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Research Article

Underpricing anomaly in initial public offerings: A research on 2021 initial public offerings performed in Borsa Istanbul

İlk halka arzlarda düşük fiyatlama anomalisi: Borsa İstanbul'da gerçekleştirilen 2021 yılı halka arzları üzerine bir araştırma

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Abstract

One of the most common anomalies related to price performance in initial public offerings (IPOs) is short-term underpricing and long-term underperformance anomalies. There are many studies on these anomalies conducted in the previous literature. This article's primary purpose is to contribute to this existing academic research by examining the underpricing for the IPOs made in Borsa Istanbul during 2021. For this purpose, 32 initial public offerings performed in Borsa Istanbul in 2021 as of the analysis date are examined. In the analysis, the first day, the first three days and the first seven days after the issuance are described as the short-term. Based on empirical findings, no short-period underpricing is detected for all public offerings performed in Borsa Istanbul in 2021. In other words, it can be concluded that investors can't earn residual (abnormal) returns by purchasing stocks from these public offerings in a short period.

Keywords: IPO, Underpricing, Price Anomaly, Borsa Istanbul, t-test

Jel Codes: G10, G12, G14, G20

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Öz

İlk halka arzlarda fiyat performansı ile ilgili olarak en sık görülen anomaliler kısa dönem düşük fiyatlama ve uzun dönem düşük performans anomalileridir. Literatürde bu anomaliler ile ilgili birçok çalışma mevcuttur. Bu çalışmanın temel amacı, düşük fiyatlama anomalisini 2021 yılında Borsa İstanbul'da yapılan ilk halka arzlar için inceleyerek mevcut literatüre katkı sağlamaktır. Bu amaçla, analiz tarihi itibariyle Borsa İstanbul'da 2021 yılı içerisinde gerçekleştirilmiş 32 ilk halka arz incelenmiştir. Analizde kısa dönem olarak, halka arzdan sonraki ilk gün, ilk 3 gün ve ilk 7 günlük süreler kullanılmıştır. Yapılan t-testi sonuçlarına göre Borsa İstabul'da 2021 yılında yapılan tüm halka arzlar için kısa dönem düşük fiyatlama anomalisi tespit edilememiştir. Diğer bir ifadeyle, yatırımcıların kısa vadede bu halka arzlardan hisse senedi satın alarak artık (anormal) getiri elde etmesi mümkün değildir.

Anahtar Kelimeler: İlk Halka Arz, Düşük Fiyatlama, Fiyat Anomalisi, Borsa İstanbul, t-testi

Jel Kodları: G10, G12, G14, G20

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Introduction

There are two basic financing alternatives, Equity and Debt, that companies can use in their long-term financing decisions. Both methods have their advantages and disadvantages. In debt financing, companies have an interest debt burden and repayment obligation, while in equity financing, unlike borrowing. However, there are no financial obligations such as repayment and interest. In addition, the firm's existing shareholders share the management with new investors. That is, their management power decreases. Therefore, firms choose between debt and equity financing methods to optimally meet their needs, depending on their situation.

The most well-known equity financing methods are the public offerings, which are frequently applied in the capital markets. Public offerings cover the company's official announcement to all individual and corporate investors to become a shareholder in the company and all share sales processes following this call. If a firm invites investors for the first time to become a shareholder of the company and sells stocks accordingly, it is called an initial public offering (IPO). In contrast, a public offering conducted after the initial public offering is called seasoned public offerings (SEO). Public offerings provide cash inflow to the issuer firm through IPO proceed and the status of a publicly-traded company (listed company) and make a significant contribution to the company's brand recognition power (CEF, 2020). On the other hand, IPOs bring some responsibilities to firms such as Independent Audit, Dividend Payout, Public Disclosure and Corporate Governance etc. (CEF, 2020).

Public offerings have always been a popular topic in the capital markets. This is because public offerings play an essential role in developing and depth a country's capital market. For instance, in Turkey, one of the emerging economies, while the number of publicly-traded companies in Borsa Istanbul is 371 as of 2020, there are more than 5 thousand companies in all stock exchanges in the USA, which is accepted to have an efficient capital market.

Public offerings represent a non-refundable long-term financing source for the issuer and a vital investment alternative for investors. For this reason, there are many studies performed on public offerings in the literature. Some of these studies are the short and long-term price performance of the stocks of the publicly offered company, in other words, the return performance of issued stocks. In most of the studies carried out to date, some price anomalies have been detected in initial public offerings. These anomalies are the short-term underpricing anomaly and the long-term underperformance anomaly. Underpricing anomaly suggests that the stock price of the public offering company outperforms the market price in the short term and thus provides abnormal or residual returns to the investors who buy the shares at the issuance. However, a long-term underperformance anomaly states that these stocks will offer much lower returns than the stocks of similar companies (peer groups) operating in the same sector during the long run. The short-term underpricing anomaly suggests that the issuer and the investment bank deliberately underprice the public offering to guarantee the success of an IPO and sell out all of the relevant stocks. As a result, it provides an opportunity for abnormal returns for investors in the short term. The long-term underperformance anomaly states that the company will earn lower returns than the portfolio consisting of other stocks after keeping the securities purchased in the initial stage for the long run. There are many studies on both anomalies in the national and international literature.

In this study, the short-period underpricing anomaly, one of these price anomalies, will be examined for the initial public offerings made in Borsa Istanbul in 2021. This study aims to contribute to the existing academic research through new findings on this subject. For this purpose, 32 initial public offerings made in Borsa Istanbul in 2021 as of the date of this study were examined. First, the short-term price performances of initial public offerings are analysed. Then, crude and abnormal returns are calculated in the short-term, the first day, the first three days, and the first seven days after the public offering. Based on t-test results, underpricing was not observed in all initial public offerings for all short-term types.

In the 2nd part of the study, short-term underpricing and long-run underperformance anomalies will be summarized. The 3rd part will examine the national and international literature on this subject. In the 4th part, the analysis will be carried out to detect the underpricing anomaly. In the conclusion part, which is the last part of the study, the analysis findings will be evaluated, and the findings will be discussed.

Price anomalies observed in IPOs

The efficient market hypothesis refers to a market where the prices reflect the most up-to-date and accurate information about the relevant financial instruments. All investors access information

simultaneously and equally. Therefore, investors will never be able to obtain abnormal returns (Fama, 1969: 384). In other words, the efficient market hypothesis reflects the ideal situation in which financial markets work perfectly. According to this hypothesis, since prices are ideally determined by market supply and demand, it is impossible to estimate future prices by applying technical or fundamental analysis (Bayraktar, 2012:38). However, investors may receive a return above the market average in practice. This obtained return is called a residual or abnormal return. As a result, it is impossible to discuss a fully efficient market in the world capital markets. However, it can be stated that the US Stock Exchanges are relatively more efficient than the stock markets of other countries. Financial markets are divided into three groups: Poor Efficiency, Semi-Strong Efficiency, and Strong Efficiency, according to the degree of effectiveness specified above (Altun, 1992: 5).

If the market is in a weak or semi-strong form, some anomalies can be seen in the price movements of the relevant instruments. These are called price anomalies. These anomalies can also be observed in initial public offerings.

In many studies in the literature, the period from the first day till the end of the third month after the public offering is defined as a short period, and the anomalies observed in the price movements of the stocks in this period are examined. In the literature, the long-term is generally accepted as 3 or 5 years after the public offering. The return of the stocks to the investors who still hold the stocks during this period has been examined.

The short-term underpriced anomaly means that the offering price is less than its fair value (Iding, 2016). The issuer discounts the investors who buy shares from the issuance in the initial public offering. In this way, the initial returns of the investors who buy the stock from the first issue can be higher than the average market return (Kaya, 2019: 10). In this case, investors gain more from the market, called abnormal or residual return. These abnormal returns are only valid for the short term after the issuance, and there are no abnormal returns in the long run, and in some cases, even underperformance can be observed in stocks. In capital markets stock exchanges, the short term continues from the 1st day after the issuance until the end of the relevant week. The average return of the investor who bought the stock from the initial issue and held it during this period will be higher than other investors who did not buy this publicly offered stock. Investors who know that the issuing institution generally applies discounts in initial public offerings want to get a share from the issue, supporting the demand for the initial public offering. Strong demand positively affects the short-term price performance of the related stock prices after the issuance.

While underpricing seen in IPOs gives an abnormal return opportunity for the investor in the short term, it points to the money left on the table for issuers. Loss of revenue in the public offering increases cost of the public offering. In some studies, in the literature, it has been determined that this cost exceeds even 10% of total IPO proceed (Ritter, 1984: 237).

Numerous studies are conducted on short-period underpricing anomalies, their determinants, duration of underpricing period, and similar issues in the literature. Although market conditions, company structure and investor profile variables were used as short-term price performance determinants of publicly offered stocks in most of these studies, factors other than market conditions were generally emphasized (Kaderli and Demir, 2008: 108). In studies on the determining factors of underpricing, it has been stated that the main determining factor is the pricing behaviour of the brokerage house (investment bank / financial agency). A typical investment bank tries to market all shares to ensure the success of the public offering and not to miss any public offering orders of potential customers (Logue, 1973: 92). However, apart from investment bank pricing behaviours, there are also other hypotheses about underpricing. For instance, the adverse selection model suggests that in a public offering, some parties who may have superior information may benefit from this information against others by timing offering and making share allocation plan as they wish (Rock, 1986: 189-190). In addition to these studies, another waterfall effect hypothesis considers the interaction between investors. According to this hypothesis, investors are affected not only by their knowledge and experience but also by each other's knowledge and experience in the decision-making process, that is, the existence of interaction between investors (Welch, 1992: 697-698). Finally, some studies comparatively analyse the underpricing anomaly of initial public offerings based on criteria such as sector, country and public offering method etc.

These studies will be outlined in the literature review chapter.

Literature review

Many theoretical models built on public offering have been grouped into four groups by Ljungqvist: (Pamukçu and Öztürk, 2018: 23):

* Models based on information asymmetry between the investor, the public offering company and the intermediary institution. It is anticipated that one of these three actors has more information than the others.

* Institutional reasons and theories focus on the three main features of markets: risk of exposure to legal proceedings, price stability transactions of the brokerage house after the IPO, and taxes.

* Control issues and theories, which argue that underpricing will assist in the selection of new shareholders in a way that will reduce the intervention of new partners that will emerge after the public offering,

* Behavioural approaches and theories assume that there are "irrational" investors who offer a price other than the fair value to the company that makes the public offering. Therefore, companies that exhibit behavioural errors cannot put enough pressure on intermediary institutions to reduce underpricing.

Based on the four basic models explained above, the hypotheses developed regarding the underpricing anomaly seen in the initial public offerings are respectively Asymmetric Information Hypothesis, Monopsony Power Hypothesis, Brokerage Reputation Hypothesis, Covered Insurance Hypothesis, Risk-Avoiding Intermediary Hypothesis, Speculative Bubble Hypothesis, Signal Hypothesis, Information Acquisition Hypothesis and Hot and Cold Market Hypotheses (Korkmaz, 2016: 36).

This part of the study will provide a summary of the national and international literature studies based on the models and hypotheses explained above.

West (1965) examined the relationship between underpricing in initial public offerings and competition among investment banks. He found that when the competition among investment banks is not relatively high, the public offerings are underpriced. In this way, they provide high returns to the investor who bought the stocks from the issuance in the short term. However, he stated that when the competition is aggressive, the stocks will be overpriced by investment banks. Therefore, the initial returns of the investors may be harmful in the short term.

Logue (1973), Baron and Holmostrom (1980) argued that the underpricing anomaly is related to the behaviour of underwriters during the IPOs process. Contrary to expectations of the firm owners to maximize the proceed of the issuance, investment banks stated that they would be reluctant to overprice the public offering. He stated that investment underprices IPOs to ensure the success of the public offering, to market all the stocks to be offered to the public, to provide high returns to the investors in the short term, and to ensure that other companies planning to perform the public offering in this way choose this investment bank in the future.

Ritter (1984) examined the underpricing anomaly in IPOs in the hot and cold public offering markets separately. Therefore, more than 5 thousand IPOs were analysed in the USA during an extended period, such as 1960-1982. The underpricing anomaly was generally confirmed in IPOs included in the analysis. Therefore, rest on the test results. It was determined that IPOs included in the analysis were underpriced by 18.8%. He also determined that underpricing in hot public offering markets is much higher than in cold ones.

Rock (1986) proposed the adverse selection model about the underpricing of IPO. In this model, the author divides the investors into two as the conscious investor who wants to buy the stock from the issuance when the price of the stock is determined as relatively low, and the unconscious investor who desires to buy the stock from the offering regardless the stock price is overvalued or undervalued. In the model, public offerings' overvaluation and undervaluation situations are examined separately. According to the analysis results, it is stated that if the public offering is underpriced, all investors, both knowledgeable and uninformed about the public offering, will buy the stock. Still, in case of overpricing, only the investor who does not have sufficient information about the public offering will buy the stock.

Yi (1992) argues that underpricing anomaly occurs due to the information difference between the parties in initial public offerings. This information difference is between the investment bank that mediates the public offering and the investors and is defined as asymmetric information.

Elmas and Amanianganeh (2013) focused on the determining factors of underpricing in their study. In the study, the factors that affect the underpricing are the public offering method, the share of the foreign investor in the public offering allocation, and the state of the market at the date of the public offering. In addition, they made a sectoral and sub-sector analysis on a sample of 227 companies offered to the public in the 1995-2020 period. According to the analysis results, it has been determined that the market condition variable has a significant effect on underpricing in all sectors in the sample. However, in terms of the whole sample, it was observed that the public offering method and the variable of selling to foreigners did not have much effect on underpricing. Still, both variables had a significant effect on underpricing by sector.

Gandolfi et al. (2018) tried to confirm the short-term underpricing and long-term underperformance anomalies seen in initial public offerings for 437 IPOs in the European regions during the 1997-2011 period. In his study, unlike the studies published in the previous literature, he worked on a more homogeneous sample, taking into account the effects of the 2008 global financial crisis. It included Italy, France and Germany, the three largest European Union countries, in the analysis. According to the analysis results, all three countries show similar short-term underpricing results. Therefore, it has been determined that the sector in which it operates is not a determining factor in underpricing.

Anand and Singh (2019) analysed the impact of corporate governance practices on the underpricing seen in initial public offerings in the Indian capital market. The sampling included 443 companies that made an initial public offering during the 2003-2017 period. According to the analysis results, it has been determined that only nested boards of directors have a significant negative relationship with underpricing.

Li, Wang, Wang (2019) examined 2063 initial public offerings in China during the 2001 – 2016 period and examined the effect of trust on the short-period underpricing anomaly observed in IPOs. They developed and tested some hypotheses in their studies. The first of these hypotheses states that trust reduces the effect of underpricing. The second hypothesis states that the relationship between underpricing and trust is more striking in companies with asymmetric information. According to the analysis results, it was determined that there is a statistically significant negative relationship between the level of trust and the volume of underpricing. In addition to this, they observed that in the presence of asymmetric information, the effect of the factor of trust is more pronounced, especially for small and growing firms and firms in the high-tech sector.

Tuncay, Karan and Aydın (2020) analysed the post-IPO price performance of the stocks of companies traded in Borsa Istanbul separately for hot and cold issue markets. Investor Optimism, Sector Concentration and Firm Size variables were used as explanatory variables while examining the IPO price performance. In 2010-2017, 119 IPOs realized in Borsa Istanbul were examined. The findings obtained from the analysis are that underpricing existed in Borsa Istanbul in the relevant period. They also found that underpricing did not significantly differ for hot and cold markets. In addition, they found that underpricing is more valid, especially for small companies, and the size of underpricing is higher in the hot issues market. The study also determined that underpricing had a positive correlation with the consumer confidence index but not with the type of sector.

Kahraman and Coşkun (2020) observed the change in the size of the underpricing phenomenon seen in initial public offerings over time. A sample of 325 companies in total was included in the analysis. Firstly, 125 companies made an initial public offering between 1993 and 2000, 200 companies went public in 2002-2015. According to the analysis results, it has been determined that investors generally have a statistically significant positive return after the public offering. According to the calculations, it has been determined that if the investor buys a share from the issuance and holds it until the end of the 3rd trading day after the public offering, he will obtain an abnormal return of approximately 10% on average. As a result of the observations, it was observed that the abnormal return turned negative, especially after the 5th day. In the analysis based on periods, while the size of underpricing was about 8% in the 1993-2000 period, in other words, while investors could obtain 8% abnormal returns, this rate decreased to approximately 5% in the 2002-2015 period. It was observed that the said decrease was statistically significant. As a result of the analysis, it has been determined that the size of the underpricing seen in the initial public offerings has decreased over time.

Setya, Supriani and Fianto (2020) investigated the factors affecting the underpricing of service industry IPOs on Indonesian Stock-Exchange (IDX) during 2011-2017. Unlike previous studies in the literature, they divided the stocks included in the analysis into two as Islamic and non-Islamic. They analysed the underpricing anomaly over these two groups comparatively. While they determined underpricing in 22 of 44 initial public offerings by companies they defined as Islamic, they found underpricing in 21 of 32 initial public offerings of shares they defined as non-Islamic. Multiple regression and independent-

sample t-test methods were used in the analysis. According to the analysis results, it has been determined that the reputation of the intermediary financial agent (investment bank, etc.) and the auditor has a significant effect on the underpricing of the IPO in IDX, both in Islamic non-Islamic service companies. In addition, the independent sample t-test results show that Islamic service company stocks have better financial performance than non-Islamic service company stocks.

Valta and Jakob (2021), in their study, examined the effect of the announcement as a result of the stock repurchase announcement of the companies after the IPO in the US capital market. They measured the investors' reaction to the stock with the stock repurchase announcement. As a result of their observations, they determined that the investors were optimistic for the stocks that were announced to be repurchased, and as a result, the discount rate of the relevant stock decreased. It has been determined that the announcements have a statistically significant relationship with positive investor response in the short term and abnormal returns in prices in the long term. According to the findings obtained from the analysis, it has been determined that when a company makes a stock repurchase announcement, it causes investors to perceive it as excessively underpriced, and investors react positively to the stock in the short term.

Tammi (2021) examined the effect of gender diversity in the board of directors on the IPO performance of companies listed on the Finnish stock exchange, separately for both the short and long term. The main problem in his study was whether companies with more female members on the board of directors were priced less in the IPO than other companies. For this purpose, a sample analysis consisting of 45 companies that made an initial public offering on the Nasdaq Helsinki stock exchange between 2013 and 2018 was included. The sample was divided into two companies with and without female members on the board of directors during the public offering process. In addition, the short-term was included in the analysis as the first trading day after the public offering for all companies. In the calculations, by the previous literature, first, the raw return was calculated for all stocks. Then, after subtracting the average indicator return of the market from this raw return, abnormal returns were calculated for each stock. According to the analysis results, it is revealed that the dimensions of underpricing in the Finnish capital market have decreased gradually over the years. However, the effect of gender composition on underpricing could not be statistically confirmed.

Massa and Zhang (2021) analysed the impact of divergence in investment horizons among local institutional investors on public offerings. They state that stocks after the public offering will have high liquidity in the market, especially since short-term investors prefer stocks with higher liquidity. As a result, they argue that the high liquidity observed in the short term after the IPO is associated with the underpricing anomaly. Their work developed a variable that they defined as Local Short-term Asset. This variable takes into account regional cross-sectional differences among investors. According to the analysis results, it has been determined that the local short-term asset has a positive relationship with the underpricing of the IPO.

Dataset and methodology

In this study, 32 initial public offerings performed in Borsa Istanbul in 2021 as of the date of this analysis are examined. All analyses are carried out by using Excel-2016 and SPSS-22 versions. Basic information about the sample can be found in Table 1 as follows:

Table 1: Summary Information of the Sample

SECTOR	# of IPO
Technology / Informatics	6
Electric Gas and Water / Electric Gas and Steam	6
Manufacturing / Chemical Pharmaceutical Petroleum Tire and Plastic Products	4
Manufacturing / Based on Stone and Soil	3
Financial Institutions / Real Estate Investment Trusts	3
Manufacturing / Food, Beverage and Tobacco	2
Construction and Public Works / Construction and Public Works	2
Financial Institutions / Intermediate Institutions	1
Administrative and Support Service Activities / Renting and Leasing Activities	1
Transportation, Storage and Communications / Transportation and Storage	1
Wholesale And Retail Trade, Restaurants and Hotels / Wholesale Trade	1
Financial Institutions / Holdings and Investment Companies	1
Manufacturing / Base Metal Industry	1
TOTAL	**32**

Source: www.spk.gov.tr

The event study method developed by Brown and Warner (1985) will be used in this study. An event study is a research methodology used to determine whether financial markets have a statistically relevant reaction.

The short-period price performance of the stocks offered to the public is examined, and the short-period underpricing anomaly is investigated. In this study, the first day, the first three days and the first seven days after the issuance date are considered short-term. In all initial public offerings, the offering price and the closing price of the relevant stock are compared at the end of the 1st day, 3rd day, and 7th day. It is calculated whether the investors can obtain a positive return when they purchase stocks from the issuance. In addition, the initially calculated returns are compared with the return of the Borsa Istanbul - 100 national stock index, which is a benchmark return, and it is examined whether the investors would obtain a residual return (abnormal/adjusted return) if they purchased stocks from the issuance.

The methodology of this study assumes that the investors buy the stock from the issuance and hold it for the short-period periods considered in this study. In other words, they apply a buy-hold trading strategy.

The raw return of the stocks purchased from the issuance is calculated with the help of the formula shown in Equation-1:

$$\mathbf{Rnt} = \frac{(\mathrm{Xnt} - \mathrm{Xnt} - 1)}{\mathrm{Xnt} - 1} \qquad (1)$$

***Rnt*:** Return for stock n at time *t*

Xn*t*: Closing value for stock n at time *t*

Xn*t*−1: Closing value of for n at time *t*-1 (at issuance)

Bist-100 national share index return, which is used as benchmark indicator return in this study, for the same period are calculated as shown in Equation-2 below:

$$\mathbf{Rmt} = \frac{(\mathrm{Xmt} - \mathrm{Xmt} - 1)}{\mathrm{Xmt} - 1} \qquad (2)$$

***Rmt*:** Return for Bist-100 national stock index at time *t*

Xm*t*: Closing value for Bist-100 national stock index at time *t*

Xm$t-1$: Closing value for Bist-100 national stock index at time t-1 (at issuance)

Adjusted returns are obtained by deducting Bist-100 return from the raw return of the stocks offered, and calculation is shown in Equation-3 below: (Asquith and Mullins,1986:69):

$$\mathbf{AR_{it}} = R_{it} - R_{mt} \quad (3)$$

Whether the AR value is positive or not, it is decided whether the public offering of the relevant stock is underpriced. For this purpose, the hypotheses used in the analysis of the 1st, 3rd and 7th-day abnormal returns, respectively, are as follows (Asquith and Mullins, 1986):

Hypotheses used for first-day abnormal returns:

H_0: $\overline{AR_t} \leq 0$ *Underpricing Anomaly is not valid.*

H_1: $\overline{AR_t} > 0$ *Underpricing Anomaly is valid.*

Hypotheses used for the 3rd and 7th-day abnormal returns:

H_0^1: $\overline{AR_t} \leq 0$ *Underpricing Anomaly is not valid.*

H_1^1: $\overline{AR_t} > 0$ *Underpricing Anomaly is valid.*

H_0^2: $\overline{CAR_t} \leq 0$ *According to Cumulative Adjusted Return Underpricing Anomaly Is Not Valid*

H_1^2: $C\overline{AR_t} > 0$ *According to Cumulative Adjusted Return Underpricing Anomaly Is Valid*

H_0^3: $\overline{BHAR_t} \leq 0$ *According to Compound Adjusted Return Underpricing Anomaly Is Not Valid*

H_1^3: $\overline{BHAR_t} > 0$ *According to Compound Adjusted Return Underpricing Anomaly Is Valid*

Empirical findings

In the study, the short-period price performances of the stocks were analysed separately for the first day, first three days and first seven days.

Descriptive statistics and Normality Test Results are provided in Table 2 and Table 3, respectively, as follows:

Table 2: Descriptive Statistics

Day	Parameter	R	AR	CARit	BHARit
1	Mean	5,22	4,55	-	-
	Standard Deviation	21,85	21,20	-	-
	Min	-70,56	-65,80	-	-
	Max	21,00	23,46	-	-
2	Mean	4,51	4,23	8,78	27,15
	Standard Deviation	6,11	6,07	21,92	225,90
	Min	-6,58	-7,89	-57,18	-750,68
	Max	10,07	11,23	34,69	241,34
3	Mean	2,97	2,98	11,76	26,26
	Standard Deviation	6,43	6,33	23,57	2387,86
	Min	-9,85	-10,11	-48,47	-8317,97
	Max	10,00	11,63	44,47	2653,99
4	Mean	3,18	3,32	15,09	-1734,33
	Standard Deviation	6,39	6,31	25,09	25058,06
	Min	-9,97	-10,48	-39,98	-91227,83
	Max	10,04	11,20	52,22	29059,48
5	Mean	1,16	1,10	16,19	-52307,06
	Standard Deviation	5,93	6,02	24,34	254414,28
	Min	-9,99	-9,89	-30,23	-989494,81
	Max	9,99	10,02	61,98	319271,11
6	Mean	1,91	1,83	18,02	2235,14
	Standard Deviation	6,09	5,88	25,66	2713956,50
	Min	-9,96	-9,98	-25,71	-10856393,12
	Max	10,08	11,64	70,46	5029364,54
7	Mean	-2,87	-2,95	15,06	-6011859,81
	Standard Deviation	17,43	17,48	30,53	18485436,98
	Min	-92,58	-93,60	-63,87	-73032883,63
	Max	10,00	10,92	81,19	35560620,78

Source: Author's Own Calculations

Table 3: Normality Test

	1st Day	2nd Day	3rd Day	4th Day	5th Day	6th Day	7th Day
R	0,200	0,110	0,200	0,223	0,2	0,221	0,223
AR	0,236	0,125	0,224	0,124	0,221	0,229	0,256
CARit	-	0,226	0,128	0,111	0,258	0,147	0,117
BHARit	-	0,230	0,189	0,224	0,31	0,155	0,145

Source: Author's Own Calculations

The conformity of the 1–7-day data of the parameters to the normal distribution was examined with the Kolmogorov Smirnov test. According to test results shown in Table 3 above, it was found that the data were suitable for the normal distribution.

First-day price performances of stocks

In this part of the analysis, the average raw returns ($\bar{R}$) of the stocks are calculated by using the price of the stocks offered to the public at the date of the public offering and the closing prices of the first day after the public offering. Then, using the first-day raw returns and market returns, the average adjusted returns $\bar{(AR)}$ of these stocks were calculated. In this transaction, while calculating the market return, the percentage change between the value of the BIST National 100 index on the day the stocks offered to the public was traded in the market and the value of the previous day was used. Table-4 shows test results for the first day.

Table 4: First-Day Stock Price Performance

# of Days	n	$\bar{R}$	t-statistics	$\overline{AR}$	t test-statistics
1-st Day	32	5,22	0,24	4,55	0,21

Note: n; is the number of observations. Critical values for the t-test are 1,3095, 1,6955 and 2,4528 for 0,10, 0,05, and 0,01 at significance levels, respectively.

Based on observations shown in the table above, the first-day raw returns of the stocks issued in IPOs are positive but statistically insignificant. In addition, the first day adjusted returns of stocks were positive and statistically insignificant.

Based on these findings:

$\boldsymbol{H_0}$: $\overline{AR_t} \leq 0$ *Underpricing Anomaly is not valid.*

$\boldsymbol{H_1}$: $\overline{AR_t} > 0$ *Underpricing Anomaly is valid.*

H_0 hypothesis cannot be rejected. However, in this case, by looking at the first day returns after the public offering, it can be stated that the underpricing anomaly is not valid for the stocks offered to the public.

First three-day performances of stocks

At this stage of the analysis, avg raw returns ($\bar{R}$), avg adjusted returns arranged for market returns ($\overline{\boldsymbol{AR}}$), avg cumulative adjusted returns ($\overline{\boldsymbol{CAR}}$) and avg compound returns ($\overline{\boldsymbol{BHAR}}$) of stocks were calculated. Raw returns are calculated as the difference between the closing price of stocks and their offering price. Abnormal returns are calculated by subtracting market returns from raw returns.
The obtained results are presented in Table 5.

Table 5: First Three-Days Stock Price Performance

# of Days	n	$\bar{R}$	t test-statistics	$\overline{AR}$	t-statistics	$\overline{CAR}$	t test-statistics	$\overline{BHAR}$	t test-statistics
1-st Day	32	5,22	0,24	4,55	0,21	4,55	0,21	4,55	0,21
2-nd Day	32	4,51	0,74	4,23	0,70	8,78	0,40	27,15	0,12
3-rd Day	32	2,97	0,46	2,98	0,47	11,76	0,50	26,26	0,01

Note: n; is the number of observations. Critical values for the t-test are 1,3095, 1,6955 and 2,4528 for 0,10, 0,05, and 0,01 at significance levels, respectively.

Based on observations shown in the table above, the average raw returns of the stocks of the companies offered to the public in the first three-day period are positive but statistically insignificant. Avg adjusted returns, avg cumulative adjusted returns, and avg compound returns of stocks are similarly positive and statistically insignificant. In this situation:

$\boldsymbol{H_0^1}$: $\overline{AR_t} \leq 0$ *Underpricing Anomaly is not valid.*

$\boldsymbol{H_1^1}$: $\overline{AR_t} > 0$ *Underpricing Anomaly is valid.*

$\boldsymbol{H_0^2}$: $\overline{CAR_t} \leq 0$ *According to Cumulative Adjusted Return Underpricing Anomaly Is Not Valid*

$\boldsymbol{H_1^2}$: $\overline{CAR_t} > 0$ *According to Cumulative Adjusted Return Underpricing Anomaly Is Valid*

$\boldsymbol{H_0^3}$: $\overline{BHAR_t} \leq 0$ *According to Compound Adjusted Return Underpricing Anomaly Is Not Valid*

$\boldsymbol{H_1^3}$: $\overline{BHAR_t} > 0$ *According to Compound Adjusted Return Underpricing Anomaly Is Valid*

All three null hypotheses are not rejected. In other words, by looking at the first three days' data, it may be accepted that the underpricing anomaly is not existing for stocks issued in IPOs.

First seven-day performances of stocks

At this stage of the analysis, avg raw returns ($\bar{R}$), avg adjusted returns arranged for market returns ($\overline{AR}$), avg cumulative adjusted returns ($\overline{CAR}$) and avg compound returns ($\overline{BHAR}$) of stocks were calculated. Raw returns are calculated as the difference between the closing price of stocks and their offering price. Abnormal returns are calculated by subtracting market returns from raw returns.

The obtained results are presented in Table 6.

Table 6: First Seven-Days Stock Price Performance

# of Days	n.	$\bar{R}$.	t test-statistics	$\overline{AR}$.	t test-statistics	$\overline{CAR}$.	t test-statistics	$\overline{BHAR}$.	t test-statistics
1-st Day	32	5,22	0,24	4,55	0,21	4,55	0,21	4,55	0,21
2-nd Day	32	4,51	0,74	4,23	0,70	8,78	0,40	27,15	0,12
3-rd Day	32	2,97	0,46	2,98	0,47	11,76	0,50	26,26	0,01
4-th Day	32	3,18	0,50	3,32	0,53	15,09	0,60	-1734,33	-0,07
5-th Day	32	1,16	0,20	1,10	0,18	16,19	0,66	-52307,06	-0,21
6-th Day	32	1,91	0,31	1,83	0,31	18,02	0,70	2235,14	0,00
7-th Day	32	-2,87	-0,16	-2,95	-0,17	15,06	0,49	-6011859,81	-0,33

Note: n; is the number of observations. Critical values for the t-test are 1,3095, 1,6955 and 2,4528 for 0,10, 0,05, and 0,01 at significance levels, respectively.

Based on observations shown in the table above, the avg raw returns of the stocks of the companies issued in IPOs during the first seven-day period, except for the seventh day, are positive but statistically insignificant. The average raw returns are negative but statistically insignificant on the seventh day. Average adjusted returns of stocks in the first seven-day period, except for the seventh day, the average raw returns are positive but statistically insignificant. In contrast, the average raw returns are negative but statistically insignificant on the seventh day. Average cumulative adjusted returns are positive but statistically insignificant in the first seven-day period. Average compound returns are also negative on the fourth, fifth, and seventh days, positive on the first, second, third, and sixth days, and statistically insignificant. According to this situation:

$\boldsymbol{H_0^1}$: $\overline{AR_t} \leq 0$ *Underpricing Anomaly is not valid.*

$\boldsymbol{H_1^1}$: $\overline{AR_t} > 0$ *Underpricing Anomaly is valid.*

$\boldsymbol{H_0^2}$: $\overline{CAR_t} \leq 0$ *According to Cumulative Adjusted Return Underpricing Anomaly Is Not Valid*

$\boldsymbol{H_1^2}$: $\overline{CAR_t} > 0$ *According to Cumulative Adjusted Return Underpricing Anomaly Is Valid*

$\boldsymbol{H_0^3}$: $\overline{BHAR_t} \leq 0$ *According to Compound Adjusted Return Underpricing Anomaly Is Not Valid*

$\boldsymbol{H_1^3}$: $\overline{BHAR_t} > 0$ *According to Compound Adjusted Return Underpricing Anomaly Is Valid*

All three null hypotheses are not rejected. In other words, by looking at the data for the first seven days, it may be accepted that underpricing anomaly is not existing for stocks issued in IPOs.

Conclusion and discussion

Financial markets may not always be organized as efficient markets where all investors obtain average returns and access information reasonably. It can be observed that some investors have obtained adjusted returns much higher than the market average. In this case, price anomalies emerge. Price anomalies may also be observed in the initial public offering. The price anomaly seen in the short term after the issuance is defined as underpricing anomaly, while the price anomaly seen in the long term is defined as an underperformance anomaly. In the underpricing anomaly, the issuer incurs a loss of income by pricing the public offering below its actual value in the initial public offerings. In the long-term underperformance anomaly, investors who buy publicly offered stocks from the first issue and keep them in their portfolios for a long time get lower returns than portfolios with similar sectors and firms. It is defined as an undesirable price anomaly in an efficient market in both cases. There are many studies in the literature on some topics, such as the presence of both anomalies, their size, determining factors, etc.

In this study, to contribute to the existing literature, the short-term underpricing anomaly, which is one of the price anomalies seen in the initial public offering, was examined on the initial public offerings held in Borsa Istanbul in 2021. The objective of this study is to update the results of the study, which is a continuation of the work we have done for Borsa Istanbul before. For this purpose, 32 initial public

offerings in Borsa Istanbul as of the date of this analysis were examined. The data used in the study are offering prices of each company included in the sample, the closing prices of shares for each trading day after the issuance, and the closing values of the Borsa İstanbul-100 national share index for the same period. In the study, the first trading day, the 3rd trading day, and the 7th trading day, the first weekly period after the public offering, are considered short-term. Raw and adjusted, cumulative adjusted and compound adjusted returns were calculated separately in the analysis. For each calculated return, the t-statistic was calculated, and it was confirmed whether the obtained values were statistically significant. According to the analysis results, adjusted, cumulative adjusted and compound adjusted returns were statistically insignificant for all short-term types. In other words, according to the analysis result, the presence of underpricing anomaly was not observed on the sample included in the analysis.

Based on these findings obtained from the study, it can be concluded that underpricing anomaly was not observed in the initial public offerings made in 2021 in Borsa Istanbul. In other words, it couldn't be statistically confirmed that investors can obtain a higher return (abnormal/residual return) than the market average by investing in IPO for the short term. Applying a buy and hold investment strategy for stocks as buying them at issuance and keeping them in the portfolio during 1, 3, and 7 days will not significantly return investors. However, to get more detailed, comprehensive and meaningful results, it is kindly recommended to carry out an analysis based on criteria such as the sector, public offering method, stock sales methods, etc.

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Appendix

Appendix 1: Initial Public Offerings Performed in 2021

Equity Code (Ticker)	Date of Issuance	Offering Price	Sector
ISKPL	21-22/01/2021	16,10	MANUFACTURING / CHEMICAL PHARMACEUTICAL PETROLEUM TIRE and PLASTIC PRODUCTS
TRILC	25-26/02/2021	10,00	MANUFACTURING / CHEMICAL PHARMACEUTICAL PETROLEUM TIRE and PLASTIC PRODUCTS
NTGAZ	25-26/03/2021	8,50	ELECTRIC GAS and WATER / ELECTRIC GAS and STEAM
MTRKS	30-31/03/2021	28,00	TECHNOLOGY / INFORMATICS
TUREX	01-02.04.2021	12,00	TRANSPORTATION, STORAGE AND COMMUNICATIONS / TRANSPORTATION AND STORAGE
QUAGR	05-06/04/2021	16,46	MANUFACTURING / BASED ON STONE AND SOIL
GWIND	15-16/04/2021	5,06	ELECTRIC GAS AND WATER / ELECTRIC GAS AND STEAM
BIOEN	19-21/04/2021	18,00	ELECTRIC GAS and WATER / ELECTRIC GAS and STEAM
AYDEM	19-22/04/2021	9,90	ELECTRIC GAS and WATER / ELECTRIC GAS and STEAM
CANTE	21-22/04/2021	3,90	ELECTRIC GAS and WATER / ELECTRIC GAS and STEAM
ZRGYO	28-30/04/2021	1,60	FINANCIAL INSTITUTIONS / REAL ESTATE INVESTMENT TRUSTS
PENTA	06-07/05/2021	32,00	TECHNOLOGY / INFORMATICS
KLKIM	06-07/05/2021	14,75	MANUFACTURING / BASED ON STONE and SOIL
MERCN	20-21/05/2021	8,81	MANUFACTURING / CHEMICAL PHARMACEUTICAL PETROLEUM TIRE and PLASTIC PRODUCTS
ATATP	27-28/05/2021	24,00	TECHNOLOGY / INFORMATICS
BOBET	26-28/05/2021	3,50	MANUFACTURING / BASED ON STONE and SOIL
UNLU	31/05/2021-01/06/2021	6,90	FINANCIAL INSTITUTIONS / HOLDINGS and INVESTMENT COMPANIES
BMSCH	31/05/2021-02/06/2021	4,87	MANUFACTURING / BASE METAL INDUSTRY
OYYAT	02-04/06/2021	18,65	FINANCIAL INSTITUTIONS / INTERMEDIATE INSTITUTIONS
BASGZ	03-04/06/2021	9,72	FINANCIAL INSTITUTIONS / REAL ESTATE INVESTMENT TRUSTS
SELVA	17-18/06/2021	3,06	MANUFACTURING / FOOD, BEVERAGE and TOBACCO
MEDTR	23-24-25/06/2021	28,00	MANUFACTURING / CHEMICAL PHARMACEUTICAL PETROLEUM TIRE and PLASTIC PRODUCTS
EDATA	29-30/06/2021	6,00	TECHNOLOGY / INFORMATICS
KTSKR	01-02/07/2021	21,00	MANUFACTURING / FOOD, BEVERAGE and TOBACCO
VBTYZ	05-06/07/2021	12,48	TECHNOLOGY / INFORMATICS
ESCAR	07-08/07/2021	15,00	ADMINISTRATIVE and SUPPORT SERVICE ACTIVITIES / RENTING and LEASING ACTIVITIES
KARYE	09-12/07/2021	8,00	ELECTRIC GAS and WATER / ELECTRIC GAS and STEAM
MANAS	13-14/07/2021	9,90	TECHNOLOGY / INFORMATICS
GENIL	28-30/07/2021	10,75	WHOLESALE and RETAIL TRADE, RESTAURANTS and HOTELS / WHOLESALE TRADE
KZBGY	04-06/08/2021	15,80	FINANCIAL INSTITUTIONS / REAL ESTATE INVESTMENT TRUSTS
GESAN	11-12-13/08/2021	17,00	CONSTRUCTION and PUBLIC WORKS / CONSTRUCTION and PUBLIC WORKS
BRLSM	12-12-13/08/2021	9,10	CONSTRUCTION and PUBLIC WORKS / CONSTRUCTION and PUBLIC WORKS