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**Analysis of the key financial factors influencing
changes in the initial public share offering price in Poland**

PhD thesis

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Budapest, 2023

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1. A topic selection overview

Over the past three decades, the transition of Central and Eastern Europe, which saw the fall of communist regimes and the start of the process of catching up with Western democratic institutions in Central and Eastern European countries, has also brought about significant changes in the financial services sector. Due to continuous technological development and innovation, a wider range of products and services have appeared in the regional money and capital markets, and thus the contribution of economic actors to competitiveness and national economic growth has gradually increased. This kind of contribution is essential for a well-functioning economy, as a stable, competitive corporate environment is one of the foundations of competitiveness and growth, ensuring the country's long-term macroeconomic prosperity. However, a competitive corporate environment cannot exist on its own without adequate financing background and a household sector, which generates the vast majority of demand for corporate products and services. For this reason, the targeted use of various support, economic stimulus and development tools is essential for the efficient functioning of the corporate sector. In my dissertation, I focus specifically on the change of the issue price of shares and the main effects of the factors influencing it in the first public share offering transactions in Central Eastern Europe, especially in Poland.

Initial public offerings (IPOs) are essentially complex capital market transactions, yet many companies decide - as opposed to other ways of selling shares - in favour of the first public offering (Bayar and Chemmanur, 2011). One of the main reasons for this is the flexibility of IPO transactions to increase capital, as the vast majority of companies going public need to raise the necessary funds for future growth, for which an IPO can provide an appropriate solution (Lowry, 2003). In addition to capital increase, an additional benefit of IPO transactions, after the period of strong growth envisaged at the time of the company's IPO, is the possibility to exploit additional capital raising alternatives for the company's development (Bancel and Mittoo, 2009). However, in addition to the above advantages of IPOs, the literature also identifies a number of disadvantages and counter-arguments. One of the most significant of these drawbacks is the cost of initial public offerings (Ferris et al, 1991), as IPO transactions can be preceded by a year and a half of preparation, during which the company is supported by various advisors to ensure a successful IPO.

Another disadvantage of being listed on the stock exchange is the constant reporting and disclosure obligations imposed on companies (Draho, 2005). Under these rules, in addition to their regular quarterly, half-yearly and annual reporting obligation, publicly traded companies

must disclose all information that may have an impact on, inter alia, the company's operations and profitability, and thus its share price.

The main features of IPO transactions described above show that the mechanisms of the initial public offering market are based on complex corporate processes. As a result, the change in the IPO share price during IPO transactions is influenced by a number of factors simultaneously. This is why I consider the analysis and study of the factors influencing the change in the issue share price to be an exciting topic of investigation. This also includes the fact that, when examining certain factors that influence changes in the issue share price, the results may vary from country to country, region to region or continent to continent. If we look at the literature on the issue price of shares, it is mostly focused on the markets of the US, Japan, China or other developed countries, and only a small part of the research focuses on the Central-Eastern European (CEE) region. Consequently, I also consider it important and justified to set up a consolidated research project that focuses on the examination of changes in the issue price of shares in the course of the first initial public offering transactions in Poland within the CEE region. In my view, such a summary study could further enhance the visibility of Poland's initial public offering markets for leading international stock market participants. I believe that the performance of the IPO market of Poland is lagging behind that of the IPO markets of developed countries largely due to the high degree of stock market and pricing uncertainty that investors generally face, which means that the level of return investors expect is no longer able to compensate for the level of the expected risks. Therefore, in my opinion, there is a need to create a study on the issue price of shares that is based on practical principles and that specifically examines factors influencing the change in the issue price of shares which could significantly help to reduce the share price uncertainty of international investors.

When studying the change in the issue share price in the Polish IPO market, it is important to note that conducting the analysis at regional level is a much more difficult and complex task, mainly due to the relatively low number of available transaction cases. Concerning the topic selection, one thing is certain: one of the challenges is handling the data set and the sample itself, as the number of completed IPO transactions in Poland - similarly to other continental European countries - is significantly lower compared to the Anglo-Saxon markets. Consequently, in the framework of my research, I believe it is important to examine the different types of market effects among individual corporate indicators in Poland in terms of statistics and economics. Applying this kind of analytical structure is of primary importance for me, as earlier studies have mainly dealt with the IPO transactions of developed countries. In the light of this, I focus on the Polish stock market in my thesis. Based on the above, I intend

to create a focus of research and investigation, which, as far as I know, has been studied in connection with the capital market so far.

1.1. Main objectives of the thesis

The study of stock market movements, and in particular the price movements and volatility of individual company shares, has been the subject of much research over the past decades. The study of the operation of the stock market is a long-standing topic, and thus a focus of research for many economists. For this reason, in my research I want to build an extended database based not only on IPO transactions in one financial year, but also on IPO transactions performed in Poland in the period from 2010 to 2018. Therefore, one of the objectives of my research is to provide a summary analysis of the change in the issue price of shares during the initial public offerings in Poland and the relationship between the factors influencing this change. A further aim of my dissertation is to synthesise share issuance data from Poland and analyse them in a common data set.

In addition to the literature on initial public offerings, many studies in these developed stock markets examine the impact of a single influencing factor on the change in the issue share price, thus the research results show the impact assessment between a given factor variable and the dependent variable. This means that some of the influencing factors I have examined have already been analysed in the context of the impact assessment for developed markets, but these analyses have been conducted in the framework of a separate impact assessment as described above.

As far as I know, studies on the CEE region mostly focus on the underpricing or overpricing of IPO shares and mostly use regional and macroeconomic indicators to find connections regarding the effects of IPO share price movements. Based on the above, I aim to conduct still unprecedented set analysis and impact assessment of unique focus which is based solely on a simultaneous analysis of individual company indicators and only looks at the macroeconomic environment in an outlook manner, so that I can put any possible emerging corporate performance shocks in context. Consequently, the structure and division of my research reflect this.

1.2. Structure and main questions of the research

My dissertation basically consists of two main parts. The first part is mainly a review of the international literature, while the second part is an overview of other market segments in Poland, mainly those which affect the initial public offering market, and an analysis of the results of the regression models and, in line with this, the hypotheses of the dissertation. In the first part of this thesis, my aim is to review the literature on the factors influencing the change in the issue share price in initial public offering transactions in order to establish deeper relationships with the parameters under investigation in regression analysis and hypothesis testing.

In line with this, the second main part of the thesis can actually be divided into two sub-chapters. The aim of the first sub-chapter is to examine how the performance of alternative financing markets "competing" with the initial public offering market has changed in Poland in recent years. This is also important because the performance of the IPO market depends not only on the willingness of a company to issue shares or the attractiveness of the IPO market itself, but also on how alternative financing markets perform in a given economic situation. This is why, in my opinion, it is important to put the situation of alternative financing markets in context when examining the change in the issue price, in order to be able to interpret and evaluate the received regression results more comprehensively. Therefore, in this subchapter, I separately examine, inter alia, the characteristics of Polish corporate lending, venture capital and fund management markets. In parallel, the second sub-chapter deals with data analysis, the presentation of the regression results and the testing of the hypotheses.

As I mentioned in the previous overview section, the hypotheses of my dissertation focus on the change in the issue price of shares and the impact assessment of the factors influencing the change in the issue price, thus I will seek to answer the following main questions:

- How does leverage affect corporate operation? What is the impact of leverage on the change in the issue price of shares in initial public offerings in Poland?
- Can a change in the number of share trades affect the change in the issue price of an IPO in Poland?
- With regard to the change in the issue price of shares, does the share price rate depend on the activity or industry sector of a company? Is there a real stock pricing difference in the change of the issue price of the shares of companies operating in the manufacturing or services sector in Poland?

- Does the proportion of non-strategic investors in a publicly traded company affect the change in the issue price of an IPO in Poland?

1.3. Methodology applied

My research is empirical research based on secondary information, which investigates existing and previously known capital market processes and factors, by using existing research materials and databases. In terms of research materials, my dissertation draws on mainly analyses in international literature on the topic of the thesis, while in terms of databases, it uses publicly available annual reports of listed companies in Poland, data on stock price and capital market trends published by the Warsaw Stock Exchange, and publicly available data from some international databases.

I primarily use regression analysis to conduct an impact assessment between the change in the issue price of shares and the factors influencing this change in share price, which is the focus of the dissertation investigation. Given that the factors of the model are examined for a given period (2010-2018), the hypotheses presented in the thesis were tested by means of a cross-sectional regression analysis. The main steps and processes involved in cross-sectional regression analysis are illustrated in the diagram below.

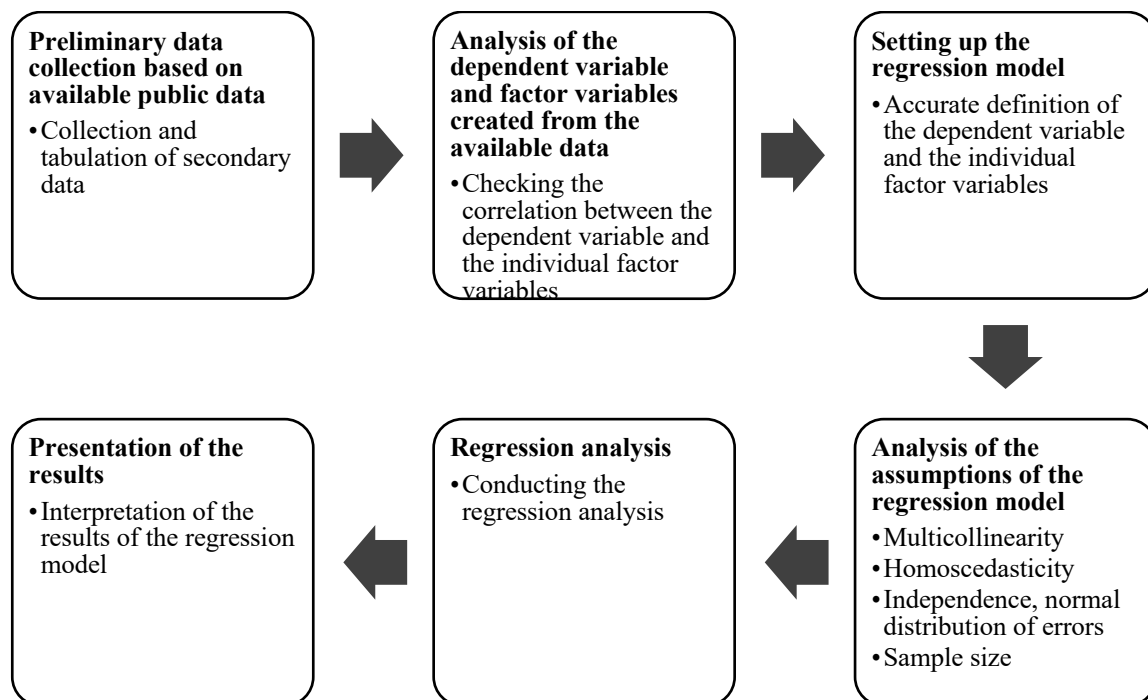


Diagram 1: Main steps of the cross-sectional regression analysis

Source: own editing

In addition to regression analysis, I also used factor analysis in my research to gain a more comprehensive understanding of the results. My aim with the factor analysis was to examine the strength of the correlation between the factor variables studied in the regression model and, as a consequence, whether it is necessary to transform these factor variables into qualitative "latent" variables which would provide additional information for the analysis of the change in the issue price of shares. In fact, this also means that I used factor analysis essentially as a kind of data reduction and synthesis strategy in order to create fewer uncorrelated factor variables instead of the highly correlated factor variables in the model, in order to increase the reliability of the regression model. Quantitative data analyses for regression analysis and factor analysis were performed in Microsoft Excel and IBM SPSS.

2. Theoretical background of the research: Effects on the change in company share price

2.1. The corporate impact of leverage and the creation of an optimal capital structure

Corporate leverage is a financing ratio whereby a company finances its necessary asset purchases through debt, rather than through its own operations and the equity provided to the company by its owners. This allows the company to use the amount of credit (debt) provided by the lender instead of its own capital, with the aim that the expected profit after taxes on the business investment used to secure the borrowing exceeds the total cost of credit and interest on the debt, thus providing multiple profit for the company's owners.

When defining corporate leverage, we need to distinguish between operational and financial leverage. Operating leverage primarily measures the ratio of a company's fixed costs to its variable costs, while financial leverage refers to the ratio of a company's debt to equity. It is widely accepted in literature that an increase in operating leverage for a company with high debt levels can significantly accelerate the deterioration of the company's financial position. However, where possible, it is preferable to establish a substitution relationship between the two types of leverage and replace financial leverage with operating leverage in this form, if the business model of the firm allows, as increased debt can make financial leverage more dangerous and more likely to promote or contribute to a near-bankruptcy situation than operating leverage (Mandelker and Rhee, 1984; Kahl et al., 2019). In addition, research on operating leverage shows that the higher the legal protection of workers in a country, the less financial leverage companies use given that individual companies face much higher operating leverage (Serfling, 2016; Simintzi et al., 2015).

In order to gain a deeper understanding of the creation of capital structures, in my dissertation I also examine the three main capital structure models in detail. These models are as follows:

- Trade-off theory,
- Pecking order theory,
- Market-timing theory.

The first model is the trade-off theory, according to which individual companies consider the decisions related to the construction of their capital structure based on the cost and tax savings arising in connection with debt (Kraus and Litzenberger, 1973). It is known to the owners of the company that companies that use financial leverage can have financial difficulties, and with high indebtedness, the risk that the company will not be able to pay its debt service can easily arise, thereby the company may get close to bankruptcy. This risk factor appears in the determination of the company's market value calculated based on the trade-off theory. Based on the above, the value of the company is the sum of the value of the financing of the company exclusively from the company's equity and the tax savings realized in connection with borrowing, reduced by the costs of any financial difficulties that may occur.

The second capital structure model is the pecking order theory, whereby firms rank their financing alternatives according to their associated costs, assuming that the higher the information asymmetry of a form of financing, the higher the cost of that financing (Donaldson, 1961; Myers and Majluf, 1984). Accordingly, asymmetric information influences the choice between internal and external financing. According to this theory, the first form of financing is internal financing, the extent of which is determined by the profitability of the company, followed by borrowing, and finally, when the company has exhausted its borrowing possibilities, by issuing shares. In fact, the pecking order theory illustrates that more profitable firms have lower debt ratios because they do not need external financing, while less profitable firms are no longer able to finance their own operations entirely from their equity and cash flow, therefore they use external financing.

The third model is the market-timing theory, according to which firms determine their capital structure decisions based on what the market expects under given market conditions and will accordingly create a capital structure that will result in the highest shareholder value and return for the firm's owners (Baker and Wurgler, 2002). In line with this, companies choose to issue shares when share values are most favourable in a given economic situation, while they choose

to borrow when market and base rates are lowest, thus minimising borrowing and repayment costs and ensuring the highest return for the company's owners.

2.2. The transactional challenges and management of information asymmetry

A common advantage of listed SPVs is that all information about the company's operations is available to anyone, therefore a potential investor can be fully informed about the company's profitability and operations before investing in the SPV. From an investor's point of view, this has the express advantage that investors can eliminate the risk of counter-selection that may arise from information asymmetry¹ (Akerlof, 1970). In economic terms, counter-selection occurs when an investor, in the absence of information on the SPV, acts contrary to its original acquisition intention and withdraws from the acquisition transaction. Counter-selection can lead to market inefficiency, which in the long run can lead to the termination of the market, therefore it is particularly important to identify and examine the factors that lead to counter-selection.

For this reason, several studies have shown that publicly traded acquiring companies prefer to rely on their past transaction experience and the information gathered from it in order to select the most commercially advantageous SPV (Castellaneta and Conti, 2017). As a consequence, it can be concluded that the quality of the information environment itself is a key consideration in the acquisition decisions of acquiring firms. Therefore, investors are constantly looking for sources of information that can help them to gain a broader understanding of the market and thus identify the ideal SPV. Besides public listings, another important source of this "information gathering" may be the media itself, as it is one of the most widely available information channels that can shape public opinion on a given event, and thus investors consider the information available from it to be reliable (Alvesson, 1990). In order to further reduce information asymmetry, equity analysts at investment banks can also provide information of sufficient quality on a particular company or industry (Arya and Mittendorf, 2007). In addition, information from a range of different industries and companies engaged in similar activities is a crucial factor in transactions, which can help acquiring companies to reduce their transaction costs significantly (Balakrishnan and Koza, 1993; Coff, 1999; Datar et

¹ The essence of information asymmetry is that in a takeover transaction, the acquiring party has much less information about the given SPV than the owners of the SPV, and therefore the acquiring party faces significant challenges.

al., 2001; Kohers and Ang, 2000). However, in the case where the investor and the SPV operate in separate industries, the investor is exposed to significant information and transaction costs due to even higher information asymmetry (Stigler, 1961; Rangan, 2000).

2.3. The emergence and effects of share under-pricing

2.3.1. *Share pricing uncertainties and the regulatory environment*

From a share pricing perspective, the literature distinguishes two periods. One is the period before the 2000s and the other after the 2000s. The divergence of the two pricing periods is related to the stock rally² of the internet stock era, where it was common practice in the case of many IPOs prior to the 2000s to underprice the shares issued, allowing the IPO investment service providers to favour their chosen clientele. Clients who bought shares at a discount in this way were able to realise a significant excess return (exchange gain) on the first trading days after listing. The decline of this phenomenon started in 2003 with a voluntary regulation whereby the regulator imposed listing conditions on the senior executives of the IPO company regarding the shares issued. The legislation has led to a steady decline in the number of cases of share under-pricing abuses in the US. When issuing shares on the stock exchange, the majority of investors aim to generate the highest possible returns in the medium and long term. Empirical research also clearly shows that the success of IPOs and pricing is highly dependent on the past performance of the company, and thus the dispersion of IPO returns is much higher than for a smaller company with a history of IPOs (Lowry et al, 2006).

² Stock rally: with the rise of the internet in the late 1990s, investors' expectation of returns and belief in companies whose activities were in some way linked to the internet increased, leading to a massive buying up of shares in "internet companies", causing share prices to rise dramatically. As the stock market continued to rise, share prices rose to a level that could no longer be justified by the financial fundamentals of the companies concerned, and the speculative bubble around the share prices of internet companies burst, causing a huge fall in share prices and the bankruptcy of many technology companies which had been prospering in the early 2000s (Glatzl, 2016).

2.3.2. *Causes and corporate effects of share under-pricing*

The literature on the causes of share under-pricing can be divided into two main groups. One group identifies stock pricing uncertainty and related information asymmetry as the reason for under-pricing. According to this research, the under-pricing of initial public offerings is a consequence of poor information flow between informed and uninformed investors in the IPO process. Consequently, under-pricing should be an incentive in the IPO transaction that is attractive to uninformed investors who are not aware of the fair value of the company. At the same time, informed investors have sufficient information about the fair value of companies that are about to go public, therefore they can avoid subscribing to low-value IPO shares. In other words, uninformed investors have an incentive to participate in an IPO transaction only if they are compensated by some level of under-pricing (Rock, 1986). Consequently, the higher is the future pricing uncertainty around a stock, the higher is the degree of under-pricing expected by investors (Koh and Walter, 1989; Keloharju, 1993).

In contrast, according to another large body of literature, the representatives of the signalling theory, under-pricing is not the result of information asymmetry between informed and uninformed investors, but is an individual, voluntary decision of each company. As a consequence, given that IPO companies have more information about their own operations and future potential than investors, companies use under-pricing as a means of signalling their high future growth potential and value (Allen and Faulhaber, 1989; Welch, 1989). Valuable companies with high growth prospects can generate demand for their shares by under-pricing their shares to the benefit of investors, while they will seek to recoup this selling discount from the increased share price in the secondary market. According to signalling theories, companies can signal their value to investors through a variety of means. Such indicators may include the number of shares not offered for sale, the level of corporate indebtedness, and the professional standing of lead arrangers and other IPO advisers. Correlational research results on the under-pricing of these factors are summarised in the table below.

Table 1: Under-pricing-related correlation between shares not offered for sale and post-IPO share performance

Influencing factor	Correlation	Consideration
Percentage of shares not offered for sale	Negative	The higher the number of shares not offered, the lower the degree of under-pricing (Leland and Pyle, 1977).
Post-IPO share performance	Positive	The greater the risk of future performance of an IPO stock, the greater the degree of under-pricing expected by investors (Beatty and Ritter, 1986).
Level of corporate indebtedness	Positive	The higher the indebtedness level of a company, the higher the degree of expected investor under-pricing (Myers, 1977).
Advisers participating in share issuance	Negative	The higher the professional and market reputation of an IPO advisor, the lower the under-pricing expected by investors (Titman and Trueman, 1986).

Source: own editing

Keeping the focus of this dissertation on the signalling theories related to under-pricing - which, as I have shown in detail, focus on the individual decision-making mechanisms of companies and hence of corporate decision-makers - I will also review the main models of economic behaviour. One of the best known behavioural models for share under-pricing is the adaptive expectations model of the 1950s and 1960s. The model is based on the idea that economic operators form their ideas about the future on the basis of past events. Thus, market participants ultimately base their expectations on past processes and data (Cagan 1956, Friedman 1957). However, the oil crisis and the economic events of the 1970s showed that the adaptive expectations model was not appropriate, therefore a new model had to be developed, and the rational expectations model was created. The essence of the rational expectations model is that expectations are not determined on the basis of past data, but are always formed by market participants using all the information available in the present (Muth, 1961).

Since the 1970s, the role of capital markets in the financing of the economy has come increasingly to the fore. As a result, the analysis of currently available data is no longer sufficient, since the capital market itself is almost explicitly driven by the immediate decision-making mechanisms of individual economic agents, where lightning-fast decisions and market adaptation are required. This gave rise to the theory of efficient markets, a model developed from the rational expectations model, which now focuses specifically on money and capital

markets. The theory of efficient markets is that market returns can be outperformed in the short run, but not in the long run, because in the long run there is an equilibrium return and capital market returns always equalize. The model recognises that market participants rationally and continuously change their behaviour and expectations in response to market expectations, and, as a consequence of this, equilibrium returns are achieved in the long run (Fama, 1970). Consequently, it can be said that efficient markets theory in some respects is now almost exclusively future-oriented, using the present as a current projection base, but in terms of pricing it focuses explicitly on possible future pricing.

2.4. General corporate ownership roles of non-strategic (institutional) investors

Over the past decades, the number of initial public offerings has steadily increased, leading to a growing involvement of institutional investors. In the case of an initial public offering, institutional investors are already actively involved in the book-building process and have priority in the share allocation, thus they can have a significant impact on the share price development in the first period after the issue (Ritter and Welch, 2002, Aggarwal et al., 2002). Moreover, institutional investors are also key actors in the internal remuneration and R&D policies of companies (Hartzell and Starks, 2003, Bushee, 1998). Consequently, literature also actively examines the involvement of institutional investors in publicly traded companies. The focus of this kind of research is primarily on the role of institutional investors in corporate governance and control. According to theories in literature, the involvement of institutional investors allows for higher corporate operating performance given that institutional investors have a controlling stake in the decision making process and, at the same time, own enough equity to cover the costs of corporate governance and control (Jensen and Meckling, 1976, Jensen, 1986). Accordingly, the involvement of institutional investors in the firm increases in direct proportion to the size of their shareholding, i.e. the higher the share of ownership held by institutional investors, the greater their interest in participating in the operational management of the firm (Shleifer and Vishny, 1986).

The involvement of institutional investors in a company depends not only on the size of their shareholding, but also, to a large extent, on the number of co-owners. Most of the literature on the ownership of institutional investors focuses on well-performing, prosperous companies, with fewer reviews on cooperation with underperforming firms. In itself, however, this is also an important parameter, as, in the case of underperforming companies, institutional investors prefer selling their stakes to participating in the operational functioning of the company

(Hirschman, 1970). This decision is mainly due to the fact that institutional investors always consider the losses resulting from the cost of interfering in the company's operations to be so high that they prefer rationalising the sale of shares in the company (double agent problem and freerider problem).

In contrast to the double agent and freerider problem, the third approach³ can be interpreted as a two-level collective dilemma. The essence of the collective dilemma is that a conflict of interest arises between the owners of the institutional investor and the managers of the underperforming portfolio company, whereby the institutional investor weighs the costs of intervention in the portfolio company against the interests of its own owners, rather than the individual interests of the investment manager or the loss of competitiveness of the institutional investors. As a consequence, the cost of intervening in an underperforming portfolio company would be too high for the institutional investor's owners, therefore the institutional investor will continue to choose either passive ownership or the sale of the underperforming portfolio company.

As far as the research part of the dissertation is concerned, it is very difficult because, to my knowledge, no specific empirical research has been done on the impact of the factors influencing the change in the issue price, but rather, it is possible to rely on general studies of a comprehensive nature, which can only be used to make assumptions on the preliminary direction of the relationship of the impact assessment.

3. Data analysis and research results

3.1. Formulation and presentation of hypotheses

The complexity of literary overviews clearly shows the complexity of corporate share price as a potential dependent variable, as well as its crucial relation to potential factor variables. Based on the above, keeping the research focus of the dissertation in mind, I have formulated the following four hypotheses:

³ The collective dilemma describes a situation in which economic actors are unwilling to cooperate due to a conflict of interests between them, therefore, the rational behaviour of an economic actor results in a positive outcome mostly for itself and not necessarily for the community. This situation, however, is not the best for any economic actor, because the best solution can only be achieved through joint cooperation (Olson, 1965).

Hypothesis 1: Growth in financial leverage negatively affects the change in the issue price of shares related to a company's initial public offering in Poland.

Hypothesis 2: An increase in the change in the number of share trading transactions has a positive influence on the change in the share price following an initial public offering in Poland.

Hypothesis 3: The underpricing of shares in the initial public offerings of companies in the Polish services sector is higher than the underpricing of the issue price of shares in the Polish manufacturing sector.

Hypothesis 4: There is a negative relationship between the share of non-strategic investors in a company and the change in the issue price of the company's initial public offering in Poland.

In view of the fact that the focus of the above hypotheses is the change in the issue price of shares during IPO transactions and the impact assessment of the factors affecting the change in this share price, in the aforementioned regression analysis, I apply the change in financial leverage, the change in the number of share trading transactions, the industry sector (dummy variable) and the rate of free float as factor variables. I will return to the definition of individual factor variables, their economic connections and relations to each other in the following part of the study on data set analysis. In this chapter, I try to present the main economic indicators and the economic environment in Poland so that we can put the IPO transactions in the examined period, the underlying economic processes and market movements into perspective more easily. In my analysis, I will deal with the changes of Poland's primary macroeconomic indicators, as well as the features of the country's fund management markets. Another large part of the chapter consists of the analysis of the regression results and the examination of the individual hypotheses, during which I specifically focus on the presentation of the specific data gained from the initial public offerings realized in Poland, the results obtained from the regression analysis of these data, and ultimately the testing of the hypotheses of the thesis.

3.2. The characteristics of the Polish alternative financing and fundraising markets

Poland joined the European Union in 2004. Currently, its official currency is the Polish zloty. At the beginning of the year 2010, 1 euro was worth 4.08 Polish zlotys. This value began to weaken significantly in the following years, when at the beginning of 2012, almost 4.60 zlotys had to be paid for 1 euro. Following significant weakening in 2012, the exchange rate stabilized at around 4.10 zlotys on average until the second half of 2015, when greater strengthening could be observed. Later, the zloty weakened continuously until the end of 2016, and then strengthened against the euro from December 2016 until May 2017. After that, with minor fluctuations it kept its value between 4.17 and 4.39 until the end of 2018 (European Central Bank, 2021). Regarding global competitiveness and indicators, Poland is considered to be one of the largest and fastest developing economies in Central and Eastern Europe. The change in the Polish GDP is clearly reflected by the exchange rate fluctuations between the zloty and the euro and, as a result, the international “appeal” of the Polish currency.

Along with the change of the GDP, in 2010, the inflation rate in the country was around 2.6%, which increased to a level of around 4% both in 2011 and 2012, then, after a sharp change in 2013, it dropped from 4% in the previous period to 0.8%. This decrease also continued between 2014 and 2015. Eventually, the inflation rate entered a negative range in 2015, where it peaked at -0.7% at the end of 2015. The deflationary period still lasted at the end of 2016, however, the rate of deflation decreased to 0.2%. In the following years, inflation started to show an almost continuous rise, From 2017, it already had a positive value (1.6%), which dropped only slightly by the end of 2018 (Eurostat, 2021). Regarding the central bank’s current prime rate, the Polish interest rate showed a basically increasing trend between 2010 and 2012. In the first half of 2012, it reached its highest value of 4.75% in the period examined during this research. After reaching its peak in 2012, the base rate began to decrease continuously and at the beginning of 2013 it was only at 4%. It can be claimed with certainty that in the period of 2010 - 2018, the most significant changes in the base rate took place in 2013, when it dropped by 50% from the aforementioned 4% level to 2% by the beginning of 2014. After the changes in 2013, there was only a small drop in 2015, when the central bank’s current prime rate decreased to 1.5%, after which it remained unchanged until the end of 2018 (Trading Economics, 2021). To some extent, the relatively stable levels of the aforementioned macroeconomic indicators also contributed to the fact that Poland was ranked 34th in the IMD global competitiveness

ranking⁴ in 2018. The high degree of stability and reliability of the Polish banking system played a decisive role in this result, as well..

Due to its flexibility, the banking sector was largely able to avoid the liquidity and solvency problems arising during the financial crises over the past decades, despite the fact that the credit institutions of other member states were more severely hit by such problems. Regarding the Polish market as a whole, in general, it can be stated that loans play a decisive role concerning the functioning of the economy. In 2010, the total assets of the banking sector equalled almost 30% of the Polish GDP. This percentage increased continuously in the period between 2010 and 2018. Between 2010 and 2015, the aforementioned rate rose relatively moderately, however, between 2016 and 2017, as a delayed effect of the further reduction of the central bank's current prime rate, it significantly increased. By the end of 2017, the total assets of banks made up 50% of the GDP. In addition to the asset portfolio, the relative ratio and volume of bank receivables also increased significantly. Concerning the functioning of the Polish economy, it is obvious that, in terms of loans, the banking system's exposure is the largest to non-financial companies and the retail clients. In the ratio of households to non-financial companies, non-financial companies are definitely more dominant. On the other hand, the total credit portfolio of households cannot be neglected either, as its level already slightly exceeded 30% of GDP in 2010, while the value of loans owned by non-financial companies was nearly 38%. As the diagram below indicates, in terms of the total loan portfolio, the borrowing "appetite" of households and non-financial companies shows a very similar tendency. Basically, it can be claimed that it increased at a similar rate between 2010 and 2018, except perhaps for the year 2016 when the increase in the loan volume of non-financial companies was more considerable, while the loan volume of households in relation to GDP stagnated or rather decreased slightly.

As far as the Polish venture capital market is concerned, in general it can be said that the market was able to attract not only local capital investors, but also international capital investors in the examined period. As a result, by the end of 2018, 1.4% of the total volume of European venture

⁴ "The world-famous Swiss IMD World Competitiveness Center has been publishing its competitiveness ranking in the form of a Yearbook since 1989. The relative ranking of 63 countries is based on altogether 258 indicators. In the study, statistical data (e.g.: data on employment and trade) are included with double weight compared to "softer" data, which are obtained from opinion polls interviewing company managers on important matters such as corruption, problems related to environmental protection, or the assessment of the quality of life." (IMD Competitiveness Yearbook 2019, ICEG European Center, p.1)

capital was concentrated in Poland. (Private Equity Insights, 2019). The majority of this capital came from European investors (38%), but the proportion of non-European investors was also very considerable (26%). Furthermore, it is important to mention that regarding the largest and most significant Polish family-owned companies, generation changes have not taken place yet, therefore these companies are still run by their elderly founders. Consequently, according to the estimates of the Polish Ministry of Technology, more than one million family-owned companies are about to undergo a generation change, which might attract a new level of venture capital investors to the country (Private Equity Insights, 2019). Apart from the generation change, several your start-up entrepreneurs appeared in the Polish market in the examined period, which further facilitated the country's visibility. However, due to the growing demand for venture capital, the economic role of the state also increased in the venture capital market, which meant that, in 2017, more than 30% of the capital invested in Polish venture capital investments came from the Polish State. Basically, this type of measure pushed venture capital investments towards investing in early-stage companies. as a result, only 0.8% of the invested capital was invested in already established, late-stage companies in 2017, which was well below the European average. Therefore, studies related to regional venture capital investment mostly forecast for the next period the appearance of several venture capital investment companies that ensure the development of companies that are already at a later stage (White Star Capital, 2021).

However, in addition to the increasing venture capital investments in Poland, the Warsaw Stock Exchange also offers excellent fundraising opportunities for start-ups as well as mature companies. Moreover, Poland also belongs to the most attractive countries in Europe in terms of the direct inflow of capital from abroad, the value of which reached EUR 13.9 billion in 2018. At the same time, in addition to the increasing liquidity of the stock market in the Polish domestic market, in the examined period, the fund management market was primarily dominated by bond funds and other types of funds, the number of which already exceeded 1350 (National Bank of Poland, 2020). Regarding willingness to invest and the return, in 2018, some of the most significant funds were bond funds, the value of which increased by nearly 280% between 2010 and 2018. Considering the historical values and trends, it was clearly visible that the year 2017 was a historical point in the 2010-2018 period, as the total value of the assets managed by the investment fund managers reached approximately EUR 76,989 million. When examining the fund management market as a whole, we can observe that, in 2018, investors conducted transactions worth more than EUR 1 billion related to bond funds, while the value of transactions related to other funds exceeded a record of EUR 10 billion in 2015. However,

this kind of record growth was followed by significant falls, and, as I mentioned earlier, investors mainly turned to bond funds.

3.3. Analysis of the dataset examined

3.3.1. *Presentation of the sample*

My research sample contains and processes company-level data from IPO transactions in Poland between 2010 and 2018. I collected the data mainly using stock market trading data from Poland, individual company annual reports and major information databases such as Mergermarket and Capital IQ.

The full raw database included a total of 160 IPO transactions between 2010 and 2018 in Poland. In order to obtain a data set of sufficient quality for the regression analysis, I first examined the companies in the raw sample, one by one, on the basis of the available company information, to see whether they had ceased to trade or had been delisted during the period under examination. The study found a total of 62 companies whose shares were delisted during the study period, which means that there were 98 IPOs that could form the basis of the sample for the study. From this point onwards, for each transaction and company, I have also analysed individually which companies did not make any interest or dividend payments during the period under study. This was necessary because if a company did not pay either interest or dividends, then instead of financial leverage, only the effect of the company's operating profit less depreciation and amortisation on the change in its share price could be measured, i.e. regression analysis of these companies would have led to a financially "uninterpretable" result (I did not identify similar possible interpretability constraints for the other three variables). As a result, all companies that did not pay interest or dividends were filtered out of the database, therefore a company sample consisting of 75 elements was created in relation to initial public offering transactions between 2010 and 2018.

The following table shows the data of corporate IPO transactions obtained as a result of data cleaning in the aforementioned way.

Table 2: Annual distribution of the number of Polish IPO transactions, 2010-2018

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Poland	15	20	8	10	8	6	7	0	1

Source: Source: own editing based on the test database

The change in the number of Polish IPO transactions included in the sample is basically in line with the processes in Polish alternative financing markets, as it was also clearly visible in the fund management market that between 2014 and 2016 the number of equity funds increased continuously until the first half of 2018, when it fell below the 2013-level. Based on the above, regarding share transactions, in the case of the IPO market, the dominant presence of initial public offerings can also be proven in the period between 2014 and 2016, when out of the 75 share issues which took place between 2010 and 2018, 21 transactions were conducted in these 3 years. This type of “equity-oriented behaviour” on the part of the investors can be measured not only in the number of IPO transactions and the shift towards equity funds, but also the WIG index itself clearly indicates this kind of change in market behaviour. We also have to take into account the fact that the WIG index also rose to around 55,000 points. If we study the understanding of this "behaviour change" in an even broader economic context, it is also worth putting the economic environment itself into perspective. In the light of the above, if we look at the macroeconomic environment, it is clear that in the period between 2016 and 2018 the growth of the Polish GDP - compared to the other years of the examined period - grew at a significantly higher rate. This growth was accompanied by a mild inflationary environment, while the central bank’s current prime rates began to decrease significantly after the year 2015. Consequently, economic prospects could increase significantly, as lending activity could strengthen at a high rate due to the low interest rate environment, which was mostly observable based on the promotion of consumption and the productivity of the corporate sector. To some extent, the process above was also the reason for the strong GDP growth in this period. When returning to the relationship between the stock market and the low interest rate environment, in this relation, it is also clear that in a low interest rate environment, a high number of investors turned to the stock markets, as due to the low interest rates, stable forms of investment (be they government bonds or bank deposits) did not provide a sufficiently high rate of return, therefore investors were forced to turn to higher-risk but higher-return investment forms. Such higher-risk but higher-return investment alternatives can include individual shares, regardless of whether they are already traded or are about to be listed on the stock exchange.

Considering the number of Polish IPO transactions, in addition to the period between 2014 and 2016, the period between 2010 and 2013 was also regarded as outstanding, when an additional 53 initial public offerings were realized. In my opinion, this period is also interesting because, as opposed to the period of 2014 and 2016, between 2010 and 2013, a lower rate of GDP growth and a higher interest rate environment were observable, however the number of IPO transactions was still relatively higher compared to the other years examined. Anyway, when examining share issue trends, I think that the decrease in the number of initial public offerings from 2010 to 2012 can provide only partial explanation and thereby it is in line with macroeconomic trends. This period mainly differs from other periods in the pace of the slowdown, based on which I concluded that the change in investors' behaviour was slower than in the 2014-2016 period. As far as the years 2017 and 2018 are concerned - where the total number of realised relevant initial public offerings was one - basically, the inflation of a few percent was stable and could not be considered high. In addition, there was a low interest rate environment, with cheap financing options available. However, less investors turned to such an extent towards stock markets than in the previous years between 2014 - 2016. I see a connection between the low number of share transactions and the low interest rate environment. I could mostly explain it with the low volume of inflowing foreign capital. As I already showed in the previous section on macroeconomics, the Polish economy, in addition to local companies and state investment, is also more exposed to foreign investors, therefore the low number of transactions can be accounted for to some extent in accordance with the lower FDI rate for 2017. Furthermore, if study the strategies of investment fund managers, the number of bond and real property funds increased significantly during this period. In the light of this, it is likely that the asset-based investment strategy of investors may have contributed to the low number of transactions.

In addition to analysing the number of IPO transactions and the investment environment, it is also worth reviewing the industry breakdown of transactions in a few sentences.

Table 3: Breakdown of the number of IPO transactions by the service and the manufacturing sector, 2010-2018

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Service Provider	11	16	4	4	4	2	7	0	1
Manufacturer	4	4	4	6	4	4	1	0	0
Total	15	20	8	10	8	6	7	0	1

Source: Source: own editing based on the test database

In terms of the distribution of IPO transactions by industry, it is clear that service companies dominate the sample in terms of the number of transactions, as 64% of IPO companies are service companies, while 36% are manufacturing companies. In addition, however, it is important to mention that since 2016 the presence of service companies has been extremely strong, as only one of the IPOs that took place in the 2016-2018 period can be linked to a former manufacturing company. This trend is much more balanced in the period between 2010-2016, where, with the exception of the years 2010 and 2011, the proportion of initial public offerings by service and manufacturing firms was almost equal, with two more initial public offerings by manufacturing firms than by service companies in 2013 and 2015.

3.3.2. Regression model and analysis

As I mentioned in the methodology section, I used regression analysis to explore the impact assessment which is the main focus of this dissertation.

The dependent variable in the regression model represents the change in the issue price of shares, while the factor variables in the model indicate the change in financial leverage, the change in the number of transactions, the industry classification of individual companies and the proportion of non-strategic (institutional) investors. As for the change in the number of transactions, my aim is to analyse the impact of any possible information asymmetry on the change in the issue price. In this way, I considered the change in the number of transactions in the stock trading of the IPO companies in the sample as a measure of information asymmetry. In addition to the number of transactions, the share of non-strategic investors is a factor variable that I measure directly by another quantitative variable - the share of the free float of the company, i.e. the share of non-strategic investors in a company is measured by the share of free float of the firm. In addition, the industry sector is a dummy variable in the model that takes a value of 0 or 1 depending on whether the company is in the service or manufacturing segment. This means that in the model I use a dummy variable to measure whether there is a difference between service and manufacturing firms in terms of the change in the issue price of shares, i.e. how the change in the issue price of shares of service firms relates to the change in the share price of manufacturing firms.

A definition of the issue price of shares and each factor variable is given in Table 4.

Table 4: Variables of the regression model

Name of the variable	Definition
Issue price (ISSUEPRICE)	The share price at the subscription stage of the initial public offering transaction, which corresponds to the opening price on the first trading day of that share.
Financial leverage (MONEYCAPITAL)	The ratio of a company's operating profit less depreciation and amortisation to its operating profit less depreciation and amortisation less interest and dividends.
Transaction number (TRANS)	The total number of shares of a company traded per day.
Industry (SERVICE)	A dummy variable with a value of 1 if the firm is in the service sector and 0 if the firm is in manufacturing.
Percentage of non-strategic investors (FREEFLOAT)	The proportion of shares held by non-strategic investors in a company compared to the proportion of total shares of the company.

Source: Own editing

In order to carry out the impact analysis presented above, I set up the following cross-sectional regression model.

$$(1) \quad \Delta \text{ISSUEPRICE} = \beta_0 + \beta_1 (\Delta \text{MONEYCAPITAL}) + \beta_2 (\Delta \text{TRANS}) + \beta_3 (\text{SERVICE}) + \beta_4 (\text{FREEFLOAT})$$

According to the definition above, the issue price of shares of a given company can be easily measured through the opening price of the shares on the first day of trading, however, the measurement of the change in the issue price of shares is a much more complex issue due to secondary market trading, given that the share price, from the first day of trading, is constantly affected by the current demand and supply, and, for this reason, we can observe significant share price movements even on a daily basis. In order to measure the change in the issue price of shares, I calculated the average trading share price of the 15 days before and 15 days after the 30th trading day following the initial public offering transaction. As a result, I believe that possible daily share price fluctuations - if there were any - can be somewhat compensated, thus the large swings in the trading of a given stock can be "smoothed out" to a certain extent. The calculation of the change in the issue price of shares and the change in financial leverage can be seen in the formulas below.

$$(2) \quad \Delta \text{ISSUEPRICE} = \frac{A ((\text{ISSUEPRICE})_{t+15}; (\text{ISSUEPRICE})_{t+16} + \dots + (\text{ISSUEPRICE})_{t+45}) / 30}{(\text{ISSUEPRICE})_t}$$

$$(3) \quad \Delta \text{MONEYCAPITAL} = \frac{\frac{\text{EBIT}_{\text{endofyear}+1}}{(\text{EBIT}_{\text{endofyear}+1} - \text{INTEREST}_{\text{endofyear}+1} - \text{DIVIDEND}_{\text{endofyear}+1}) / (1-t)}}{\frac{\text{EBIT}_{\text{endofyear}}}{(\text{EBIT}_{\text{endofyear}} - \text{INTEREST}_{\text{endofyear}} - \text{DIVIDEND}_{\text{endofyear}}) / (1-t)}}$$

As for the number of transactions, calculation is based on a similar principle to the one applied related to the change in the issue price of shares, i.e. the change in the number of transactions is the total transaction volume of the first trading day following the initial public offering divided by the average daily number of transactions of the 15 trading days preceding the 30th trading day following the initial public offering and that of the 15 trading days following the 30th trading day following the initial public offering.

$$(4) \quad \Delta \text{TRANS} = \frac{(\text{TRANS}_{t+15}; \text{TRANS}_{t+16} + \dots + \text{TRANS}_{t+45}) / 30}{\text{TRANS}_t}$$

Free float, as shown in formula (5), is the ratio of the number of publicly traded shares of a company following the initial public offering transaction to the total number of shares of the company.

$$(5) \quad \text{FREEFLOAT} = \frac{\text{NUMBER OF PUBLICLY TRADED SHARES AFTER IPO}_t}{\text{TOTAL NUMBER OF SHARES}_t}$$

Before examining the results of the regression model defined in equation (1), the most important parameter is to check the prerequisites of the model. The first prerequisite is to check the required sample size of the model. In this case, including a separate dummy for industry activity, I am examining a total of 4 factor variables in the model - therefore, according to the general rule of thumb, the sample should contain at least 20 items. The analysis examines 75 IPO transactions which took place in Poland between 2010 and 2018 as a result of data cleansing, therefore the sample consists of 75 elements instead of the required 20 elements, thus fulfilling the prerequisite regarding the sample size of the model. Descriptive statistics for the model is summarised in Table 5.

Table 5: Descriptive statistics of the regression model (1)

	<i>ΔISSUEPRICE</i>	<i>ΔMONEYCAPITAL</i>	<i>ΔTRANS</i>	<i>FREEFLOAT</i>
Average	-0.0267	-0.0296	-0.0950	0.3100
Standard error	0.0221	0.0583	0.0871	0.0209
Median	-0.0215	-0.0048	-0.2443	0.2942
Standard deviation	0.1915	0.5053	0.7547	0.1811
Minimum	-0.5826	-1.3819	-0.9813	0.0308
Maximum	0.4789	1.5963	4.0000	0.8000
Sample size	75	75	75	75

Source: Own editing

Regarding descriptive statistics, it is important to note that each variable has a nonzero variance, therefore, there are no variables with zero variance in the model. As a result, the variables in the model are interpretable.

With regard to the prerequisites, the next parameter to be tested is the linearity and correlation between the variables. In the dissertation, I examined the linearity of each variable using a point cloud analysis, the results of which clearly showed that for each factor variable, the dispersion of the residuals around the regression line - both negative and positive - is essentially similar and mostly homogeneous, thus satisfying the linearity condition of the regression model (1).

In addition to linearity, the degree of correlation between variables should also be examined. Correlation implies checking the correlation between the dependent variable and the factor variables, as well as the correlation between the individual factor variables (multicollinearity). I tested the correlation using a correlation table, the results of which are shown below.

Table 6: Correlation between the dependent variable and factor variables of the regression model (1)

	<i>ΔISSUEPRICE</i>	<i>ΔMONEYCAPITAL</i>	<i>ΔTRANS</i>	<i>FREEFLOAT</i>	<i>SERVICE</i>
<i>ΔISSUEPRICE</i>	1				
<i>ΔMONEYCAPITAL</i>	0.5977	1			
<i>ΔTRANS</i>	0.5109	0.3869	1		
<i>FREEFLOAT</i>	0.3404	0.0209	0.1611	1	

SERVICE	-0.1943	-0.1768	-0.0082	-0.0529	1
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Source: Own editing

The correlation table clearly shows that there is mostly a strong correlation between the dependent variable and the individual factor variables. Another part of the correlation test between variables is the multicollinearity test. In the dissertation, I used a tolerance value test to check for multicollinearity, which showed a value above 80% for all the examined factor variables in the model (1). Based on this, no multicollinearity existed between the factor variables in the model.

The next regression prerequisite is the homoskedasticity of the residuals of the model. In the case of the multivariate regression model (1), the homoskedasticity principle was also verified by point cloud analysis, where it was clearly shown that the residuals between the measured and estimated variables had similar values, as illustrated by the almost equal dispersion of the residuals around the regression line. As a result, it was found that the principle of homoskedasticity for the residuals of the model was satisfied. In terms of the regression residual, the model also has an additional prerequisite: testing the normal distribution. Normality was tested using histogram analysis, which confirmed the fulfilment of the prerequisite related to the normality of the residuals.

In addition to the normal distribution of the residuals, the examination of the independence of the residuals is also part of the prerequisites of the regression model. The independence of the residuals in the regression model was checked using the Durbin-Watson test. In the case of the regression model (1), the Durbin-Watson test result was 2.1675 - i.e. the Durbin-Watson statistic for the residuals associated with the estimated values of the dependent variable is close to 2 - and hence the independence of the residuals could be established. In this way, the last prerequisite for the regression model was verified, and consequently the testing of the results of the model could begin.

3.3.3. Testing of regression results and hypotheses

As a first step in testing the hypotheses that are the research focus of this dissertation, I tested the "reliability" of the regression models associated with each impact assessment. Consequently, I first examined the statistical value (F value), multiple coefficients of determination (R, R² and corrected R² values) of model (1). The main values for model (1) are summarised in the tables below.

Table 7: Main test values of regression model (1)

R	0.7329
R ²	0.5372
Corrected R ²	0.5107
Standard error	0.1340
Sample size	75

Source: Own editing

Table 8: ANOVA table calculated for the regression model (1)

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>F significance</i>
Regression	4	1.4585	0.3646	20.3112	<0.001
Residual values	70	1.2566	0.0180		
Total	74	2.7151			

Source: Own editing

Based on the tables above, it is clear that the F value of the model is 20.3112 and the corresponding F significance value is close to zero. This suggests that the results of the model are reliable and the probability of the regression model being inappropriate is also close to zero, as indicated clearly by the F significance value.

Further analysing the model, it was also observed that the value of the model R² was 0.5372, while the corrected R² was 0.5107. This means that the model is also reliable with respect to factor variables, as the factor variables included in the model can account for almost 50% of the change in the issue price of shares as a dependent variable. The R-value of the model is 0.7329, which means that there is a strong correlation between the measured and estimated values of the change in the issue price, further strengthening the reliability of the model.

In addition to the values used for the general presentation of the model, in the second round, I examined the results of the regression analysis, which are presented in the table below.

Table 9: The main results of regression analysis (1)

	<i>Coefficient</i>	<i>Standar</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower</i>	<i>Upper</i>	<i>Lower</i>	<i>Upper</i>
	<i>s</i>	<i>d Error</i>			<i>95%</i>	<i>95%</i>	<i>95,0%</i>	<i>95,0%</i>
Constant	-0.0822	0.0388	-2.1185	0.0377	-0.1597	-0.0048	-0.1597	-0.0048
ΔMONEYCAPITA L	0.1762	0.0341	5.1674	<0.001	0.1082	0.2442	0.1082	0.2442
ΔTRANS	0.0724	0.0228	3.1811	0.0022	0.0270	0.1178	0.0270	0.1178
FREEFLOAT	0.2958	0.0874	3.3843	0.0012	0.1215	0.4701	0.1215	0.4701

SERVICE	-0.0377	0.0329	-1.1454	0.2560	-0.1032	0.0279	-0.1032	0.0279
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Source: Own editing

However, looking at the results of the regression model (1), I thought it important to return to the global explanatory power of the model and make some further comments. The R^2 and the corrected R^2 values of the model were 0.5372 and 0.5107, which, in my opinion, were still of good explanatory power, however, in order to increase the analytical value of the dissertation, seeing the results obtained, I felt that it might be necessary to extend the model with additional potential factor variables. In my view, it was necessary mainly because the regression results showed that the p-value of the variable SERVICE was 0.2560 - which means that the presence of the service provider as a dummy in the model was unjustified for the purpose of the study - i.e. the other three factor variables in the model were better able to explain the variability of the dependent variable. Consequently, before attempting to add further factor variables to the regression model, I create the following three-variable regression model to verify the above statement about the variable SERVICE:

$$(6) \quad \Delta \text{ISSUEPRICE} = \beta_0 + \beta_1 (\Delta \text{MONEYCAPITAL}) + \beta_2 (\Delta \text{TRANS}) + \beta_3 (\text{FREEFLOAT})$$

The results of the regression model (6) clearly show that the model's R^2 and corrected R^2 have barely decreased compared to the regression model in equation (1), i.e. despite the removal of one variable from the model, the overall explanatory power of the model has decreased by only 0.87 percentage points. This confirms the possible line of investigation that the results of the trivariate regression model (6) would be more significant without the service provider as a dummy, i.e. that the inclusion of the dummy SERVICE in the model is unnecessary. Consequently, the number of factor variables in regression model (1) was reduced to three, which raised the problem that I considered the change in the issue price to be too complex a dependent variable to base the impact assessment, which is the focus of this thesis, on three factor variables. As a consequence, I added additional factor variables to regression model (6), such as the change in return on equity (ΔROE), the change in equity (ΔEQUITY), the change in dividends paid ($\Delta \text{DIVIDEND}$), the change in operating profit (ΔEBIT) and the change in revenue ($\Delta \text{REVENUE}$).

Based on the above, I created the following eight-variable regression model:

$$(7) \quad \Delta \text{ISSUEPRICE} = \beta_0 + \beta_1 (\Delta \text{MONEYCAPITAL}) + \beta_2 (\Delta \text{TRANS}) + \beta_3 (\text{FREEFLOAT}) + \beta_4 (\Delta \text{ROE}) + \beta_5 (\Delta \text{EQUITY}) + \beta_6 (\Delta \text{DIVIDEND}) + \beta_7 (\Delta \text{EBIT}) + \beta_8 (\Delta \text{REVENUE})$$

where,

$$(8) \quad \Delta \text{ROE} = \frac{\text{ROE}_{\text{endofyear}+1} - \text{ROE}_{\text{endofyear}}}{\text{ROE}_{\text{endofyear}}} - 1$$

Return on equity (ROE) is a measure of a company's performance that relates the company's profit after tax to the value of its equity, i.e. it shows the percentage return on the total net profit generated by the company itself compared to the value of the equity already invested in the company. Consequently, in model (7), the change in the return on equity is based on the closing ROE of the sample companies in the year of the public share offering ($\text{ROE}_{\text{endofyear}}$). I compared this value to the closing ROE of the year after the issue of the shares ($\text{ROE}_{\text{endofyear}+1}$), as illustrated in formula (8).

ROE is calculated using the following formula:

$$(9) \quad \text{ROE}_{\text{endofyear}} = \frac{\text{EARNINGS AFTER TAXES}_{\text{endofyear}}}{\text{EQUITY}_{\text{endofyear}}}$$

where I collected data on profit after taxes, equity as well as dividends using the tools and databases presented in my thesis.

$$(10) \quad \Delta \text{EQUITY} = \frac{\text{EQUITY}_{\text{endofyear}+1} - \text{EQUITY}_{\text{endofyear}}}{\text{EQUITY}_{\text{endofyear}}} - 1$$

The change in equity was calculated in a similar way to the change in ROE using formula (10), where $\text{Equity}_{\text{endofyear}+1}$ is the closing equity value on the balance sheet of the company in the financial year following the initial public offering, while $\text{Equity}_{\text{endofyear}}$ measures the same but in the year of the issue of the share.

The third newly introduced variable is the change in dividends, given that dividends alone are one of the most effective measures of financial return, as dividend payments provide company owners with direct cash, the amount of which they can easily compare with the amount of

capital they have already invested in the company, and thus measure the return on their investment immediately.

The method of calculating the change in dividends is detailed in formula (11):

$$(11) \quad \Delta \text{DIVIDENDK} = \frac{\text{DIVIDEND}_{\text{endofyear}+1}}{\text{DIVIDEND}_{\text{endofyear}}} - 1$$

I have not gone into much detail on how the change in dividend is calculated, since the principle is exactly the same as in formulae (8) and (10), i.e. the change in dividend is nothing more than the ratio of the dividend rate paid by the company at the end of the year following the initial public offering to the dividend rate paid at the end of the year of issue.

Similar to the change in equity capital, the return on equity capital and dividends, I created the calculation method for the change in EBIT and sales revenue, which I will detail below.

$$(12) \quad \Delta \text{EBIT} = \frac{\text{EBIT}_{\text{endofyear}+1}}{\text{EBIT}_{\text{endofyear}}} - 1$$

where,

$$13 \quad \text{EBIT}_{\text{endofyear}} = \text{REVENUE}_{\text{endofyear}} - \text{DIRECT OPERATING EXPENSES}_{\text{endofyear}}$$

A company's operating profit or EBIT shows the company's earnings before paying interest and taxes. In other words, EBIT is actually the difference between the revenue generated by a company and the operating expenses directly related to its operation, i.e. EBIT does not take into account any cost items which are not directly related to sales revenue generation, such as the obligation to pay taxes or interest.

Still examining the profitability of the companies, and based on the formula of the newly introduced factor variables described above, I also calculated the change in revenue according to the same principle, which is the quotient of the amount of revenue generated by a company at the end of the year following the public share offering and the amount of revenue generated at the end of the year of the issue.

The method of calculating the change in revenue is detailed in formula (14):

$$(14) \quad \Delta \text{REVENUE} = \frac{\text{REVENUE}_{\text{endofyear}+1}}{\text{REVENUE}_{\text{endofyear}}} - 1$$

The method for calculating EBIT also reveals to what extent the revenue generated by the company can determine the profitability of the given company. Consequently, the revenue is nothing the value of the products and goods sold by a company, or the services provided, calculated exclusive of VAT, i.e. in the case of every company, the consideration for the products and services sold during the performance period under its contractual relationship has to be reported as net revenue (increased by price subsidies and surcharges, or, where appropriate, reduced by discounts).

In order to conduct the analysis of the model extended with the newly introduced factor variables, it was also necessary to check the prerequisites of the model. However, given that regression model (7) also works from the same database as regression models (1) and (6), I assumed that the regression assumptions examined in the above section were also valid for model (7), and thus started the regression analysis directly.

In this context, the regression results of equation (7) show that, as I had previously expected, the explanatory power of the model increased, which means that the main test values increased compared to model (6) - R^2 from 0.5285 to 0.6537, corrected R^2 from 0.5086 to 0.6117 and R from 0.7270 to 0.8085 - and the significance level for the value F remained close to zero, i.e. it can be claimed that the model results are reliable.

As far as the newly involved factor variables are concerned, it is observable that three of the five factor variables have a p-value below 0.05 (Δ ROE, Δ EQUITY, Δ DIVIDEND), while two very considerably exceed the 0.05 limit (Δ EBIT, Δ REVENUE). Based on the above, the global reliability of the model also requires the inclusion of the aforementioned three significant factor variables, while Δ EBIT and Δ REVENUE can be omitted. As for the three newly included factor variables, all of them have a p-value below 0.05, i.e. they are absolutely significant and their inclusion in the model is necessary. In my view, this may mean that in connection with the Polish market, investors can use an asset-backed corporate approach, i.e. they probably prefer companies with a more stable equity structure and take less into account changes in the income statements of these companies.

Summarizing the results obtained, I believe that the inclusion of the additional factor variables (Δ ROE, Δ EQUITY and Δ DIVIDEND) was definitely a good decision, since, in addition to the significant improvement of the explanatory power of the regression model, the p-value of three of these five factor variables (Δ ROE, Δ EQUITY, Δ DIVIDEND) became highly significant, which justified their inclusion in the model not only from an economic but also from a statistical point of view. This also means that a six-variable model which no longer includes the factor variables Δ EBIT and Δ PRICE INCOME would be more suitable for explaining the

change in the issue price of shares. Consequently, taking into account the results of the regression model (7), I considered it necessary to create a six-variable regression model in which only the newly entered and individually significant factor variables were included.

In view of the above, I created the following six-variable model:

$$(15) \quad \Delta \text{ISSUEPRICE} = \beta_0 + \beta_1 (\Delta \text{MONEYCAPITAL}) + \beta_2 (\Delta \text{TRANS}) + \beta_3 (\text{FREEFLOAT}) + \beta_4 (\Delta \text{ROE}) + \beta_5 (\Delta \text{EQUITY}) + \beta_6 (\Delta \text{DIVIDEND})$$

where, the definition of the individual factor variables included in the model is completely the same as that of the factor variables included in the regression model (7), therefore I will not describe them one by one again. Furthermore, based on the same principle, similarly to model (7), I do not test the regression prerequisites individually, since neither the sample, nor the relationship between the individual factor variables has changed. Therefore, based on the verification methodology introduced above, I accept the fulfilment of the regression prerequisites.

Based on the regression results of model (15) set up with the methodology above, it is clearly visible that, in accordance with my assumption presented above, the explanatory power of the model has hardly decreased, in spite of the fact that even two factor variables were taken out from the regression model (7). Moreover, compared to model (7), the main test values decreased only slightly - R^2 from 0.6537 to 0.6399, corrected R^2 from 0.6117 to 0.6082 and R from 0.8085 to 0.8000 - and the significance level for the value F remained close to zero, i.e. it could be claimed that the results of the model were reliable. However, in the light of the results of the received model (15), an idea came to my mind: when examining the results of model (7), one of my assumptions was that the change in revenue and EBIT might have had no effect on the change in the issue price of shares in Poland, because the investors might have rather applied a valuation approach based on balance sheet and source data instead of an approach based exclusively on profit and income statement. Consequently, I asked whether another crucial balance sheet element could have an impact on the change in the issue price of share, therefore I re-examined the balance sheet statements of the individual companies in the sample and realised that the companies had a significant volume of assets in some respects. Therefore, on the basis of model (15), I set up a 7-variable model, which already included the change in the company's asset portfolio as a factor variable. This regression model is entirely

based on model (15). The only difference is that I examine the change of the asset portfolio in it.

As a result, I created the following regression model for the examination of the effect of the company's asset portfolio:

$$(16) \quad \Delta \text{ISSUEPRICE} = \beta_0 + \beta_1 (\Delta \text{MONEYCAPITAL}) + \beta_2 (\Delta \text{TRANS}) + \beta_3 (\text{FREEFLOAT}) + \beta_4 (\Delta \text{ROE}) + \beta_5 (\Delta \text{EQUITY}) + \beta_6 (\Delta \text{DIVIDEND}) + \beta_7 (\Delta \text{ASSET})$$

where, ΔASSET factor variable refers to the change in the company's asset portfolio. Based on a similar principle applied for other factor variables in model (15), the calculation of ΔASSET is shown by the following formula:

$$17 \quad \Delta \text{ASSET} = \frac{\text{ASSET}_{\text{endofyear}+1}}{\text{ASSET}_{\text{endofyear}}} - 1$$

where,

$$18 \quad \text{ASSET}_{\text{endofyear}} = \text{FIXED ASSETS}_{\text{endofyear}} + \text{CURRENT ASSETS}_{\text{endofyear}} + \text{ACCRUED ASSETS}_{\text{endofyear}}$$

Based on the definition above, it is clear that a company's asset portfolio is the amount of the company's fixed assets, current assets and accrued assets. In view of the above, from a company's point of view, total assets can be an important indicator because they include all the resources under a company's direct control which can⁵ provide some future economic advantages to the company. On the whole, it can be claimed that a company's assets contain key resources in terms of the company's cash generation, therefore I assume that a change in the assets can affect the change in the issue price of shares. In order to examine the above assumption, I use the regression analysis mentioned and described above. Of course, in the case of model (16), I also believe that it is important to mention that the fulfilment of the regression prerequisites was considered a given in this case as well, considering that model

⁵ For example, such economic benefits include, the situation when a trading company purchases goods, which after the purchase increases the value of the company's stock, however, they will generate revenue for the given company if sold in the future, and, in this manner, the company is able to turn the given asset (resource) into a cash-generating tool.

(16) was set up on the basis of the previously examined regression models and, in this way, I did not find any influencing parameters, which would have made me presume that the regression prerequisites would not be fulfilled for whatever reason.

In fact, the results of model (16) showed that my assumption regarding the relationship between the change in a company's asset portfolio and the change in the issue price of shares presented above was incorrect and the inclusion of factor variable $\Delta ASSET$ in model (16) was unjustified. This was mainly indicated by the fact that the explanatory power of model (16) was almost not really strengthened in spite of the fact that I added an extra factor variable compared to regression model (15), and even the value of the corrected R^2 dropped slightly. The aforementioned assumption was further supported by the fact that, based on the regression results, the p-value of $\Delta ASSET$ was extremely high (0.7054). However, I considered the result to be interesting, as, based on the above definitions and assumptions, I believed that a change in the company's asset portfolio would affect the change in the issue price of shares. In order to interpret the result, I re-examined the individual company data in the research sample, and I stated that, in the case of certain companies, after the issue of shares, significant asset investments and purchases which could have had a distorting effects on the results were observable. The aforementioned distorting effect was well-illustrated by the fact that the value of the asset portfolio of the examined companies showed a growth of 37% on average, however, the median value of the change in the asset portfolio was only 5%. Based on the above, I concluded that basically the low correlation between the change in the asset portfolio and the change in the issue price of shares and the lack of significance in the examined Polish market could have been affected by the low level of asset-backed investments of the companies after their IPO transactions.

Consequently, based on the results of the obtained model (16), I believed that the model (15) was the most suitable for studying the change in the issue price of shares during the Polish IPO transactions taking place in the examined period, i.e. the factors which have the greatest influence on the change in the issue price of shares are the factor variables of regression model (15).. In view of the above, I drew the conclusion that I would base the examination of the hypotheses of my dissertation on the results of model (15), as it gave the most significant results in both economic and statistical terms among all the studied models and variables.

As a result, I examined regression model (15) more closely, in context, including the weak correlation observable between the individual factor variables (0.3869 between $\Delta MONEYCAPITAL$ and $\Delta TRANS$, 0.1648 between $\Delta MONEYCAPITAL$ and ΔROE , 0.1611 between $FREEFLOAT$ and $\Delta TRANS$, and -0.1750 between ΔROE and $\Delta EQUITY$). This

correlation is basically negligible - which is why the issue of multicollinearity did not arise during the examination of the regression prerequisites - but I found it interesting from an economic point of view, since the existence of this weak correlation raised the question whether there might be a factor variable or might be factor variables which could explain the change in the issue price in a more complex way. In order to find out the answer to this question, I used factor analysis. Factor analysis requires a correlation between the variables included, but it is important to note that in this dissertation I did not perform factor analysis as a necessary element to prove or reject hypotheses, but mainly to gain a more comprehensive understanding of the dissertation results. As part of this, I wanted to examine if any correlations could be found between the factor variables under study, which would further help in interpreting and understanding the results. In order to determine how many factors can be constructed from the factor variables in model (15), I used an eigenvalue-based determination in the factor analysis, as I considered this method more measurable and reliable given the complexity of the model as already presented.

The results of the factor analysis showed a medium fit (based on the KMO value) and level of significance based on the Bartlett's test of sphericity, i.e. it was found that the variables under study are correlated. The next step in the analysis was the selection of the ideal factor number, where the results showed that the ideal factor number was 2, i.e. I was able to establish a total of 2 new qualitative variables or factors from the factor variables under examination. Factor names were determined based on the "properties" of the associated factor variables. With regard to the first factor, it could be stated that it encapsulated factor variables such as Δ MONEYCAPITAL, Δ TRANS and FREEFLOAT, i.e. it carried the properties of these variables. A closer look at these factor variables reveals that they are sensitive and exposed to the current momentum of share turnover - since liquid share turnover is based on higher free float and a higher number of transactions, as well as higher financial leverage, as a lot of capital and funding is needed to realize the continuous growth expectations of investors. Therefore, I have summarized this factor as *growth share strategy*. In contrast to the first factor, the second factor included factor variables such as Δ ROE, Δ EQUITY and Δ DIVIDEND, which are all indicators of long-term corporate money-generating capacity and stability, since in a company, stable ROE and equity values are among the key indicators of long-term shareholder equity growth, while dividend is a key indicator of long-term cash-flow generating capacity, therefore I have summarized Factor 2 as *return-generating share strategy*.

Seeing the outcome of the regression analysis, I thought that the factor analysis yielded fully valuable results for the research focus of my dissertation. Based on the results obtained, I also

wondered whether, regarding the change in the issue price in Poland in the examined period, any conclusions could be drawn about which investment strategy that had the greatest impact on the change in the issue price, i.e. which option investors prefer: if a newly listed company offers a growth share strategy or a return-generating share strategy?

I investigated this issue using a correlation matrix between the change in the issue price of shares and the return-generating and growth share strategy variables, which suggested that, in general, those companies that offered an investment story primarily based on a growth strategy among the companies listed in the period 2010-2018, taking into account the underlying financial indicators of each company that I examined in the regression analysis, were able to realize higher share price changes in the post-IPO period. In contrast, companies whose investment story was built around a long-term return generation strategy were in a much less favourable position and saw their share prices move less favourably in the post-public offering period.

In view of the research findings above, I conducted a test of the hypotheses of the dissertation.

Hypothesis 1: Growth in financial leverage negatively affects the change in the issue price of shares related to a company's initial public offering in Poland.

The results of model (15) also suggest that if the change in the financial leverage of a firm increases by 1 percentage point, the change in the IPO transaction's issue price increases by approximately 15 percentage points. This means that, firstly, there is a positive relationship between the change in the issue price of shares and the change in financial leverage, i.e. if the change in financial leverage increases, the change in the issue price of shares also increases or vice versa. In fact, what is particularly interesting based on the results obtained is that this result contradicts the theoretical approach in financial literature, which suggests that excessive financial leverage can be very dangerous for the operation of a company and therefore, in certain strategic situations, it may be advisable to replace financial leverage with operating leverage, if possible (Mandelker and Rhee, 1984, Kahl et al., 2019). Consequently, I calculated the change in the average level of indebtedness for each company for IPO transactions between 2010 and 2018, which showed that the average interest/EBIT value of the sample companies decreased from 0.72 to 0.64 in the year following the IPO. Therefore, the sample companies were not over-indebted but rather optimised their capital structure, which may have been driven by the growth objectives mentioned above. As a result, it was clear from the regression results obtained that the p-value of Δ MONEYCAPITAL was close to zero, which means that the

change in financial leverage is highly significant, and thus its inclusion in the model is justified. *Consequently, and based on the analytical results presented, it can be concluded that, contrary to Hypothesis 1, there is a strongly significant positive relationship between the change in the issue price and the change in financial leverage.*

The second hypothesis of the dissertation assumes a positive relationship between the change in the issue price of shares and the change in the number of share trading transactions in Poland. The hypothesis was formulated as follows:

Hypothesis 2: An increase in the change in the number of share trading transactions has a positive influence on the change in the share price following an initial public offering in Poland.

My aim was to measure the change in the information asymmetry between investors and the owners and managers of companies, in terms of the number of share trading transactions. Based on the above, I assumed that an increase in the number of trading transactions of a share primarily reflected the appearance of new investors and their willingness to buy, which was the result of increased transparency in the company's operations and growth, which was ultimately a consequence of the market information provided by the company, i.e. a consequence of the decrease in information asymmetry itself.

The results of the regression analysis defined in regression equation (15) showed that there was a positive relationship between the change in the issue price of shares and the change in the number of trading transactions, and the p-value of ΔTRANS was also well below 0.05, thus the inclusion of ΔTRANS in the model was justified. Furthermore, based on the regression coefficient of the change in the number of trading transactions, it was verified that if the change in the number of share trading transactions increases by 1 percentage point, the change in the share price after the initial public offering increases by a little over 7 percentage points.

Based on the regression results obtained, I conclude that the change in the number of transactions, as a measure of the change in information asymmetry, has a positive effect on the change in the post-issuance share price, i.e., I hypothesize that the change in information asymmetry has an effect, even if indirectly, on the change in the post-issuance share price. *Therefore, Hypothesis 2, according to which there is a positive relationship between the change in the issue price of shares and the change in the number of share trading transactions, is confirmed by the regression model results.*

The third hypothesis of the paper examines the degree of under-pricing across different types of the corporate sector, i.e. the relationship between the scope of activity of each company and the change in the issue price of shares. The hypothesis is as follows:

Hypothesis 3: The underpricing of shares in the initial public offerings of companies in the Polish services sector is higher than the underpricing of the issue price of shares in the Polish manufacturing sector.

My hypothesis was based on the assumption that service companies face lower share underpricing than manufacturing companies following an IPO, i.e. the change in the issue price of shares of manufacturing companies is lower than that of service companies.

In the relevant analytical part of this thesis, I showed in detail by setting up regression model (6) that the inclusion of the variable SERVICE in the regression model was not justified and that the other three factor variables in the model (Δ MONEYCAPITAL, Δ TRANS and FREEFLOAT) were better able to explain the variation of the dependent variable. Consequently, I created the regression model (6) mentioned above, ignoring the dummy SERVICE. The resulting trivariate regression model showed very strong significance not only at the level of the model, but also for the individual factor variables. Consequently, based on the regression results obtained, I concluded that the industrial or sectoral distribution of a given company - i.e. whether a company operated in the service or manufacturing segment - had no effect on the change in the issue price of shares, therefore, my assumption, according to which service companies faced lower share under-pricing after initial public offering than manufacturing companies in Poland, was not supported. *In the light of the above, it can be stated that the assumption of Hypothesis 3 is not supported by the results of the relevant regression model.*

The fourth hypothesis examines the relationship between changes in the issue price of shares and the proportion of non-strategic investors. The hypothesis is the following:

Hypothesis 4: There is a negative relationship between the share of non-strategic investors in a company and the change in the issue price of the company's initial public offering in Poland.

In testing the hypothesis, I relied on the regression model defined in equation (15), similar to the cases of the previous hypotheses, given that the model's results were highly significant both globally and at the level of individual factor variables.

For the analysis of the present hypothesis, I studied the relationship between the variables FREEFLOAT and Δ ISSUEPRICE. Based on the results of regression model (15), there is a positive relationship between the change in the issue price of shares and the free float ratio. Moreover, the p-value of the FREEFLOAT factor variable is below 0.001, which means that the inclusion of the FREEFLOAT factor variable in the model is also expressly justified. The regression coefficient of the FREEFLOAT for regression model (15) is 0.2897, which means that if the free float ratio of a company increases by 1 percentage point, the change in the issue price of shares of the company increases by more than 30 percentage points. It was clearly visible that the direction of the relationship was different from the direction of the relationship I had assumed, and the change of slightly more than 30 percentage points between the free float ratio and the change in the issue price of shares seemed to be a fairly high number.

In my view, the vast majority of a company's share trading transactions in Poland are made on behalf of institutional investors, which is mostly due to the valuation difference between strategic and non-strategic investors. This also means that the valuation uncertainty around the issue price of shares in an initial public offering transaction is much higher given that the company does not yet have historical data on share trading. Consequently, following an IPO, institutional investors at the "top" of the secondary market may have a more positive valuation attitude towards shares. Consequently, they have a higher willingness to trade shares in the first period following the IPO, which may lead to a higher change in the issue price of shares.

Based on the regression results, I believe that the difference in pricing opinions between strategic and non-strategic (institutional) investors of individual companies illustrates the significant positive relationship between the free float ratio and the change in the issue price of shares in Poland, which suggests that the hypothesis that there is a negative relationship between the free float ratio and the change in the issue price of shares is not supported.

4. Future directions for research

Based on the findings of my dissertation, my future research will be aimed at a more extensive study of the factors influencing initial public offering markets. As a result, my long-term goal is to broaden my research area and focus to explore not only the factors influencing the change in the issue price of shares but also the potential corporate decision-making mechanisms behind IPOs, with a focus on the V4 countries, especially Hungary. In the future, I would like to put more and more emphasis on the study of the Hungarian IPO market, mainly because Hungary has the second lowest market capitalisation to GDP ratio after Slovakia among the V4 countries

(in December 2020, Hungary's market capitalisation to GDP ratio was 16.7%, while the combined market capitalisation to GDP ratio of Poland and the EU Member States was 46.1% and 54.6% respectively). A well-diversified Hungarian capital market is necessary not only for the healthy functioning of the economy, but also for reducing bank indebtedness in the corporate sector and ensuring the stability of its capital structure. In recent years, a number of stock exchange development policies have been adopted in Hungary, but their impact on capital market activity is still less visible, despite the fact that these policies are now targeting small and medium-sized enterprises as well as large Hungarian companies. As a result, I believe that in the near future the number of IPOs may increase, providing me with an additional opportunity to examine the Hungarian capital market on a wider scale.

A priority for future research is to gather further comparative analyses and quantitative data that will further our understanding of the characteristics and mechanisms of the stock market presented so far. My data collection will be further supported mainly by international and domestic databases (Mergermarket, IMF, ECB, MNB) and case studies analysing other major share issues. For the purpose of research, it could also be interesting to conduct financial interviews with some Hungarian corporate decision-makers in order to gain a deeper understanding of future capital market expectations from the corporate side. For exploring the aforementioned capital market mechanisms, I would consider it a good starting point to examine whether an SME stock exchange, set up by a group of SMEs with a strong brand name and reputation, could be an effective alternative to finance the future growth of companies and thus increase secondary market trading in the stock market, given that most of the players in the Hungarian corporate sector are SMEs.

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Welch, I. (1989) Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings. *Journal of Finance*, 44(2), pp. 421–449.

6. Related publications by the author

Chapters in academic books, volumes of studies

The liquidity of the Hungarian and Czech stock markets – main drivers and motivations of going public?

Monetarizmus - a 2008-as pénzügyi válság előfutára? (Monetarism - A precursor to the 2008 financial crisis?)

Journal publications, articles

A kockázati tőkealapok befektetéseinek hatása a tőzsdére bevezetett portfólió cégek felvásárlási aktivitására (The impact of the investments of venture capital funds on the acquisition activity of their listed portfolio companies)

Egy hatékony pre-IPO vállalati controllingrendszer kialakításának főbb paraméterei (Key parameters for the establishment of an effective pre-IPO corporate controlling system)

Conference papers

Could a Keynesian economic policy be a potential solution to overcome the coronavirus crisis in Hungary?

Does IPO underpricing compensate for lower stock liquidity in Hungary?

Megvalósítható és elérhető egy optimálisan működő, fejlett hazai tőkepiac? (Is an optimally functioning, developed domestic capital market feasible and achievable?)

Az elsődleges részvények árazása – melyek lehetnek a leghatékonyabb árazási módszerek? (Pricing of primary shares - what could be the most effective pricing methods?)