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Asymmetric information in IPO underpricing — literature review

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Abstract: Market anomalies after initial public offerings are a subject of extensive scientific research. One of such anomalies is underpricing, which refers to an increase of stock price in relation to the offering price shortly after stock issue. The occurrence of underpricing has been verified in many markets; however, the reasons for this phenomenon have not been yet conclusively established. The existence of information asymmetry in the capital market is one of the most popular assumptions applied in the studies in an attempt to explain the reasons why issuers discount the price of their offers. The purpose of this paper is to present the explanatory underpricing theories which are based on the asymmetry of information present between market participants, and to summarize the explanatory variables of underpricing that stem from the theory.

Asymetria informacji w zjawisku underpricingu — przegląd literatury

Abstrakt: Anomalie rynkowe występujące po pierwszych ofertach publicznych są przedmiotem wielu badań naukowych. Jedną z takich anomalii jest *underpricing*, który odnosi się do wzrostu ceny akcji w stosunku do ceny ofertowej, krótko po emisji. Występowanie underpricingu zweryfikowano na wielu rynkach, jednak przyczyny tego zjawiska nie zostały jeszcze ostatecznie ustalone. Istnienie asymetrii informacji na rynku kapitałowym jest jednym z najpopularniejszych założeń przyjmowanych w badaniach próbujących wyjaśnić przyczyny dyskontowania ofert przez emitentów. Celem niniejszego artykułu jest przedstawienie teorii wyjaśniających *underpricing*, które opierają się na asymetrii informacji występującej między uczestnikami rynku, oraz podsumowanie zmiennych objaśniających *underpricing*, wynikających z teorii.

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Introduction

Roger G. Ibbotson¹ shed a light on the price behaviour of issuers conducting initial public offering (IPO). The author, basing on 120 instances from the U.S. market that took place in the 1960s, confirmed that average one-day returns when investing in IPO amounted to 11.4% (after adjusting for market risk). Positive initial returns and efficiency of the secondary market showed that stocks of debuting firms are on average underpriced, which means that the market price at the end of the first day after debut increased in relation to the offer price set by the issuer. Ibbotson's work boosted the interest of the academic environment in underpricing and since then, this market anomaly became a popular topic of analyses. The underpricing phenomenon has been confirmed on many markets, and the issuers and investors are aware of these bizarre price reactions. On the one hand, issuers may try to raise more capital than they require or change the parameters of the offer, while investors will focus on a short-term investment and omit obtaining stocks for a more extended period of time. Both sides will want to exploit the anomaly. On the other hand, from the perspective of advisers, there may be a conflict of interest. There is also the problem of information asymmetry between the parties participating in IPO. Therefore, the identification of the causes of underpricing is crucial to help reducing information asymmetry that occurs between market participants.

There is an extensive amount of international research that concentrates on the formation of prices shortly after market debut. J.R. Ritter,² based on a sample of over 13 thousand issuers from the American market, confirmed that average initial return in years 1960–2019 was 16.9%. P. Pomykalski and P. Filipiak³ examined 349 IPOs from Warsaw Stock Exchange that took place between 2005–2016. The underpricing in the Polish market was on average 12.35%, and 11.84% when adjusting for the market return. Based on the data from the Italian market, D. Dell'Acqua, L.L. Etroa, E. Teti, and M. Murri⁴ also confirmed the presence of underpricing. Their sample consisted of 129 issuers from years 2001–2012. The first-day return based on this data was on average equal to 6.52%. A. Ljungqvist⁵ analysed the German IPO market. In the sample he included 180 firms that joined the market between 1970–1993. The average return for the sample was 9.2%.

¹ R.G. Ibbotson, "Price performance of common stock new issues", *Journal of Financial Economics* 2, 1975, no. 3, pp. 235–272.

² J.R. Ritter, "Initial Public Offerings: Underpricing", 2020 https://site.warrington.ufl.edu/ritter/files/IPOs2019_Underpricing.pdf (access: 18.01.2021).

³ P. Pomykalski, P. Filipiak, "Factors influencing IPO underpricing in Poland", *Folia Oeconomica Acta Universitatis Lodziensis* 4, 2020, no. 349, pp. 7–21.

⁴ D. Dell'Acqua et al., "IPO underpricing and aftermarket performance in Italy", *Journal of Economic & Financial Studies* 3, 2015, no. 3, pp. 1–14.

⁵ A. Ljungqvist, "Pricing initial public offerings: Further evidence from Germany", *European Economic Review* 41, 1997, no. 7, pp. 1309–1320.

Based on the sample of 266 IPOs conducted between 1976–1989, P.J. Lee, S.L. Taylor, and T.S. Walter⁶ showed that initial return on the Australian Stock Exchange was on average 16.4%. J. Coakley, A. Hadass, and L. Wood⁷ based their research on the 591 issuers from the London Stock Exchange that conducted IPO between 1985–2003. The results showed that first-day return in the UK market was 10.5% on average.

Numerous researchers attempted to find a reason for underpricing. A. Ljungqvist⁸ divided the theories explaining the presented problem into four groups — theories related to institutional factors, ownership, behavioural aspects, and information asymmetry.

Institutional theories relate to issues of taxation, legislation, and price stabilisation activities of an underwriter. Ownership theory is based on the assumption that underpricing is used as a means to retain control by managers. An underlying assumption of behavioural theories is that behaviour of investors obtaining shares in IPO is irrational, resulting in overoptimistic market valuation in relation to the true value on the first day after company's market debut. The foundation of the group of information asymmetry theories is based on the premise that one of the parties involved in the IPO transaction has an information advantage over other transaction participants. The information asymmetry highlights the problem of adverse selection and moral hazard that can be exploited by insiders.

The aim of the paper is to present theories that explain underpricing. It concentrates on a group of theories based on the asymmetry of information. When conducting empirical research to verify reasons for short-term price reactions of issuing companies, it is necessary to identify the factors influencing rates of return corresponding to a given explanatory theory. Therefore, the other aim of the article is to include the summary of such measures used in the literature concerning the subject of underpricing, which can be further applied in statistical models to verify its presence.

The remainder of the article explains selected theories and presents the mechanisms of how information asymmetry translates into investor behaviour.

1. Information asymmetry theories

1.1. Winner's curse theory

The very first attempt to explain the reasons for underpricing has been made by K. Rock.⁹ His theory is based on the assumption that there are two types of

⁶ P.J. Lee et al., "Australian IPO pricing in the short and long run", *Journal of Banking & Finance* 20, 1996, no. 7, pp. 1189–1210.

⁷ J. Coakley et al., "UK IPO underpricing and venture capitalists", *The European Journal of Finance* 15, 2009, no. 4, pp. 421–435.

⁸ A. Ljungqvist, "IPO Underpricing", [in:] *Handbook of Corporate Finance: Empirical Corporate Finance*, vol. 1, ed. B.E. Eckbo, Amsterdam 2007.

⁹ K. Rock, "Why new issues are underpriced", *Journal of Financial Economics* 15, 1986, no. 1–2, pp. 187–212.

investors. The first group consists of informed investors, i.e. the ones with superior information regarding the true value of the offering, and the other group contains uninformed investors. On the one hand, Rock states that better-informed investors only take advantage of profitable trading opportunities and invest in attractive, underpriced offers. On the other hand, uninformed investors participate in both underpriced and overpriced offers. Therefore, uninformed investors compete for better-quality offers with informed investors; however, in the case of inferior offers, the likelihood of acquiring all shares for which they have subscribed increases due to low demand from insiders. The shares are being rationed by underwriters in case of excess demand, thus in line with Rock's theory, uninformed investors become victims of adverse selection (or so-called winner's curse) as they are largely awarded overpriced shares, but only a part of what they bid for in the case of underpriced ones.

Due to this bias in allocation, the investors may get discouraged from further investments, so only equally informed investors will remain in the market, which may be insufficient to cover the capital needs of issuing company. Rock states that in order to attract uninformed investors, issuers are forced to discount their offers. This will not eliminate the allocation bias entirely but will result in uninformed investors not suffering losses when weighting initial return for the allocation rate. As a result, when adjusting for rationing, the return of uninformed investors should be on average equal to a risk-free rate. According to the winner's curse theory, when looking at the IPO market as a whole, underpricing is necessary to ensure the demand for new issues. However, from the point of view of an individual issuer, underpricing creates costs that the company may want to avoid. Thus, such issuers may attempt to free-ride by discounting the offering less than necessary.

Yet, R.P. Beatty and J.R. Ritter¹⁰ stated that underwriters must be careful to set the offer price at the appropriate level in order not to lose potential issuers if they underprice too much, or potential investors in case the discount is not big enough.

In the case of a fixed price offer, a single price is set for the entire stock series. Investors interested in subscribing for shares make subscriptions, and at the end of the IPO date the shares are assigned to investors. When oversubscription occurs, underwriters allocate shares to subscribers, usually in an equal proportion to the number of shares they wanted to obtain. The research aimed at verifying the winner's curse theory mainly takes into account the impact of the allocation rate on the level of underpricing. According to the theory, when an issue is underpriced, the demand is higher as both uninformed and informed investors subscribe for shares. In the case of oversubscription, high demand translates to lower allocation rate. At the same time, when the offer is unsuccessful and only uninformed investors are interested in obtaining the shares, the level of allocated securities in relation

¹⁰ R.P. Beatty, J.R. Ritter, "Investment banking, reputation, and the underpricing of initial public offerings", *Journal of Financial Economics* 15, 1986, no. 1–2, pp. 213–232.

to the number of shares that given investor subscribed for is high. It has been said that such investors are cursed for obtaining an overpriced issue. Therefore, in line with the theory, the allocation rate is negatively related to underpricing.

The theory based on the allocation rate was confirmed in many studies, for example in the UK (M. Levis¹¹), Singapore (F. Koh and T. Walter¹²), Finland (M. Keloharju¹³), Malaysia (R.A. Rahim, N.A.C. Embi and O. Yong¹⁴), Israel (Y. Amihuda, S. Hauser and A. Kirsh¹⁵) and China (T. Yu and Y.K. Tse¹⁶). However, such research is not possible to carry out on all markets, as in some countries (such as the United States) allocation methods adopted by underwriters are not available to the public and the process may even vary across subscribers.

Another analysed factor is the involvement of private placements, being a proxy of institutional investors' participation in the IPO. The negative correlation between private placements and initial returns indicates that it makes uninformed investors more likely to pay higher offer prices and obtain lower initial returns when institutional investors participate in the IPO.¹⁷

According to the analysis of D.K. Lin, L. Kao, and A. Chen,¹⁸ in the Thai market investors have the option to withdraw from the allocation after they know how many shares have been assigned to them. The positive relationship between the allocation level and the withdrawal rate shows that investors can assess whether the investment will be profitable for them based on the allocation rate. Therefore uninformed winners may withdraw from an unfavourable investment to avoid the winner's curse.

1.2. Signalling theory

The signalling theory is based on the assumption that the issuer has the information advantage in the market about a firm's prospects and is able to assess whether the offer price is in line with its true value. In line with influential theoretical models on signalling theory by F. Allen and G.R. Faulhaber,¹⁹ M. Grinblatt

¹¹ M. Levis, "The Winner's Curse Problem, Interest Costs and the Underpricing of Initial Public Offerings", *The Economic Journal* 100, 1990, no. 399, pp. 76–89.

¹² F. Koh, T. Walter, "A direct test of Rock's model of the pricing of unseasoned issues", *Journal of Financial Economics* 23, 1989, no. 2, pp. 251–272.

¹³ M. Keloharju, "The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland", *Journal of Financial Economics* 34, 1993, no. 2, pp. 251–277.

¹⁴ R.A. Rahim et al., "Winner's curse and IPO initial performance: new evidence from Malaysia", *International journal of business and management studies* 4, 2012, no. 2, pp. 151–159.

¹⁵ Y. Amihuda et al., "Allocations, adverse selection, and cascades in IPOs: Evidence from the Tel Aviv Stock Exchange", *Journal of Financial Economics* 68, 2003, no. 1, pp. 137–158.

¹⁶ T. Yu, Y.K. Tse, "An Empirical Examination of IPO Underpricing in the Chinese A-Share Market", *China Economic Review* 17, 2003, no. 4, pp. 363–382.

¹⁷ R.A. Rahim et al., op. cit., pp. 151–159.

¹⁸ D.K. Lin et al., "Winner's Curse in Initial Public Offering Subscriptions with Investors' Withdrawal Option", *Asia-Pacific Journal of Financial Studies* 39, 2010, no. 1, pp. 3–27.

¹⁹ F. Allen, G.R. Faulhaber, "Signalling by underpricing in the IPO market", *Journal of Financial Economics* 23, 1989, no. 2, pp. 303–323.

and C.Y. Hwang,²⁰ and I. Welch,²¹ underpricing is used to send signals to the market regarding the quality of issuing firms. By purposely setting an offer price below the intrinsic value, the company agrees to “leave the money on the table” being the loss to the initial owners caused by underpricing as in the case the shares had been sold not at the offer price, but at the market price from the first day after IPO, the proceeds to the issuer would be higher. However, when the market price is established in the secondary market (and the true quality of issuers is discovered by investors), it can be expected that the stock price of high-quality issuers will increase. Therefore, such issuers can reimburse the losses through selling securities in subsequent seasoned equity offerings on more favourable terms. As issuers compete for capital, better-quality companies are motivated to distinguish themselves from the inferior entities. Thus, in line with the theory, underpricing is a desired phenomenon amongst issuers that want to “leave a good taste in investors’ mouths so that future underwritings from the same issuer could be sold at attractive prices”.²²

If the low-quality firms would like to imitate the better ones, they would have to bear the costs of signalling, risking that the true value may be discovered by investors in the future, and therefore such a firm may not be able to recoup the incurred costs of imitation. As the marginal cost of signalling is higher for low-quality issuers, investors are able to recognise the quality of the firm based on a level of underpricing.

Source literature distinguishes many factors that reflect the quality of the issuing company. A theoretical model was created by H.E. Leland and D.H. Pyle²³ where the final value of a project is a function of capital retained by owners seeking financing. Leaving more shares in the insiders’ portfolios is perceived by potential investors as a signal of confidence in the project, as owners bear a greater risk in the event of failure when they invest more capital into the undertaking. Therefore, according to the model, the higher the ownership retention rate, the higher the quality of the project. In their research H.C. Chen, C.J. Jhou, and H.C. Yeh²⁴ singled out the level of retained share capital by underwriters introducing the issuer’s shares to the market.

The model of Leland and Pyle was extended by M. Grinblatt and C.Y. Hwang²⁵ with an additional factor since, according to the authors, a single-factor ownership retention model includes the assumption that in such a case investors are able to

²⁰ M. Grinblatt, C.Y. Hwang, “Signalling and the pricing of new issues”, *The Journal of Finance* 44, 1989, no. 2, pp. 393–420.

²¹ I. Welch, “Seasoned offerings, imitation costs, and the underpricing of initial public offerings”, *The Journal of Finance* 44, 1989, no. 2, pp. 421–449.

²² R.G. Ibbotson, op. cit., pp. 264.

²³ H.E. Leland, D.H. Pyle, “Informational Asymmetries, Financial Structure, and Financial Intermediation”, *The Journal of Finance* 32, 1977, no. 2, pp. 371–387.

²⁴ H.C. Chen et al., “Signalling by underwriter retention rate in the IPO market”, *Applied Economics* 39, 2007, no. 15, pp. 1973–1983.

²⁵ M. Grinblatt, C.Y. Hwang, op. cit., pp. 393–420.

observe variance of a project's cash flows. Grinblatt and Hwang assumed in their research that both — mean and variance of cash flows are unknown. Therefore, in addition to the retained fraction of ownership used as a signal about the true value of the firm, they also included in the model an offering price that signals the variance of a firm's cash flows. The model implies that both factors are positively related to underpricing.

The assumption of F. Allen and G.R. Faulhaber²⁶ is that low-quality issuers are less likely to generate high cash flows and, subsequently, it is less likely that they will pay out high dividends. Therefore, investors perceive high dividends paid out by underpriced firms more positively than in the case of firms that issue equity with a low initial return.

One of the widely analysed groups of factors used to measure the quality of a company are the advisers supporting the issuer. It is assumed that more reputable underwriters and auditors are more credible and cooperate with less risky entities in order not to risk damaging their reputation. Therefore, according to the signalling theory, hiring high-quality advisers indicates better issuer quality. In order to determine the quality of an entity, the entire activity of the company is usually assessed, not only its IPO activities. The researchers most often use the Big-5 (formerly Big-8) companies as proxy of reputable advisers. Board members' reputation is also a subject of research, proxied by a number of independent non-executive directors in a director position (A. Albada, O. Yong, R. Abdul-Rahim and M.E. Hassan²⁷).

Signalling theory assumes that issuers who intentionally underprice their offer raise capital on better terms through secondary offerings. Therefore, factors related to the issuing activity after the company's market debut are also analysed. It is assumed that, in line with the signalling theory, more heavily underpriced firms will issue a higher number of secondary offerings, the capital will be obtained more promptly since the IPO and issuers raise more capital than less underpriced firms (J. Chi and C. Padgett;²⁸ N. Naifar;²⁹ A. Cornanic and J. Novak;³⁰ N. Jegadeesh, M. Weinstein, and I. Welch³¹). Other factors signalling the quality of the issuer that appear in empirical research include the lock-up period (A. Albada,

²⁶ F. Allen, G.R. Faulhaber, op. cit., pp. 303–323.

²⁷ A. Albada et al., “Information Asymmetry and Signalling in Emerging IPO Markets: The Case of Malaysia”, *Asian Journal of Business and Accounting* 12, 2019, no. 2, pp. 1–28.

²⁸ J. Chi, C. Padgett, “Short-run underpricing and its characteristics in Chinese initial public offering (IPO) markets”, *Research in International Business and Finance* 19, 2005, no. 1, pp. 71–93.

²⁹ N. Naifar, “Explaining IPOs Underpricing in the Tunisian Market”, *Journal of Emerging Market Finance* 10, 2011, no. 3, pp. 311–336.

³⁰ A. Cornanic, J. Novak, “Signalling by underpricing the initial public offerings of primary listings in an emerging markets”, *Czech Journal of Economics and Finance* 65, 2015, no. 4, pp. 307–335.

³¹ N. Jegadeesh et al., “An empirical investigation of IPO returns and subsequent equity offerings”, *Journal of Financial Economics* 34, 1993, no. 2, pp. 153–175.

O. Yong, R. Abdul-Rahim, and M.E. Hassan³²), IPO method (fixed offer price vs tender offer; A. Hameed and G.H. Lim³³), whether the intermediary institution commits to buying the unsold shares (E. Arik and E. Mutlu³⁴), information clarity contained in the IPO prospectus (H.D. Park and P.C. Patel³⁵), or post-IPO accounting performance measures (S.X. Zheng and D.A. Stangeland³⁶).

1.3. Agency theory

The agency theory describes a relationship based on a contract by which one party (principal) entrusts the other party (agent) with performing indicated tasks, and at the same time conveys full authority to make decisions on the assigned task. In the agent–principal relationship a conflict of interest may arise as a result of both parties' efforts to maximize utility. Due to the divergence of goals, the agent does not always act in line with the interest of the principal and instead focuses on tasks that are likely to bring them private benefits.

Information asymmetry contributes to the occurrence of adverse selection and moral hazard. Adverse selection concerns the inability to fully verify information about the agent and their competences by the principal in the period preceding the conclusion of the contract. The problem of moral hazard presupposes opportunistic behaviour of an agent leading to a failure to fulfil a contract in order to meet their own needs, even if the consequences are detrimental to others. Thus, the agency theory emphasizes the limitations of the principals' ability to recognize the true intentions of the agent they entrust with running their affairs.

To induce an agent to take action for the benefit of the principal, they agree to bear agency costs which are a product of monitoring costs, bonding costs, and residual losses. Monitoring costs are borne by the principal in order to implement control measures of the agent's work, while the agent bears bonding costs in order to perform the tasks under the contract in a strictly defined manner, i.e. the costs lead to restrictions of the agent's actions and possibly to compensation for losses caused by their harmful decisions. Residual losses are related to the agent's suboptimal decisions. They are calculated as the difference between the maximum possible wealth of the principal and the wealth obtained through the agent's actions. Monitoring and bonding costs are aimed at limiting the actions agents take

³² A. Albada et al., op. cit., pp. 1–28.

³³ A. Hameed, G.H. Lim, "Underpricing and Firm Quality in Initial Public Offerings. Evidence from Singapore", *Journal of Business Finance & Accounting* 25, 1998, no. 3–4, pp. 455–468.

³⁴ E. Arik, E. Mutlu, "Post-Initial Public Offering Operating Performance and Its Determinants: Initial Public Offering Characteristics and Corporate Governance Practices", *Emerging Markets Finance and Trade* 51, 2015, no. 2, pp. 62–83.

³⁵ H.D. Park, P.C. Patel, "How Does Ambiguity Influence IPO Underpricing? The Role of the Signalling Environment", *Journal of Management Studies* 52, 2015, no. 6, pp. 796–818.

³⁶ S.X. Zheng, D.A. Stangeland, "IPO Underpricing, Firm Quality, and Analyst Forecasts", *Financial Management* 36, 2007, no. 2, pp. 45–64.

which are unfavourable to the interests of the principal, and also allow to minimize the residual loss resulting from agents' decisions that do not maximize the benefits of the party assigning the task.

There are three major parties involved in IPO transactions and each of them may have an information advantage; in the first scenario the investment bank does. In case the issuing firm has insufficient knowledge to carry out the transaction by themselves, they can hire an investment bank to support the IPO transaction. The bank can provide their services to the issuer mainly in terms of advising regarding the offer parameters, distribution of securities, and underwriting.

The underwriting costs are proportional to the amount of IPO proceeds, so it would appear that they should reduce the level of underpricing. However, an investment bank may take actions aimed at lowering the offer price in order to mitigate distribution effort. Due to this an investment bank, knowing that its marketing and distribution activities cannot be fully observed by the issuer, may take actions encumbered with moral hazard and adverse selection, since the bank acts as the issuer's agent in the sale of new shares.

Two factors have an impact on limiting the bank's actions leading to intentional increasing of the underpricing level — competition in the investment banking industry and issuers' awareness of the situation in the capital market as well as the market of investment banks. In practice, however, the investment bank market is based on a long tradition and strong market position, while most investors have little understanding of the market, so the limiting factors work poorly.

In one of the analysed models, D.P. Baron³⁷ assumes that the issuer, not having full knowledge of the state of the capital market, employs an investment bank as an advisor in order to determine the level of the offering price. The bank determines the IPO price using its superior knowledge, and in return the issuer is willing to accept the lower price. The greater the issuer's uncertainty about the demand for the issue, the greater the sacrifice. The offer price is below its first-best possible level that could be determined for an IPO if the issuer had the same knowledge about the market as the investment bank. In a situation of information asymmetry, the costs of an agreement with an investment bank are also not optimal. The bank, as the underwriter and the IPO price setter, proposes a lower issue price and a higher underwriter spread in a situation of low demand, and vice versa. These activities are beneficial from the perspective of the investment bank when undertaking sales activities in the IPO process because the bank is able to optimize its marketing effort. The greater the uncertainty as to the intrinsic value of the issuing firm, the greater the information asymmetry between the issuer and the bank. This, in turn, leads to an increase in the importance of investment bank services, resulting in increased underpricing.

³⁷ D.P. Baron, "A model of the demand for investment banking advising and distribution services for new issues", *The Journal of Finance* 37, 1982, no. 4, pp. 995–976.

Tim Loughran and Jay R. Ritter³⁸ found that underpricing may be beneficial for underwriters when they receive indirect compensation from investors in return for allocating them better deals. As a result, its private benefits outweigh the loss caused by gaining lower underwriting fees. Nevertheless, Loughran and Ritter³⁹ stated that there is an agency problem arising between executives of the issuing firm and other pre-IPO shareholders. In this case the executives are prone to work with underwriters that have a history of leaving money on the table as they receive side-payments in exchange.

According to B. Reber and C. Fong,⁴⁰ more prestigious underwriters could take advantage of their status and persuade issuers to accept a lower offering price. The authors consider a high reputation of underwriters as the ‘stamp of approval’ that causes issuing firms to look more favourably at the mispricing of their offer.

The assumptions made by Baron were examined by C.J. Muscarella and M.R. Vetsuypens.⁴¹ They took into account 38 IPOs carried out in the years 1970–1987 in the US market, with the issuers also being underwriters who participated in the distribution of their own shares. This allowed to eliminate the information asymmetry and the agency problem between the underwriter and the issuer. Their results, however, contradicted Baron’s assumptions, as the analysed companies were still underpriced.

In their research L. Kao and A. Chen⁴² confirmed that the presence of the pre-IPO audit committee has a positive impact on IPO pricing efficiency through reducing the underwriter bargaining power.

Managers of the issuing firm may have information advantage over shareholders. To mitigate agency problems, issuers can monitor underwriters’ effort in pricing and distribution of the issue. A study by A. Ljungqvist and W.J. Wilhelm⁴³ considered a case where managers of the issuing firm act as agents of shareholders. When the equity ownership of managers at the time of IPO is substantial, they are more motivated to control underwriters’ behaviour due to a greater personal

³⁸ T. Loughran, J.R. Ritter, “Why don’t issuers get upset about leaving money on the table in IPOs?”, *The Review of Financial Studies* 15, 2002, no. 2, pp. 413–443.

³⁹ T. Loughran, J.R. Ritter, “Why has IPO underpricing changed over time?”, *Financial Management* 33, 2004, no. 3, pp. 5–37.

⁴⁰ B. Reber, C. Fong, “Explaining mispricing of initial public offerings in Singapore”, *Applied Financial Economics* 16, 2006, no. 18, pp. 1339–1353.

⁴¹ C.J. Muscarella, M.R. Vetsuypens, “A simple test of Baron’s model of IPO underpricing”, *Journal of Financial Economics* 24, 1989, no. 1, pp. 125–135.

⁴² L. Kao, A. Chen, “How a pre-IPO audit committee improves IPO pricing efficiency in an economy with little value uncertainty and information asymmetry”, *Journal of Banking and Finance* 110, 2020, pp. 1–15.

⁴³ A. Ljungqvist, W.J. Wilhelm, “IPO Pricing in the Dot-com Bubble”, *The Journal of Finance* 58, 2003, no. 2, pp. 723–752.

stake in the outcome of the pricing negotiations. Therefore, the smaller managerial ownership and thus less monitoring incentives, the more underpriced issue.

According to J.A. Elston and J.J. Yang,⁴⁴ higher ownership of controlling shareholders reduces agency problems and therefore lowers the IPO discount.

Summary and conclusions

The article summarized the theories explaining the phenomenon of underpricing after initial public offering, taking into account explanatory variables of underpricing that stem from each theory. The selected theories were based on the phenomenon of information asymmetry between the parties of the IPO transaction. Each theory assumes that a different side of the transaction has an information advantage, being a significant similarity of the presented theories. However, each theory takes into account different market participant as the one with more information. The foundation of the winner's curse theory is an information advantage of informed investors over the group of uninformed investors. Signalling theory assumes such an advantage of issuers over investors, while the agency theory focuses mainly on greater knowledge of underwriters. Depending on the chosen theory, the factors influencing IPO underpricing will be different.

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