1 if yes (a company went public in 2020), 0 - otherwise

3.3 Sample construction and descriptive statistics

To conduct empirical research, it was decided to select 5 countries, located in the different parts of the world. The sample included some of the greatest in terms of stock exchanges activity markets, the reasoning behind was for one thing, to extend the possibility for data collection, as data availability often seems to be the issue, hence, the larger, more active markets will allow for larger initial selection. On the other hand, incorporating major stock market would allow to have drastically different markets with their own peculiarities and rules to compare, and, at the same time, to cover the crucial, most important tendencies existent all over the world.

Provided the reasons mentioned, the sample included Australia, Germany, Japan, the United Kingdom and the United States of America, in total 1312 (1237 after excluding outliers) observations (IPOs) during the period from 01.01.2010 to 31.12.2020. The number of IPOs for each country:

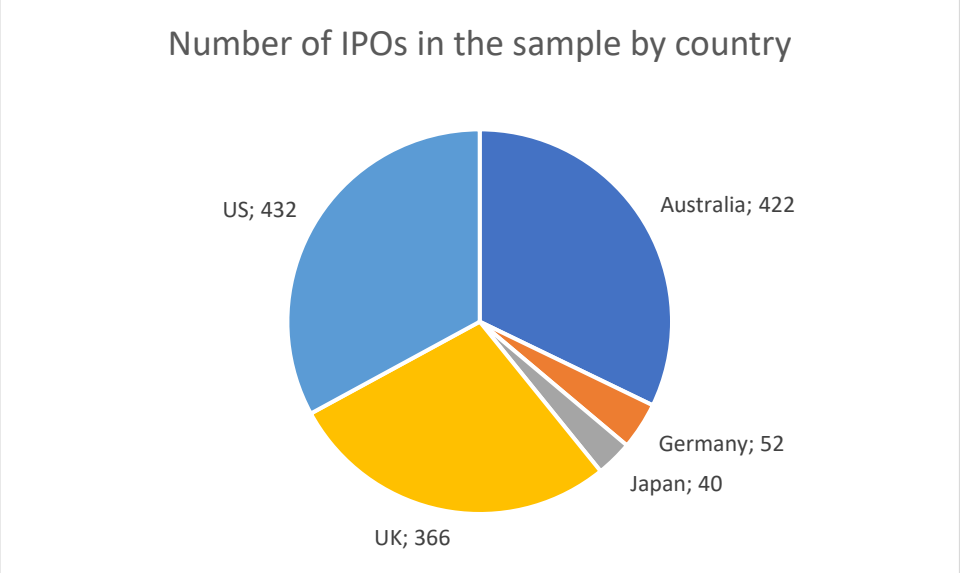

Fig. 3.3.1 Number of IPOs in the sample by country

Source: [Author's calculations]

As can be seen from the diagram, the US and Australian IPOs comprised the main part of the sample followed by the UK. However, comparatively small number of German and Japanese IPOs

was included that is justified by the data availability, still as tendencies at these markets would be interesting to explore, it was decided not to exclude them.

To conduct an empirical study, information was collected on companies that have initialized the initial public offering of shares on the Australian Stock Exchange, Frankfurt Stock Exchange, Tokyo Stock Exchange, the alternative investment market of the London Stock Exchange and London Stock Exchange main market, New York Stock Exchange. The sample included both companies registered in the one of the 5 mentioned countries.

The main sources of data were the archives of the stock exchanges, which are (comparatively) freely available on the official websites of the exchanges, the Thomson Reuters Eikon database, OECD data, the Zephyr database and the official websites of the companies.

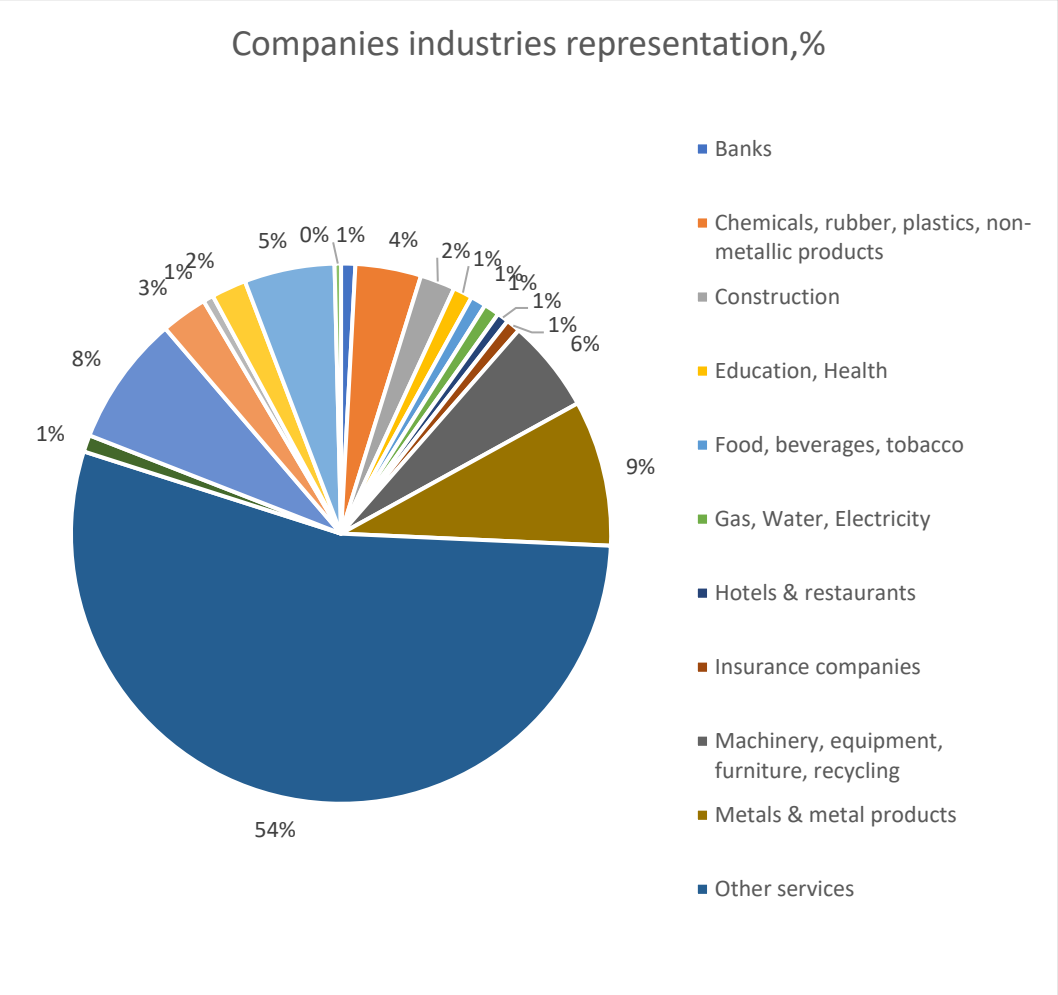

Fig. 3.3.2 Companies industries representation

Source:[Author's calculations]

As for the industries represented in the sample the range is quite diverse, with the major proportion occupied by "Other services" category, but "Metals&metal products" and "Food, beverages,

tobacco" industries are also widely represented. Overall, the sample appear to be wide and diversified enough.

In addition, to get a better grasp on the sample composition and understand it more fully, key indicators of the stock markets were calculated for each year. The main indicators for each year are presented in the table below.

As can be seen from the table, almost each year around 100 companies went public on the selected markets, the average amount of the underpricing is sufficiently volatile and varies from 7% to 73%, with the highest value being represented during 2018-2020 that is an interesting fact an explanation for which may lie in the hardship in relationships between the USA and China in 2019, the influence may be severe for the sample represented as the American companies occupy the largest proportion.

Moreover, it would be interesting to grasp some tendencies in the number of IPOs represented by year for each country. As it can be seen from the graph, the number of IPOs for the US was rising year by year during the 2010-2013 period, then a period of decline between 2014-2016 followed, after that the indicator was unstable. The pattern may be taken as evidence of favorable market conditions in the beginning of 2010s on the American stock market, hence, many companies wanted to take advantage of it, but the situation reversed in 2014, however, stock market in general was healthy.

It is important to point out that there is no alignment between different stock markets movements during the whole period under consideration that makes the research more interesting in its nature as world economic crisis, for example, is often perceived as a disrupter that does not allow to examine the relation of interest to the fullest.

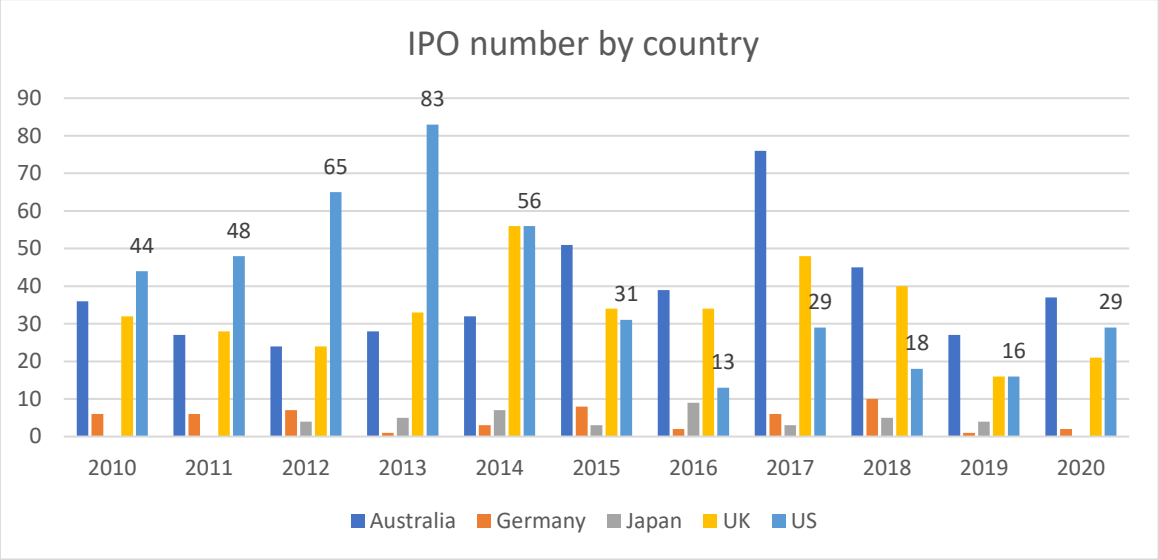

Fig. 3.3.3 IPO number by country

Source:[Author's calculations]

Descriptive statistics

Investor sentiment indicator components

To start out the indicator construction descriptive statistics of the raw indicators (components used for the index construction) was analysed to get the first glimpse on the variables.

Table 2. Investor sentiment constituents descriptive statistics.

Variable name	N observations	Mean	Standard deviation	Min	Max
CCI	660	99.94	1.46	94.86	102.62
N6m	660	41.50	31.95	0	163
Deltacall_g	642	0.81	0.19	-0.23	1.42
VO	660	2000000	0.00001	1380567	9540000

As it can be seen from the table, Consumer Confidence Index (CCI) is quite evenly distributed with the relatively small standard deviation, that signifies that the indicator is comparable across the countries and does not require any adjustments to be used. At the same time the number of IPOs in the last 6 months (N6m) has fairly large dispersion, this matter is intuitively clear, as despite the fact that the largest stock exchanges were chosen to be included into the sample, the difference between them is still sufficient (as it was shown in the graph). Moreover, the number may fluctuate tremendously even on a single market. This consideration, in fact, proves the need

to implement log transformation to the variable to scale it as was proposed by previous researchers. The same concern arises for trading volume (VO), as the values are scattered, so the log transformation may also be beneficial for it. Baker and Wurgler (2006, 2007) and Baker et al. (2012), for example, used the detrended logarithm turnover to control for the verified exponential positive trend of market share turnover. Volatility premium (Deltacall_g) has some omitted observations (data unavailable), but overall is also quite evenly distributed with certain periods characterized as extreme (max and min are far enough that indicates the presence of distress periods).

Quantitative indicators

Following the analysis of initial characteristic of the variable of interest components, the descriptive statistics of the quantity variables will be observed.

Table 3. Descriptive statistics of quantitative variables.

Variable name	N observations	Mean	Standard deviation	Min	Max
Underpricing	1237	0.10	0.21	-0.98	0.1
GrossProceeds, mln $	1237	207.34	470.75	0.44	8100
Age, years	1237	5.56	12.91	0.08	179
IndexSent	1237	72.34	19.66	7.91	100

The summary of initial measures indicates several concerns, the distribution of gross proceeds varies tremendously, that is quite logical, as the size of IPOs in the sample was not controlled, hence, all kinds from small to large IPOs were included, hence, the variable needs scaling in order to produce reasonable results, that is why a log transformation will be used. As for amount of underpricing, clearly there are some extreme values (that could take place due to the data being omitted or errors, some extra cases are also possible), hence it is necessary to detect outliers and omit them.

As for the age of companies, again there is sufficient difference in the indicator, as different companies went public on different stages, hence, some authors also implement the log transformation of the variable. This research will consider both versions of the measure. The same holds true for the market capitalization indicator, the reasoning behinds mirrors the one for gross proceeds, the log transformation should be also applied there.

Previous literature also demonstrated that some sentiment proxies take time to reveal their influence, hence, the lag-transformation may also be required. In fact, as the explicit sentiment measures are mainly utilized for the indicator construction, thus, it makes sense to adjust all the components.

Taking into consideration the mentioned concerns, the required transformations were implemented, but the raw indicators were also utilized to come up with the proper version of principal components that would allow to build the indicator capturing the most out of behavioral composition of the measures.

In the table the frequency distribution of the binary variables is presented. The majority of the companies in the sample do not represent technological industry, however there is still 17% of tech companies. The market condition in the analysed countries were favorable (bullish market prevailed). Prestigious underwriters are well represented in the sample, comprising 36%. Only a small proportion of companies went public during COVID times.

Table 4. Frequency table of binary variables.

Binary variable	0/1	Frequency	%	Cumulative
Tech	0	1.016	82.13	82.13
	1	221	17.87	100
	Total	1237	100	
Marketcondition	0	68	5.50	5.50
	1	1169	94.50	100
	Total	1237	100	
Underwriter	0	785	63.46	63.46
	1	452	36.54	100
	Total	1237	100	
COVID	0	1163	94.02	94.02
	1	74	5.98	100
	Total	1237	100	

When dynamics of the main is addressed, it can be noted that on average companies decided to go public on around 5th year of their activity, however, in 2018 and 2020 the older companies in comparison to the rest of the periods conducted IPOs. The amount of capital raised also varies in the sample, with the smallest offering being present in 2017 and the largest amount raised in 2013. Around 40% of equity on average was raised by the companies each year.

Table 5. The sample main indicators composition by year.

Year	Number of companies	Average Age, years	Average Gross Proceeds, mln $	Average new share
2010	118	6	149	0,42
2011	109	6	164	0,41
2012	124	3	228	0,45
2013	150	5	311	0,45
2014	154	5	221	0,38
2015	127	5	166	0,42
2016	97	4	156	0,45
2017	162	6	94	0,41
2018	118	9	197	0,44
2019	64	4	297	0,40
2020	89	8	295	0,49

Another dynamic valuable to observe is the change in amount of underpricing by year in the countries chosen. The variation of the IPO underpricing is represented on the graph below:

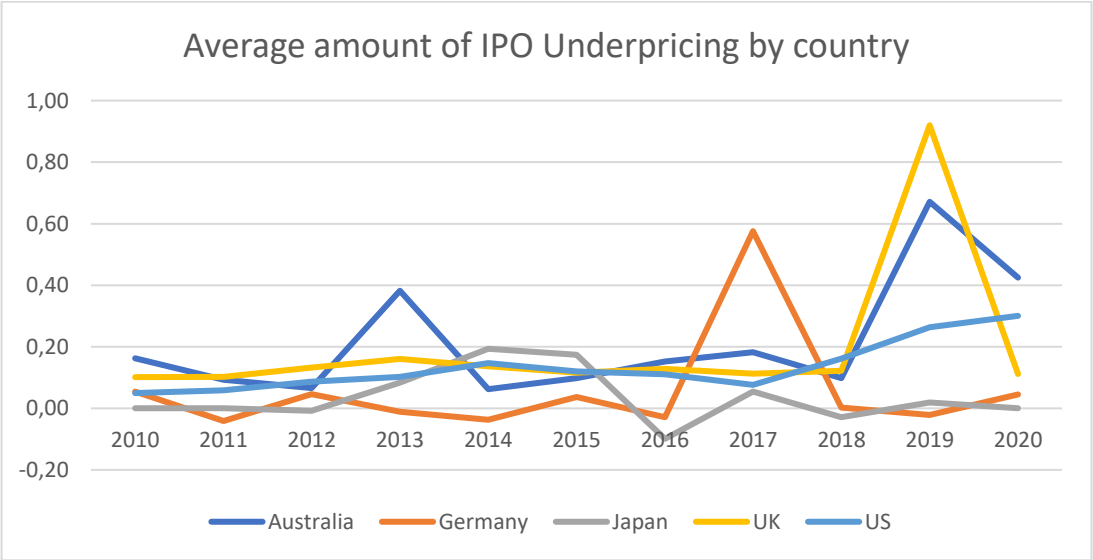

Fig.3.3.4 Average amount of IPO Underpricing by country

Source:[Author's calculations]

There is a spike in the amount of IPO underpricing in 2019 both for the UK and the US, the first case may be connected to the increased uncertainty both investors and companies experienced as a result of Brexit, hence, more money was left on the table. There were some more spikes in the

indicator in different periods for Australia in 2013, for Germany in 2017, while for Japan there was a fall in the amount of underpricing in 2016. Again, as can be seen each market had its own periods of rise and fall in the indicator, thus, observing them simultaneously allows to get a fuller picture on the phenomenon.

Table 6. Correlation matrix

	Underpricing	IndexSentiment	GrossProceeds	Age
Underpricing	1.0000			
IndexSentiment	0.0398	1.0000		
GrossProceeds	-0.0154	-0.2582	1.0000	
Age	0.0206	-0.1806	0.1910	1.0000

According to the correlation matrix, there is no red flags on possible multicorrelation, all the coefficients are less than 0.3, hence, no strong correlation is detected.

Investor sentiment indicator construction details

Methodology

The methodological procedure for investor sentiment indicator construction was adapted from Baker et al. (2012)

1.Variables transformation was implemented (as the previous literature demonstrated that some measures utilized may require certain transformations such as ln or lag modifications).

2.First-stage principal components were computed (to choose the best-fit from the explanatory power concern, the comparison was made based on First-stage Index correlation with the components, the variables closer associated with the Index were given a preference).

3.The obtained “best-fit” principal components were orthogonalized with a purpose of controlling each proxy with variables that are known to influence sentiment (based on the previous research that demonstrated the link), but are not directly related with it, to obtain clearer proxies as a result.

4.Index standardization to get rid of negative component that obstructs investor sentiment index interpretation.

To compute the 1st stage of the principal component, all the variables as well as their transformations were included for PCA construction:

- Consumer Confidence Index with its first-lag value;

- number of IPO as well as its log transformation, first-lag of the obtained variable and first-lag of the raw measure;
- Volatility premium and its first-lag value;
- Trading volume, its log transformation, the lag of implemented transformation and first-lag of initial variable.

The variable choice is aligned with the previous research, all components were also preliminary normalized. The result of PCA implementation is presented in the table below.

Then, to select the best fit, the correlations with the first-stage index that is a linear combination of the components that have eigenvalues greater than 1 were considered. The criterion is generally accepted by the literature to be significant.

Table 7. PCA results for components determination.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.6	0.85	0.3831	0.3831
Comp2	3.75	1.70	0.3126	0.6957
Comp3	2.05	0.97	0.1707	0.8664
Comp4	1.10	0.84	0.0900	0.9564

The first-stage index for the obtained result was constructed utilizing 4 principal components, with values greater than 1. These 4 components explain 95.64% of the sample variance.

$$Firststage\ Index = 0.4Comp1 + 0.33Comp2 + 0.18Comp3 + 0.09Comp4 \quad (5)$$

Then the correlations of the 1-stage Index with its variables are observed. The procedure of the Sentiment Index components selection then was based on the identifying the highest correlation the groups representatives have with Firststage Index.

As can be seen from the table nCCI, nDeltacall_g, lnN6, lnVO have the highest correlation in their groups, so normalized Consumer confidence Index, normalized volatility premium, log number of IPOs in the last 6 months prior to IPO and log trading volume were selected. The components explain 69.17% (see table below) of sample variance that is high enough and signifies that it is enough to use 4 components.

Table 8. PCA results quality check

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.58	0.39	0.3940	0.3940
Comp2	1.19	0.42	0.2977	0.6917
Comp3	0.77	0.32	0.1937	0.8854
Comp4	0.46		0.1146	1.0000

IndexSent was computed as the weighted average of the first 2 components that have eigenvalues greater than 1 (based on the table below).

Table 9. PCA end results

Variable name	Comp1	Comp2	Comp3	Comp4	Unexplained
nCCI	-0.47	0.50	0.59	0.42	0
nDeltacall_g	0.61	0.38	-0.30	0.64	0
lnN6	0.56	0.39	0.50	-0.53	0
lnVO	0.31	-0.67	0.56	0.36	0

$$IndexSent = 0.0343ncci + 0.9818ndeltacall_g + 0.9512lnN6 - 0.3607lnvo \quad (6)$$

In this case First-stage index greatly correlates (0.99) with the indicator constructed, hence, the fit is good enough.

Here is where the 4th step of the methodology described comes. In accord with the previous literature the measures for orthogonalization included (Baker et al., 2012):

- the industrial production indicator;
- the 3-month Treasury Bill rate;
- the term spread, defined as the difference in yields between the 10-year Gilt34 and the 3-month T-Bill;
- inflation rate (CPI).

The correlation with the orthogonalized variables has shown to be close to1 in almost every case, that means that the used macro and business variables explain slight of the variation in the sentiment measures.

The final, after-orthogonalization Index is as follows:

$$IndexSent = -0.05ncci + 0.51ndeltacall_g + 0.49lnN6 - 0.11lnvo \quad (7)$$

The obtained result was standardized in the following form. The standardization was maintained throughout the countries:

$$IndexSent = \frac{IndexSent_i - Min(IndexSent)}{Max(IndexSent) - Min(IndexSent)} * 100 \qquad (8)$$

The end-result IndexSent countries graphs are presented in the Appendix. The graphs demonstrate that IndexSent behave quite differently on the different markets: while it is quite stable (with moderate deviations from the mean of 80) for Australia and the UK (with a little bit larger variance), there is an upward trend for Japan, overall upward trend for the US (however, there was a significant) decline and sufficient fluctuations for Germany.

Overall, the Index constructed seems to be complex enough to capture behavioral peculiarities investors have, the interpretation of the index would be: the higher the value is the more the psychological biases and overoptimism prevail leading to irrational decisions made, in other words, higher Index corresponds with higher investors activity driven by non-rationale reasoning.

3.4 Regression Analysis

After all the necessary indicators are at place including dependent variable (difference in first day price of the share), control variables, sentiment proxy the key research part of the work is to take place. As was already mentioned, due to the dependent variable definition the cross-sectional data analysis will be conducted. The standard procedure of the OLS implementation will be used. After that all the required OLS assumptions are checked, and overall regression quality and explanatory power examined. Then overall obtained results robustness should be secured as well to reaffirm the conclusions and verify proposed theoretical and managerial implications of the results obtained in the analysis.

As it was demonstrated the sentiment indicator is market specific (there are no unified tendencies present), therefore for the econometric analysis markets will be considered separately, as a pool of all the markets will not give significant results.

The previous research demonstrated that it takes time for a investor sentiment influence to reveal its effect on the market from 1 month to a year, for the purpose of current research 3-month lagged IndexSent value is used.

Table 10. Regressions results.

Dependent variable: underpricing

Variable	Regression 1	Regression 2	Regression 3	Regression 4
L3Indexsent	0.0009***	0.0008**	0.0005*	0.0003
ln_gp	-0.0106**	-0.0100**	-0.0072*	-0.0081**
ln_age	0.0089**	0.0093**	0.0050	0.0043
Underwriter	0.0665***	0.0607***	0.0553***	0.0537***
Marketcondition		0.0622**	0.0512**	0.0577***
Tech_sent3			0.0015***	0.0015***
COVID				0.0610**
_cons	0.0488	-0.0064	-0.033	0.0060
N of obs	1237	1237	1237	1237
F-statistic	6.27	6.67	9.61	8.82
p-value (F-statistic)	0.0001	0.0000	0.0000	0.0000
R^2	2%	3%	7%	7%

*-10% level of significance,**-5%, ***-1%

All the regressions are significant (F-test $p<0.05$). All coefficients of a baseline model appeared to be significant on 5% level as well as the sentiment proxy on 1% level. Overall, the direction of influence of all variables is aligned throughout the regressions. ln Gross proceeds reduces the amount of underpricing – the more money was offered, the more confident an investor is in an offering, as it was more probably made by already well-established entity, hence, the less compensation for uncertainty is needed. ln Age is positively associated with underpricing, this means that older companies are associated with more amount of underpricing, maybe because they have more history in general and more information and market exposure that can be used to justify investment decisions and, hence, investors may be up for speculating on more reliable investment opportunities.

If a company represents technological industry that is more volatile, hence, higher risk for these companies is at stake, consequently a greater return is required by investors to compensate for larger uncertainty, that leads to higher underpricing, that is demonstrated by the baseline model. When interaction variable is introduced, the situation the variable of interaction between investor sentiment and technology industry was used, and, in fact, it revealed an interesting result it was significant, and her effect is positive, this means that for technology companies the sentiment effect on amount of underpricing is even higher than for non-technology industries companies.

Market condition also positively contributes into underpricing – if the market is bullish, the prices on the market in general are at rise, this means that more companies want to benefit on the favorable market conditions, hence, offering more equity capital and increasing the possible amount of money on the table. Prestigious underwriters participation turned to positively significantly influence underpricing, this may demonstrate the fact, that underwriters themselves end to lower the offer price in order for an IPO to be a success. As for COVID variable, it appeared to have positive significant effect, that proves that in times of high uncertainty underpricing rises as investors need more stimuli to invest in such a volatile time.

Regarding the main component of interest, the regressions demonstrated the positive relation between investor sentiment and amount of underpricing, that means that irrational investors behavior do stimulate companies to leave more money on Australian market, since their overoptimism and other irrational decisions stimulated by the psychological biases boost the first-day closing price.

Overall, the obtained results confirm the research hypothesis on the positive influence of investors sentiment on underpricing amount – the higher is the sentiment, the higher amount of money left on the table.

Main takeaways

- First of all, the importance of behavioral peculiarities investors have was proven to be a significant determinant of IPO underpricing, that helps to close the research gap existent on the matter.
- Research hypothesis of the positive influence of investor sentiment on underpricing amount turned was confirmed on 3 stock markets, that means that investors who are 'irrational' in the sense of having exuberant expectations regarding future performance do drive underpricing as underwriters attempt to maximize profits from the sale of equity, at the expense of these exuberant investors.
- Increased uncertainty influence (COVID) on underpricing was confirmed. Regression results demonstrated that the effect of increased uncertainty brought by the pandemic contributed to the amount of underpricing. Moreover, the effect overshadowed the investor sentiment indicator influence, that is quite a straightforward result, as the uncertainty markets in general faced is tremendous, no surprise other indicators are not as important at the moment.
- The empirical analysis didn't find proof to the difference in the direction of investor peculiarities influence on underpricing for different markets.

3.5 Statement and justification of expected theoretical and practical contribution.

From the theoretical perspective

- The work helps in filling in the question existent of whether behavior factors contribute to the underpricing phenomenon presence and clarifies its direction rooting the explanation in the country specifics. The composed measure implication is of the main use here as it is concentrated on the sentiment influence.

As in the existent literature there is no accord regarding the question whether IPO underpricing is a subject of behavioral peculiarities influence or no, one of the contributions research is to make is to help filling in the existent research gap. There are several theoretical branches explaining the phenomenon from different perspectives. Asymmetric information models assume that one of key IPO parties (the issuing firm, the bank underwriting and marketing the deal or the new investors) possesses more information than the others, this inconsistency in information distribution leads to underpricing in equilibrium. Institutional theories are primarily concentrated on three characteristics of the market: lawsuits, banks' price stabilizing policy after the start of trading, and taxes. Control theories argue that underpricing phenomenon adjusts the shareholder base in such a way that will allow to reduce outside shareholders influence when the company becomes public. At last, behavioral theories consider 'irrational' investors whose behavior increases the price of IPO shares far beyond true value or mangers of IPO firm psychological biases influence on the decision-making process and their failure to make underwriting banks to reduce underpricing.

Apart from the different theories existence that makes behavioral factors to compete with other explanation factors, there is no accord in the theoretical branch itself. Some works demonstrate that investor sentiment does influence the IPO returns and amount of underpricing in particular; however, others do not support this conclusion.

An example of works that did establish behavioral component influence was performed on Chinese IPO market by Xiong Y. A. P., Wang T. T. (2019), who employed turnover rate, the opening rate of return and online lottery rate (proxies both stage of continuous trading and of collective bidding) as investor sentiment indicators. Their goal was to evaluate whether this behavior factor influences IPO underpricing in three market segments (Main-board, SME Board and GEM) in order to provide the corresponding policy recommendations for the system of the country stock market IPO pricing improvement.

However, investor sentiment is not the only behavioral irregularity that influences individual investors demeanor, their expectations may be also irrational (heterogeneous). Li Y., Wang J., Liu J. (2011) considered both individual sentiment and heterogeneous factors influence on IPO

underpricing in SME and GEM Chinese stock markets. Sequent regression approach demonstrated that heterogeneous expectation affects IPO underpricing in both markets, while investor sentiment is only significant in SME market. The lack of investment sentiment influence on GEM can be explained by the fact that two types of investors present on this market: professional investors, who cannot be easily influenced by outsiders and, thus, their sentiment is not in the picture, and risk-aversive investors, who are characterized by heterogeneous expectations, thus this component identifies underpricing, not their sentiment.

Thus, the second work demonstrated the lack of investor sentiment influence on the IPO underpricing on GEM market. This situation justifies the necessity of the research gap to be filled and provides a possibility to accomplish it by conducting the proper research.

- Behavioral measure construction will allow to broaden the range of the methodology application sample

The measurement of investor sentiment is difficult, and the literature has proposed numerous sentiment proxies (for example, market momentum that is a market return over the one month before the IPO listing date; individual investor oversubscription - logarithm of the oversubscription ratio in the lottery, that can be used to indicate individual investor demand for an IPO; is first-day trading volume that can be determined by the percentage of total shares outstanding). While all of these proxies are likely to capture some aspect of sentiment, they also contain an idiosyncratic, non-sentiment related, component. Thus, it is difficult to choose a specific 'best' proxy out of the individual proxies suggested in the literature.

There is a research branch that utilizes Principal component analysis as a main instrument in behavioral measure construction (that allows to make the behavioral component "cleaner", to get at least partially rid of other different influential factors, to extract them from the available market measures). To circumvent the problem of necessity to identify the best sentiment proxy, this approach was suggested in numerous works Brown and Cliff (2004), Baker and Wurgler (2006), and Glushkov (2009). Finter P., Niessen-Ruenzi A. (2012) followed the same technique based on a principal component analysis (PCA) of various empirical sentiment proxies, the authors condensed the information that is provided by these proxies. The individual sentiment proxies considered included consumer confidence, aggregate net flows into equity mutual funds, put-call ratio, aggregate trading volume, IPO returns, and number of IPOs, as well as the equity to debt ratio of new issuances. After several robustness checks, they identified the best combination of these proxies and constructed an overall German sentiment indicator (GSI).

- A fresh perspective on the reasoning behind the acquired results and underlying phenomenon itself will be provided

There are several factors that contributed into receiving interesting results and even adding up a fresh perspective to the existing research – interaction terms of investor sentiment with gross proceeds and technological industry dummy demonstrated that in most cases the effects are even strengthened for the corresponding factors. Moreover, the COVID factor opened up an interesting perspective on the current events.

Possible managerial applications

- The overall understanding of the idea that behavioral factors do matter may influence on the book-building process, the selection of future shareholders, thus, may be adjusted

Before pricing the equity issue, investment bankers commonly "build a book". This process includes finalizing the indications of interest (bids) from investors as part of their effort to factor information into the initial IPO offer price. Each bid contains a request for a quantity of shares and may as well include a limit price. This process reveals the level of institutional demand for a firm's equity and provides insight into the price that investors are willing to pay. The lead underwriter uses the information to construct a demand curve. If there is strong demand, the underwriter will set a higher offer price. If not, however, or if market conditions are unfavorable a placement problem may arise. In alliance with management, the underwriter sets the offer price, finalizes the number of shares the issuing firm will sell, determines the date of the offering, and decides how to allocate the shares.

- Based on the models provided the issuing firm will be able to roughly estimate the possible effect of the behavioral phenomena and take it into consideration

The IPO activity is broad enough for a question of how it can be measured to arise. There can be determined 2 prime groups of indicators that allow to delineate the listing process measurement from different perspectives: short-term and long-term IPO performance. To proper understand IPO an appreciation of the process used to allocate shares to investors is required. The key component of most short-term measures of IPO performance is the offer price, as it plays a prominent role in determining the capital raised through the offering.

First short-term IPO performance will be considered, this group refers to measures that relate directly to the price performance of the firm's going public stock on the first day of trading or shortly thereafter. In general, the offer price in combination or separately from the number of shares sold are two main fundamentals that are used in most short-term measures of IPO

performance construction. The offer price and number of shares sold are subject of the expectations of a select group of stakeholders—including founders, top management, underwriters, and institutional investors, however, they are also dependent on the book value of the firm's assets and ultimately set by an underwriter. Furthermore, once public trading started, the stock price also incorporates the information available on a market and thus follows general stock market expectations about the firm's future financial performance (Fama, 1970). The most used short-term performance measures employed in the literature include IPO proceeds raised through the offering, IPO underpricing, IPO price premium (share price relative to book value per share), and market valuation.

- The market conditions observed may signal on the possible behavioral influence and give an opportunity to adjust issuing (change the timing of entering the market, for example)

When starting to study an IPO process one of the first questions that arises is the reasoning behind the whole idea, or why exactly business chooses to go public rather than staying private. It is important to realize that normally a company starts attracting capital from small number of investors without liquid market at place for trading of the issuance. Probably, the most evident fundamental idea behind is the demand for new funding a firm decides to attract through equity capital and further public market creation that will allow the founders and other shareholders to convert their wealth into cash at a future date. Financial reasons primarily include new projects financing, debt retirement, overall liquidity increase, lower capital costs attracting, and increase liquidity for founders and pre-IPO investors. There exist nonfinancial reasons as well, such as increased publicity and prestige, for instance. However, it is still not clear why the motivation to perform an IPO is stronger in some situations as many entrepreneurs still prefer to solely run their firms rather than engage in the complex public market process.

- If not detected (COVID pandemic), behavioral influence than may be neglected at least to some extent and other factors be given a closer attention to.

For example, asymmetry information theory may be given a closer attention to. The initial offer price is a subject of informational frictions of several kinds. On the one hand, the information asymmetry arises because issuers for obvious reasons are more aware of their business current situation – its frictions, hurdles it faces and hidden pains. A classic "lemons problem" may be presented here, thus, some investors tend to be afraid of it. Being aware of the problem, high-quality issuing firms may attempt to signal their quality by deliberately selling shares at a discount to discourage lower quality issuers from imitation and, as a result, mitigating the friction. This way

the issuers deliberately refuse getting more proceeds now in hope for more successful future seasoned offerings financing that will compensate the current loss.

At the same time, investors are likely to be asymmetrically well informed about conditions outside an issuing firm that can affect the performance of an offering, such as information about competitors, market index returns, and industry performance (Loughran &Ritter, 2002). The well-informed investors have no incentive to reveal the information they have before the issuance; hence, it allows them to have an advantage. To compensate for this and induce investors to reveal pricing information, underwriters offer some combination of an increase in the number of shares they allocate to the investor and underpricing. Therefore, to mitigate the informational asymmetry problem the book building process is designed in a way so that the information from the investors could be extracted. All that said, it is important to highlight that the IPO process contains many critical decision points that affect the amount of funds that a firm will generate with the offering.

Conclusion

The phenomenon of IPO underpricing has been of significant interest and importance for both academics and business community for many years, it still draws substantial attention as controversy in the theoretical explanation and empirical findings exists. The problem occupies the business world as the number of companies considering going public rises from year to year and the explanation and proper understanding of the underpricing phenomenon could help the interested parties (companies, underwriters and future investors) identify the possible outcomes, characteristics and expectations of realizing IPO, and manage their behavior accordingly. As for scientific perspective there is still no consensus regarding the topic as different theoretical directions of the analysis as well as a growing number of available empirical evidence cannot be expected to easily fit into one framework and provide single-angled picture of the reality.

The behavioral finance studies, that is a research direction the current Master Thesis belongs to, are very often considered to be complicated to conduct due to the lack of available information on irrationality or biases indicators. Nevertheless, the are proxies in previous works on the topic that allow to use publicly available information. Moreover, the behavioral finance methodology is sometimes questioned by some economists, but there is substantial number of scientific articles that prove this doubt to be unreasonable. Thus, as the behavioral approach is rather new field of study, its possible application is wide enough for, on the one hand, make contribution to the existing scientific literature covering possible research gap and, on the other hand, is of use for practitioners who may find results more proper describing reality and, therefore, more applicable to the managerial decisions making and even adjust components of their own behavior accordingly.

Closing of the existing research gap is particularly useful for management implication from the side of management control – if a company going public knows how behavior mechanism of its management and underwriters work, it may influence the certain decisions or prognose the situation in advance and behave in a company best interest. However, both current and prospective investors may also benefit by taking into consideration the effect behavioral irrationalities have on IPO underpricing: the latter can adjust their investing behavior to extract more value, while current shareholders could use the information to evaluate company prospective and outcome underpricing has on the overall activity.

To close the research gap the following steps were undertaken. After the existing scientific perspectives were thoroughly analysed during literature review preparation, two major components of the study were examined: underpricing as a phenomenon on one side and investor behavioral peculiarities on the other. The analysis gave the overview of the topic in general and grounded the future research, backed it up from various angles from formulating own perspective on the issue, to justification of the necessary variables use. Moreover, the process of the literature review preparation helped shape the methodology applied and facilitated instruments choice.

When the theoretical background for the research had been formed, the process of data collection was given start to. The first thing one should keep in mind when opening up an empirical research implementation is the indicators that need to be found (based on the existing works) and their availability. In case of investors behavioral aspects, the previous research suggests various available indicators that could possibly reflect the investor sentiment. As implementing a single indicator has its sufficient limitations and does not allow to capture the effect to the fullest, it was decided to build a behavioral index that would reflect multiple dimensions and hence, more thoroughly catch the influence of interest. Therefore, one of the main ideas the work is based on is extracting more prominent behavior part out of available market indicators realized by means of Principal Component Analysis.

After all the necessary indicators are at place including dependent variable (difference in first day price of the share), control variables, sentiment proxy the key research part of the work took place. As was already mentioned, due to the dependent variable definition the cross-sectional data analysis was conducted by means of the standard procedure of the OLS implementation. Then all the required OLS assumptions check was made, and overall regression quality and explanatory power were examined. Thus, multicolliniarity, heteroscedacity were checked and other necessary procedures conducted.

The summit of the analysis conducted was the key takeaways in the form of conclusions and possible future implications. Hence based on the obtained results, the research is categorized as a support of the debating parties on the role of behavior peculiarities influence on the IPO underpricing. The managerial implications were derived, the recommendations for managers were provided accordingly.

References

1. Albada A., Low S. W., Yong O. Prestige signals and heterogeneity of opinion regarding IPO values: Malaysian evidence //International Journal of Emerging Markets. – 2019.
2. Allen F., Brealey R., Myers S. Corporate finance //Auflage, Boston (ua): McGraw-Hill Irwin. – 2006.
3. Arora N., Singh B. Impact of auditor and underwriter reputation on underpricing of SME IPOs in India //Management and Labour Studies. – 2019. – V. 44. – №. 2. – P. 193-208.
4. Baxamusa M., Jalal A. Industry networks and IPO waves //Journal of Banking & Finance. – 2018. – T. 88. – C. 129-146.
5. Benninga S., Helmantel M., Sarig O. The timing of initial public offerings //Journal of financial economics. – 2005. – T. 75. – №. 1. – C. 115-132.
6. Benveniste L. M., Spindt P. A. How investment bankers determine the offer price and allocation of new issues //Journal of financial Economics. – 1989. – V. 24. – №. 2. – P. 343-361.
7. Berchtold R. Jonathan Berk, Peter DeMarzo. Corporate Finance. – 2014.
8. Bonini S. et al. Angel network affiliation and business angels' investment practices //Journal of Corporate Finance. – 2018. – V. 50. – P. 592-608.
9. Brigham E. F. Financial management: Theory and practice. – Cengage Learning Canada Inc, 2016.
10. Caselli S., Negri G. Private equity and venture capital in Europe: markets, techniques, and deals. – Academic Press, 2021.
11. Certo S. T. Influencing initial public offering investors with prestige: Signaling with board structures //Academy of management review. – 2003. – V. 28. – №. 3. – P. 432-446.
12. Chan K., Wang J., Wei K. C. J. Underpricing and long-term performance of IPOs in China //Journal of Corporate Finance. – 2004. – V. 10. – №. 3. – P. 409-430.
13. Cho E., Kim W. Skewness Preference and IPO Underpricing: International Evidence //Available at SSRN 3310063. – 2019.
14. Cliff M. T., Denis D. J. Do initial public offering firms purchase analyst coverage with underpricing? //The Journal of Finance. – 2004. – V. 59. – №. 6. – P. 2871-2901.
15. Cornelli F., Goldreich D., Ljungqvist A. Investor sentiment and pre-IPO markets //The Journal of Finance. – 2006. – V. 61. – №. 3. – P. 1187-1216.
16. Croce A., Guerini M., Ughetto E. Angel financing and the performance of high-tech start-ups //Journal of Small Business Management. – 2018. – V. 56. – №. 2. – P. 208-228.
17. Drover W. et al. A review and road map of entrepreneurial equity financing research: venture capital, corporate venture capital, angel investment, crowdfunding, and accelerators //Journal of management. – 2017. – V. 43. – №. 6. – P. 1820-1853.
18. Ellis K., Michaely R., O'Hara M. A guide to the initial public offering process. – K. Ellis, R. Michaely and M. O'Hara, 1999.
19. Farhadi R., Nanda V. What do employees know? Quality perception and ‘over-satisfaction’in firms going public //Journal of Corporate Finance. – 2021. – V. 66. – P. 101779.
20. Fu X. et al. New institutional investors in the IPO secondary market: Sentiment or fundamentals? //Journal of Financial Research. – 2021.
21. Gao Y. What comprises IPO initial returns: Evidence from the Chinese market //Pacific-Basin Finance Journal. – 2010. – V. 18. – №. 1. – P. 77-89.
22. Gao S. et al. Differences of opinion, institutional bids, and IPO underpricing //Journal of Corporate Finance. – 2020. – V. 60. – P. 101540.

23. Gilligan J., Wright M. Private equity demystified: An explanatory guide. – Oxford University Press, 2020.
24. Gompers P., Kaplan S. N., Mukharlyamov V. What do private equity firms say they do? //Journal of Financial Economics. – 2016. – V. 121. – №. 3. – P. 449-476.
25. Gonçalves J. R. Impact of Market Timing on Corporate Capital Structure: Evidence from the UK IPO Market. – 2019.
26. Jelita K., Tulung J. E., Gunawan E. M. DETERMINANTS OF GOING PUBLIC DECISION: THE CASE OF PT. BANK SULUTGO //Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi. – 2019. – V. 7. – №. 4.
27. Kaplan S. N., Lerner J. It ain't broke: The past, present, and future of venture capital //Journal of Applied Corporate Finance. – 2010. – V. 22. – №. 2. – P. 36-47.
28. Kim N. Y. The Impact of Reputable Underwriter's Service on Debt Financing of an IPO Firm: South Korean cases. – 2020. – V. 21. – №. 4. – P. 120-139.
29. Korsten D. IPO underpricing based on the asymmetric information theories. – 2018.
30. Li Y., Wang J., Liu J. Factors on IPO under-pricing based on Behavioral Finance Theory: Evidence from China //2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC). – IEEE, 2011. – P. 5568-5571.
31. Ljungqvist A., Wilhelm Jr W. J. Does prospect theory explain IPO market behavior? //The Journal of Finance. – 2005. – V. 60. – №. 4. – P. 1759-1790.
32. Loughran T., Ritter J. Why has IPO underpricing changed over time? //Financial management. – 2004. – P. 5-37.
33. Loughran T., Ritter J. R. Why don't issuers get upset about leaving money on the table in IPOs? //The Review of Financial Studies. – 2002. – V. 15. – №. 2. – P. 413-444.
34. Lucas D. J., McDonald R. L. Equity issues and stock price dynamics //The journal of finance. – 1990. – V. 45. – №. 4. – P. 1019-1043.
35. Ramadani V. Business angels: who they really are //Strategic Change: Briefings in Entrepreneurial Finance. – 2009. – V. 18. – №. 7-8. – P. 249-258.
36. Rathnayake D. N. et al. Are IPOs underpriced or overpriced? Evidence from an emerging market //Research in International Business and Finance. – 2019. – V. 50. – P. 171-190.
37. Ratih D. Equity market timing and capital structure: evidence on post-IPO firms in Indonesia //International Journal of Emerging Markets. – 2019.
38. Rock K. Why new issues are underpriced //Journal of financial economics. – 1986. – V. 15. – №. 1-2. – P. 187-212.
39. Rydqvist K., Högholm K. Going public in the 1980s: Evidence from Sweden //European Financial Management. – 1995. – V. 1. – №. 3. – P. 287-315.
40. Schultz P. Pseudo market timing and the long-run underperformance of IPOs //the Journal of Finance. – 2003. – V. 58. – №. 2. – P. 483-517.
41. Severini S. Review of IPO Primary Market Pricing Literature //Accounting and Finance Research. – 2020. – V. 9. – №. 4.
42. Sherman A. G. The pricing of best efforts new issues //The Journal of Finance. – 1992. – V. 47. – №. 2. – P. 781-790.
43. Skalická M. et al. Why do companies go public? Evidence from the Prague stock exchange //Entrepreneurial Business and Economics Review. – 2019. – V. 7. – №. 1. – P. 181-199.
44. Stoughton N. M., Zechner J. IPO-mechanisms, monitoring and ownership structure //Journal of Financial Economics. – 1998. – V. 49. – №. 1. – P. 45-77.

45. Takahashi H., Okada K. The Benefits of Going Public: Evidence of Increased Public Recognition //Available at SSRN 3573324. – 2018.
46. Vernimmen P. et al. Corporate finance: theory and practice. – John Wiley & Sons, 2014.
47. White B. A., Dumay J. Business angels: a research review and new agenda //Venture Capital. – 2017. – V. 19. – №. 3. – P. 183-216.
48. Wright F. How do entrepreneurs obtain financing? An evaluation of available options and how they fit into the current entrepreneurial ecosystem //Journal of Business & Finance Librarianship. – 2017. – V. 22. – №. 3-4. – P. 190-200.
49. XIONG Y. A. P., WANG T. T. Research on the Impact of Irrational Investor Behavior on IPO Underpricing in Main-board, SME Board and gem: Based on Behavioral Finance Perspective //DEStech Transactions on Economics, Business and Management. – 2019. – №. ssemr.
50. Zingales L. Insider ownership and the decision to go public //The review of economic studies. – 1995. – V. 62. – №. 3. – P. 425-448.

Appendix

Table 11. Correlation of possible investor sentiment index components with Firststage Index

	Firststage Index
Firststage Index	1.0000
ncci	-0.0086
Ndeltacall_g	0.5749
Nn6m	0.9036
nvo	-0.1056
lnvo	0.1160
lnN6	0.9525
lagCCI	-0.0038
lagDeltacallG	0.5748
lagN6	0.9022
lagVO	-0.1024
laglnN6	0.9519
laglnVO	0.1149

	Firsts~k	InvSent
Firststage~k	1.0000	
InvSent	0.9889	1.0000

Fig.Appendix 1. Firststage Index and Investor sentiment index correlation

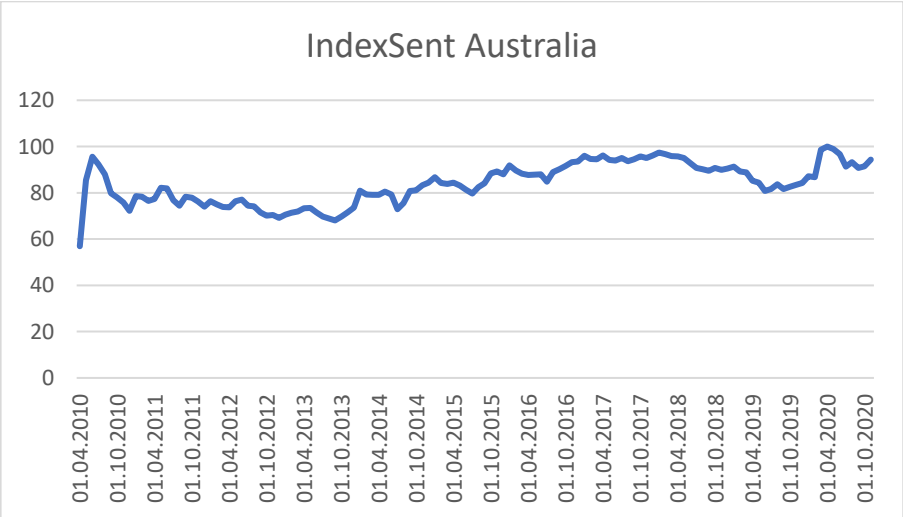

Fig.Appendix 2. Investor sentiment index trend Australia

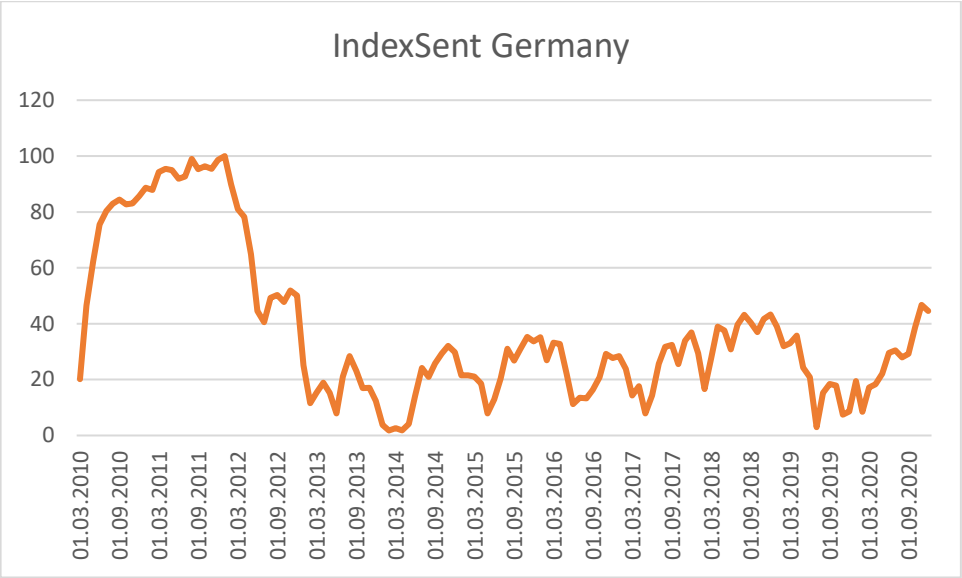

Fig.Appendix 3. Investor sentiment index trend Germany

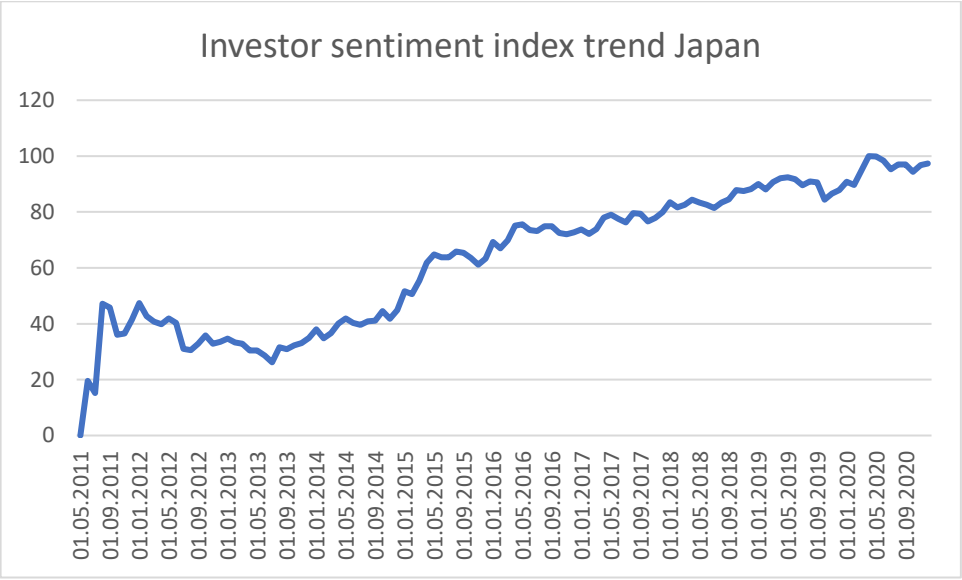

Fig.Appendix 4. Investor sentiment index trend Japan

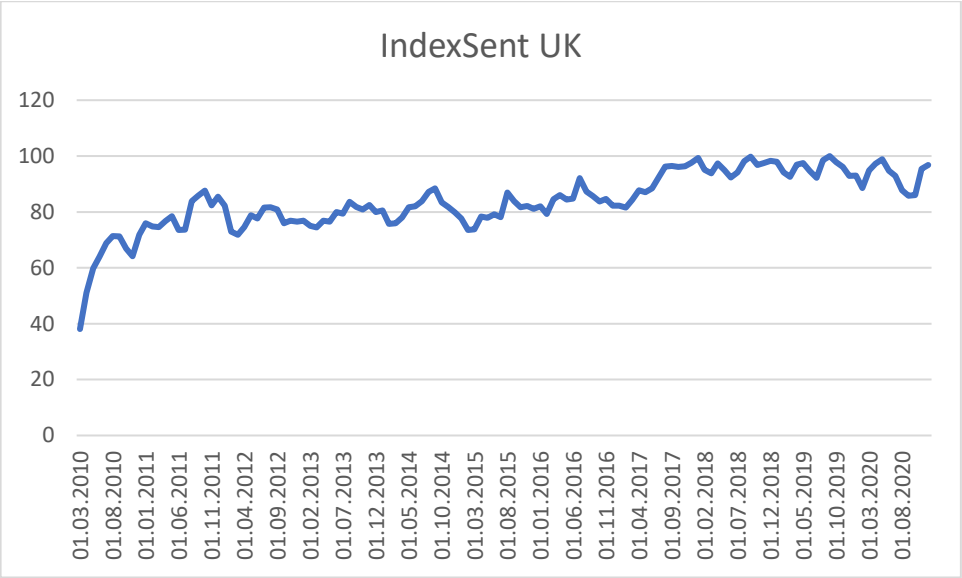

Fig.Appendix 5. Investor sentiment index trend UK

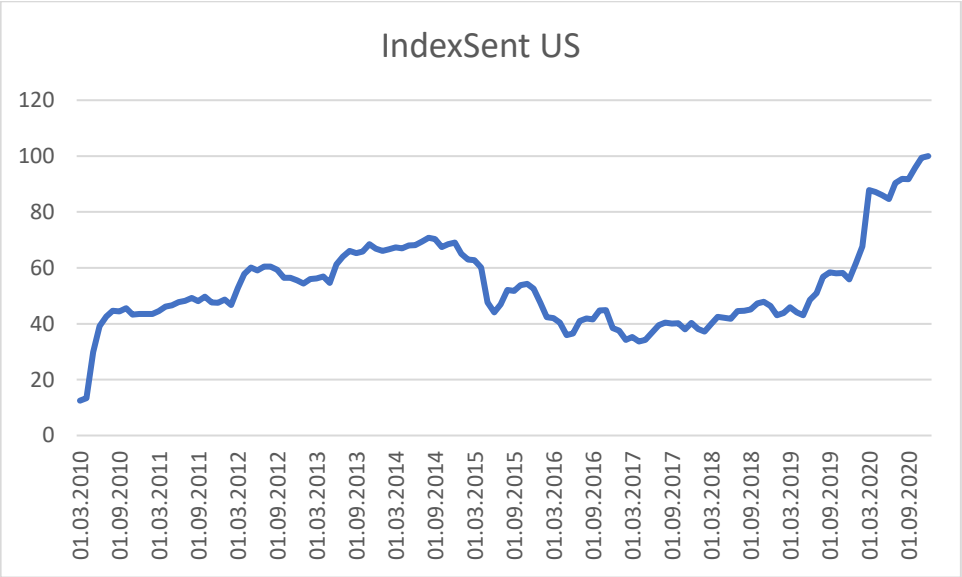

Fig.Appendix 6. Investor sentiment index trend US

Regressions outcomes:

Table 12. Regression 1 outcome

```
. regress Underpricing L3Indexsent ln_gp ln_age  Underwriter, robust

Linear regression                               Number of obs =    1237
                                                F(  4,  1232) =    6.27
                                                Prob > F      =  0.0001
                                                R-squared     =  0.0226
                                                Root MSE      =  .21182
```

Underpricing	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
L3Indexsent	.0008546	.0003328	2.57	0.010	.0002017	.0015076
ln_gp	-.0106419	.0042742	-2.49	0.013	-.0190273	-.0022564
ln_age	.0088823	.0037562	2.36	0.018	.0015131	.0162514
Underwriter	.0665379	.0156514	4.25	0.000	.0358315	.0972443
_cons	.0488108	.0348343	1.40	0.161	-.0195304	.117152

Table 13. Regression 2 outcome

```
. regress Underpricing L3Indexsent ln_gp ln_age  Underwriter Marketcondition, r
> obust

Linear regression                               Number of obs =    1237
                                                F(  5,  1231) =    6.67
                                                Prob > F      =  0.0000
                                                R-squared     =  0.0269
                                                Root MSE      =  .21144
```

Underpricing	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
L3Indexsent	.000798	.0003333	2.39	0.017	.000144	.001452
ln_gp	-.010035	.0042786	-2.35	0.019	-.0184292	-.0016407
ln_age	.0093114	.0037727	2.47	0.014	.0019098	.0167131
Underwriter	.0607499	.0157722	3.85	0.000	.0298065	.0916933
Marketcond~n	.0622017	.0208567	2.98	0.003	.021283	.1031204
_cons	-.0063979	.0388352	-0.16	0.869	-.0825885	.0697927

Table 14. Regression 3 outcome

```
. regress Underpricing L3Indexsent ln_gp ln_age  Underwriter Marketcondition te
> ch_sent3 , robust

Linear regression                               Number of obs =    1237
                                                F(  6,  1230) =    9.61
                                                Prob > F      =  0.0000
                                                R-squared     =  0.0670
                                                Root MSE      =  .20713
```

Underpricing	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
L3Indexsent	.0005285	.000304	1.74	0.082	-.0000679	.0011249
ln_gp	-.0072056	.0042144	-1.71	0.088	-.0154738	.0010626
ln_age	.004989	.0036147	1.38	0.168	-.0021026	.0120806
Underwriter	.0553359	.0149707	3.70	0.000	.025965	.0847067
Marketcond~n	.0511651	.0210113	2.44	0.015	.0099433	.092387
tech_sent3	.0015195	.0002677	5.68	0.000	.0009943	.0020448
_cons	-.0033027	.0369149	-0.09	0.929	-.0757258	.0691204

Table 15. Regression 4 outcome

```
. regress Underpricing L3Indexsent ln_gp ln_age  Underwriter Marketcondition te
> ch_sent3 COVID , robust

Linear regression                               Number of obs =    1237
                                                F(  7,  1229) =    8.82
                                                Prob > F      =  0.0000
                                                R-squared     =  0.0713
                                                Root MSE      =  .20674
```

Underpricing	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
L3Indexsent	.0003298	.0002987	1.10	0.270	-.0002562	.0009158
ln_gp	-.008121	.0041344	-1.96	0.050	-.0162321	-9.80e-06
ln_age	.0043053	.0036238	1.19	0.235	-.0028043	.0114148
Underwriter	.0537243	.0149716	3.59	0.000	.0243516	.083097
Marketcond~n	.057653	.0214389	2.69	0.007	.015592	.099714
tech_sent3	.0015003	.0002627	5.71	0.000	.0009848	.0020157
COVID	.0610497	.0259024	2.36	0.019	.0102318	.1118675
_cons	.0060063	.036228	0.17	0.868	-.0650694	.0770819