TÜRKİYE CUMHURİYETİ
ADANA ALPARSLAN TÜRKEŞ SCIENCE AND TECHNOLOGY UNIVERSITY

GRADUATE SCHOOL
BUSINESS ADMINISTRATION DEPARTMENT

VALUATION OF SELECTED FIRMS USING DIVIDEND DISCOUNT MODEL: AN APPLICATION IN BORSA ISTANBUL

EZGİ PARLAK

M.A.

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ADANA, 2023

DECLARATION OF CONFORMITY

In this thesis study, which was prepared following the thesis writing rules of Adana Alparslan Turkes Science and Technology University Institute of Graduate School, I declare that I provide all the information, documents, evaluations, and results in accordance with scientific ethics and moral codes without resorting to any means or assistance that would be contrary to scientific ethics and traditions. I also declare that I refer to all of the articles I used in this study with appropriate references and accept all moral and legal consequences if a situation is found contrary to my statement regarding my work.

04/09/2023

Ezgi PARLAK

ÖZET

SEÇİLMİŞ FİRMALARIN TEMETTÜ İNDİRİM MODELİ İLE DEĞERLEMESİ: BORSA İSTANBUL'DA BİR UYGULAMA

Ezgi Parlak
Yüksek Lisans, İşletme Anabilim Dalı
Danışman: Dr. Öğr. Üyesi Gözde TÜRKMEN MÜLDÜR
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Bu tez çalışmasının amacı, 2022 yılı için Türkiye'de faaliyet gösteren ve Türkiye Borsalarında işlem goren küçük ve büyük sermayeli şirketlerin, yatırımcı duyarlılığı teorisinin öngördüğü şekilde, içsel ve piyasa değerleri arasındaki sapmaların, küçük sermayeli şirketler lehine daha yüksek olup olmadığını araştırmaktır. Şirketlerin içsel değerleri karpayı indirgeme modeli ile hesaplanmış ve iki grup arasındaki sapmaların istatistiksel olarak anlamlı olup olmadığı Welch's t-testi ile analiz edilmiştir. İki grup arasında, tanımlayıcı istatistiklerde, ortalamalar ve varyanslar da fark görülmesine rağmen, Welch t-Testi sonuçları ortalamaların farklı olduğu hipotezinin Kabul edilemediğini ortaya koymuştur.

Anahtar kelimeler: Yatırımcı duyarlılığı, içsel değer**,** küçük şirket anomalisi, yanlış fiyatlama, karpayı indirgeme modeli, Welch'in t-testi.

ABSTRACT

VALUATION OF SELECTED FIRMS USING DIVIDEND DISCOUNT MODEL: AN APPLICATION IN BORSA ISTANBUL

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This thesis study aims to calculate the deviations between the intrinsic values and the market prices of selected firms, quoted in Turkish Exchange market 2022 to detect if there is mispricing due to small firm anomaly, as the investor sentiment theory suggests so. Intrinsic values are calculated with the dividend discount model and the significance of differences between the two groups are analyzed by Welch's t-Test. Although the difference in means and variances can be seen in the descriptive statistics, the difference in means seemed insignificant when Welch's t-test was employed.

Keywords: Investor sentiment, intrinsic value, small firm anomaly, mispricing, dividend discount model, Welch's t-test.

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LIST OF ABBREVIATIONS

BSE	: Bombay Stock Exchange
CAPM	: Capital Asset Pricing Model
DCF	: Discounted Cash Flow
DDM	: Dividend Discount Model
EPS	: Earnings per Share
EVA	: Economic Value Added
F/K	: Free Cash Flows to Firm
FCF	: Free Cash Flows to Equity
FCFF	: Free Cash Flows to Firm
IPO	: Initial Public Offering
ISE	: Istanbul Stock Exchange
IT	: Information Technologies
MDCF	: Modified Discounted Cash Flow
MSE	: Macedonian Stock Exchange
MVA	: Market Value Added
NYSE	: New York Stock Exchange
P/E	: Price/Earnings Ratio
REVA	: Residual Value Added
ROA	: Return on Assets
ROE	: Return on Equity
ROIC	: Return on Invested Capital
S&P	: Standard and Poor’s
US	: United States
USA	: United States of America

1. INTRODUCTION

Neoclassical economic model is based on assumptions. One of the most important assumptions is that people can be approximated by a Homo economic us who is rational, calculating, and selfish, has unlimited computational capacity and never makes systematic mistakes. It also assumes that market institutions work, and prices should converge to equilibrium (Cartwright, 2018). Financial economics also accepted the neoclassical view of economics where decision-makers own von Neumann–Morgenstern preferences over uncertain wealth distributions and use statistical inference techniques to form appropriate judgments based on the available data (Chandra, 2016). But there is no obvious reason why humans can be approximated by Homo economic us, or why prices converge, eventually. The only explanation would be is that it is flexible enough that it can be manipulated to explain just about any anomaly that has ever been observed (Cartwright, 2018).

The concept that financial markets are rational has been around since the days of Adam Smith, but it is the mid-1960s where it was recognized and dominated the debate. Up until the late 1950s, finance was taught in business schools and had nothing to do with economics. In 1952, Harry Markowitz published his paper in which he developed a new approach to portfolio selection that focuses on risk and return laying the foundation for a modern, quantitative approach to finance. A little later, in 1953, Maurice Kendall, a distinguished statistician, presented an extraordinary paper where he examined the behavior of stock prices in search of regular patterns but failed to prove them. On the contrary, he found each series to follow a random walk meaning that succeeding stock prices are independent and identically distributed. Then, Modigliani and Miller (1958, 1961), two conventional economists, wrote two seminal papers on capital structure and the dividend policy that restructured the corporate finance field. Lastly, Fama (1970) laid out the foundations of the modern form of the Efficient Market Hypothesis (EMH) which proposes that the price of a stock and other securities are closely related to their underlying values and quickly and fully absorb any new information that comes into the market. This concluded the primary developments in traditional finance which transformed the field into the image of modern mathematical economics, forever.

Another branch of economics, namely behavioral economics had taken momentum in the early 1980s. It is not clear when behavioral economics began, but Adam Smith can also be the founding father of the field because of the book that he published in 1759. The book is called

"The Theory of Moral Sentiments" where he explains that people are not motivated solely by self- interest, but also feel a natural sympathy with others, and have a natural sense of virtue. Behavioral finance is a sub-branch of behavioral economics. It attempts to understand and explain actual investor and market behaviors versus theories of investor behavior (Pompian, 2021). Neoclassical finance generates hypotheses from the logically consistent structure of neoclassical economics whereas behavioral finance is led by the evidence of facts on human behavior and psychology (Chandra, 2016; Cartwright, 2018).

Many research has shown that the market behaves irrationally and many scholars have come to question the EMH. EMH is indeed the most important and widely discussed idea in the behavioral finance literature. However, there seem to be several instances where market prices failed to reflect available information (Malkiel, 2005). The distortions that go against the accepted paradigm of EMH are called "market anomalies". In other words, cycles in stock returns that are not fully explained by the capital asset pricing model (CAPM) are called anomalies. Anomalies reflect inefficiency within markets (Pasricha and Dhanda, 2022). The small firm effect, an apparent market anomaly, is a theory that predicts that smaller firms, or companies with small market capitalizations, tend to outperform larger companies. This anomaly is used to explain superior returns of the small firms which should not be the case as per the EMH itself. The logic behind that theory is that small companies have more growth opportunities than larger ones. They are also inclined to be more volatile, and correcting problems such as a funding deficiency can lead to an enormous price appreciation. Lastly, small-cap stocks tend to have lower stock prices, and these lower prices mean that price increases tend to be larger than those present amongst large-cap stocks (Hayes, 2023).

There is also a behavioral perspective on small firm effect. The investor sentiment theory, which is one of the main theories in behavioral finance, argues that investors are subject to sentiment and sentiment can persist in financial markets (DeLong, Shleifer, Summers, Waldman-DSSW, 1990). Although sentiment has been a long-standing interest to economists from as early as Keynes (1936); Baker and Wurgler (2007) defined sentiment as "beliefs about future cash flows and investment risks that are not justified by the facts at hand". In their pioneering study, Baker and Wurgler (2006) argued that sentiment would have cross-sectional effects meaning that it does not increase or decrease all prices equally. In other words, sentiment-based demands or arbitrage constraints are on different levels across stocks. Therefore, sentiment theory suggests that "the shares of certain firms—newer, smaller, more volatile, unprofitable, distressed, or with extreme growth potential, and firms with analogous

characteristics—are likely to be more affected by shifts in investor sentiment". Baker and Wurgler (2006) investigated this prediction empirically and found out that when sentiment is high, future returns are relatively low for small firms and vice-versa. So their findings support the theory that investor sentiment has more persistent effects on stocks that are difficult to value and difficult to arbitrage. In 2007, they also studied the patterns in stock prices and volume and found out, again, that low-capitalization firms are likely to be more sensitive to investor sentiment than others. Theoretically, it follows because these stocks tend to be harder to arbitrage and they are more difficult to value, making biases more subtle and valuation mistakes more likely.

As investor theory suggests and Baker and Wurgler (2007) showed evidence on the potential influence on both market-wide and cross-sectional components of sentiment, this study will attempt to discover the sentiment-driven mispricing- if there is any, that is prevalent among small capitalization firms due to small firm anomaly. The first step in fulfilling this attempt is to calculate the current intrinsic values of both the small-cap and big-cap firms that are quoted in the Turkish Stock Exchange, BIST, in 2022. The intrinsic values are calculated by using the Dividend Discount Model (DDM) following Shiller (1984), Fama and French (1988), and Foerster and Sapp (2006). The second step is to compare intrinsic values with current market values that are reflected in the market share price. And lastly, we tried to find out if there is a significant difference in the deviations between these two groups of companies.

This thesis study aims to calculate the deviations between the intrinsic values and the market prices of selected firms, quoted in Turkish Exchange markets in 2022 to detect if there is mispricing due to small firm anomaly, as the investor theory suggests so. The primary motivation to research this specific subject is to provide information on the small-size anomaly from a behavioral perspective in an emerging country such as Turkey. To our knowledge, an investigation on a small firm anomaly from investor sentiment theory's point of view has not been done before neither in Turkey nor in any other developing country. Turkey is a fast-growing country with a strong financial and real sector. As of June 2021, the asset size of the financial sector was 905.2 billion USD, corresponding to 133 percent of GDP. Turkey provides access to large domestic and regional markets via its geographic proximity to Europe, the Middle East, and Asia, and a liberal investment climate with robust investor protection. These key factors make Turkey an attractive destination for investment. Turkish capital markets, with more than 2,3 million investors, and a total of 625 publicly traded companies, 511 of which are traded on the stock exchange with a 332 billion$ market

capitalization, are preferred by the most renowned investors from all around the world (BIST, 2023; CMB, 2023). Therefore, providing empirical data on sentiment which is a source of risk that cannot be eliminated by diversification would help both foreign and domestic investors in their investment decisions. To be more precise which stocks to buy and which stocks to sell when forming a portfolio in order to better accommodate anomalies to consider mispricing, will be more profitable for investors. Moreover, a very important role that the stock market performs is the allocation of capital. Market allocation of capital can only be done optimally if the market prices approximate the true intrinsic prices. Only then the capital flow to those companies will earn the highest yield, increasing the productivity and finally the economic development of the country. Lastly, behavioral finance theory suggests that changes in security prices can be explained by investors' optimism or pessimism. Overpricing can occur for many stocks during periods of high sentiment. In other words, a firm's stock price can reflect the views of investors who are too optimistic (Stambaugh and Yuan, 2012). And if small stocks are affected by sentiment disproportionately as Baker and Wurgler (2006) demonstrated, when sentiment is estimated to be high, they tend to earn relatively low subsequent returns. This will facilitate investors to exploit abnormal returns by following sentiment indexes and/or proxies in Exchange markets. Besides, security issuance, initial public offerings (IPO) to be specific, will be affected by the sentiment in the market. Therefore, it is of utmost importance to adjust the timing of the issuance by the institutions and the authorities to fully benefit from raising equity capital and realize the full potential of capital markets.

The remainder of this paper is organized as follows; the following section includes both the theoretical and empirical discussions on the efficient market theory from a behavioral perspective. Afterward, the data and methodology of the research are discussed. Lastly, the results are presented, and the discussion and conclusion parts arrive.

2. VALUATION AND BEHAVIORAL FINANCE

The market collapse of 1929, the rapid rise and fall of technology stocks, the dot-com bubble, in the late 1990s, the run-up in stock prices from 2009, in the wake of the global financial crisis, and the bear market brought on by the novel coronavirus in 2020, understanding irrational investor behavior is as crucial as it has ever been and irrational investor behavior is examined by behavioral finance (Pompian, 2021). Behavioral finance is a finance field that has a broader social science perspective, including psychology and sociology (Shiller, 1981). It explains how human psychology influences how people make financial decisions and how it affects the market (Fuller, 1998). Prior to behavioral finance, behavioral economics can be traced back to Adam Smith's (1759) book "*The Theory of Moral Sentiments"* where his famous invisible hand made an appearance for the first time. He also explained financial matters from the perspective of psychology such as pride, shame, insecurity, and egotism. Fisher (1906) praises the risk-sharing benefits that accrue from informed speculation. He also states the impact of the uninformed speculator like the public on price behavior. Early economists gave much weight to emotions, impulses, stimulus, morals, and the like. However, at the beginning of the 20th century, economics turned away from psychology and the behavioral side of economics disappeared for over half a century. Simon (1955) and Smith (1962) questioned the concept of rationality and homo economic us of standard economics. But much of the credit should be given to Kahneman and Tversky (1979) for their decision-choice model, Prospect Theory which has taken the place of Expected Utility Theory. They are also considered to be the fathers of behavioral finance for demonstrating that the human brain relies on mental shortcuts and biases in the decision-making process under uncertainty leading to irrational choices.

Unlike traditional or standard finance, which is based on strong assumptions of how investors and markets should or might behave, such as homo economic us, mean reverting prices, and run like clockwork market institutions, behavioral finance replaces those assumptions with homo sapiens, people acting on emotions rather than on logic and divert its attention to how actual investors and markets behave. Behavioral finance assumes that investors' previous experiences, their current state of mind, or their ability to recognize opportunities are important influences on their decision-making process (Cross, Grinfeld, Lamba, and Seaman, 2005). Just as Statman (1995) states "*People in standard finance are rational. People in behavioral finance are normal".* So, investors are seen as normal investors, not rational

investors. These investors trade on rumors rather than on hard information. The 1980s were the milestone for the development of the behavioral finance field. Some researchers (Shiller, 1981; Le Roy and Porter, 1981) imply that changes in prices occur for no fundamental reason at all, that they occur because of such things as sunspots or animal spirits, or just mass psychology. Black (1986) introduced the concept of "*noise*" in its pioneering article and defined noise as anything that is contrasted with information. He states that investors sometimes trade on information and sometimes on noise. He also developed the concept of "*noise trading*" and suggested that noise traders are essential for the liquidity of the markets. He believed that without noise, just trading on information, it would be impossible to find both sides of the transaction. Therefore, prices will always reflect a portion of noise. As noise increases the more liquid the markets become, and the prices will also be less efficient. Shiller (1981), in his groundbreaking study, calculated rational real common stock price series, formed as the present value of subsequent detrended real dividends, and found that they are very stable and smooth series when compared with the actual detrended real stock price series. For the first time, he showed that there is excess volatility in the aggregate stock market, relative to the present value implied by the efficient markets model. West (1988), then, found that the variance of surprises in stock prices was four to 20 times its theoretical upper bound. DSSW (1990) created a model and investigated the excess volatility of asset prices and found out that the prices in the model are excessively volatile. The model also showed that the assets are underpriced relative to their fundamental values and that noise trading can lead to large deviations between market prices and fundamental values.These papers made clear that the level of volatility of the overall stock market cannot be explained with any variant of the efficient markets model in which stock prices are formed by looking at the present discounted value of future returns (Shiller, 2003).

2.1. Efficient Markets Hypothesis

The concept of an efficient market first emerged with Eugene Fama. Fama, who was under the tutelage of Merton H. Miller wrote his dissertation thesis in 1964 and explained the randomness of stock prices. According to Fama (1964), stock prices did not behave randomly because news relevant to stock prices occurred randomly or investors' opinions were randomly distributed along a bell curve. Rather, "sophisticated traders"—fundamentalists and chart readers—would profitably exploit any non-random patterns in the market and, in the process, make them go away. He stated that new information would cause the intrinsic values to change over time. He also stated that actual market prices are the best estimates of intrinsic

values, and he called this state of affairs “efficient market” (Chandra, 2016). Since the prices of securities traded on the stock exchange announced every piece of information that could be accessed, it would not be likely to make much returns or gains in efficient markets.

EMH is the hypothesis that actual capital markets are efficient. It asserts that stocks are always in equilibrium and an investor can't win the market all the time and get a higher return than the stock’s risk level. In other words, a stock’s market price is always equal to its fundamental value. If a stock’s market price is equal to the stock’s fundamental value, and a new piece of information arrives in the market, then EMH argues that since the fundamental value would change so will the market price but it will happen so quickly that there isn’t time for an investor to evaluate this information and take a position in the stock to make a profit from the subsequent price change (Brigham and Ehrhardt, 2020).

EMH evaluates market efficiency in three different types. These are informational efficiency, operational efficiency, and resource allocation. Informational efficiency is the degree to which prices correctly and quickly reflect all available information and thus the true value of an underlying asset. An informationally efficient market uses all available information in the formation of market prices. Operational efficiency means that those who supply and demand funds can make transactions in the market with minimum expenses. A market is said to be operationally efficient when the market participants perform their transactions and receive services at a price that is fairly equal to the actual costs required to provide them. Operationally efficient markets are typically a byproduct of competition. Finally, resource allocation means the optimal allocation of assets in the market (Karan, 2001).

There are three levels of market efficiency. These levels are determined by the kinds of information that is found in security prices. The first level denotes that security prices reflect all information contained in the record of past prices. This is called *weak efficiency*. If a market is in the weak-form efficiency, then prices would follow a random walk. The second level of efficiency suggests that security prices incorporate all the public information that is available to investors. This is called *semi strong efficiency*. If a market is in the semi-strong form of efficiency, then the prices will adjust themselves immediately to this new public information. Public information can be in the form of an announcement of earnings per share, a new issue of stock, a merger proposal, or a financial statement disclosure. Lastly, in a *strong form of efficiency*, prices reflect all the information, public and private, that can be collected by an analysis of companies and the economy (Brealey, Myers, and Allen, 2020).

EMH inserts that investor actions have no effect on the market, that investors act rationally, that all information is available in the markets beforehand, and that investors are stable and do not make mistakes. The market is always stable and efficient markets prevent the buying and selling of stocks by taking advantage of price differences in the sense of incurring losses and making excessive gains. In the absence of any action, this will be corrected in a short period due to the rule of supply and demand. Consequently, according to the EMH, all investors are known to behave rationally (Barone, 2003).

Market efficiency became the model of market behavior accepted by the majority of academics and professionals. It was the dominant investment theory from the 1960s until the 1990s.The hypothesis has been addressed from different perspectives and countless academic articles have been written on the subject. The idea that stock prices always incorporate the best information about fundamental values and that prices change only because of good, sensible information fit very well with the theoretical trends of the time. Only a small portion of empirical research rebuts the efficient market theory one of which is Fama's (1970) article reporting some anomalies like slight serial dependencies in stock market returns with the tone of pointing out how small they were. Then especially peaked at the 1990s, this model started to be criticized with the disclosure of all kinds of inconsistencies forming the anomalies literature (Shiller, 2003; Sharma, 2014).

2.2. Anomalies of EMH

EMH makes sense depending on the concept of arbitrage, in which market participants, *arbitrageurs* eliminate unexploited profit opportunities, meaning that returns on a security that is larger than what is justified by the characteristics of that security, or the equilibrium rate of return. If given its risk characteristics, the normal return on a security is smaller than the optimal forecast of the return at an annual rate ($Rof > R^*$), then the *arbitrageurs* buy more to exploit that profit opportunity driving up the current price relative to the expected price. The reverse is also true. If the optimal forecast of the return is smaller than the equilibrium return ($R^* > Rof$), because it would be a bad investment, you would sell the stock, decreasing its current price relative to the expected future price until the equilibrium point reached out and the efficient market condition is satisfied again. In an efficient market, all unexploited profit opportunities will be eliminated and it does not take all the market participants to be *arbitrageurs*, just a few rational investors will be enough to eliminate the unexploited profit opportunities (Mishkin and Eakins, 2018, 160). Theoretically this condition of "no

unexploited profit opportunities" would hold, but to establish that in reality, the data should be compared with theory. This is where behavioral finance stepped in since it is about testing the standard economic models by applying insights from laboratory experiments, psychology, and other social sciences. Although early evidence on the EMH was quite favorable, lately there have been some cracks which are called anomalies. Kumar, Motahari, and Taffler, (2023) explain market anomalies as the cross-sectional patterns in stock returns that are not fully explained by differences in systematic risk exposures, as measured by existing asset pricing models. Some of the well-known anomalies that arise against the EMHare as follows:

- The Overreaction Hypothesis: This hypothesis is put forward by De Bondt and Thaler (1985). Research suggests that investors value stocks with the information they find and overreact to the news about the company by adjusting their expectations very slowly. This is mostly caused by inexperienced investors paying more attention to new news than old ones. This situation refutes the view that information in efficient markets is immediately reflected in prices. The overreaction hypothesis also suggests that past prices and returns can be used to predict future prices and returns. This means that the efficient markets hypothesis also contradicts the view that the future cannot be predicted by looking at the past period (Jegadeesh and Titman, 1993).
- Timeliness of Profit: Ball and Brown (1968) described this anomaly for the first time. They analyzed earnings announcements on an annual basis and found that the price reactions associated with subsequent earnings announcements occurred before the announcement.
- Excessive Volatility**:** This anomaly refers to the fluctuations in stock prices and how they are greater than the fluctuations in their fundamental value. Shiller (1981) found that changes in the S&P 500 stock index could not be justified by the subsequent changes in the dividends of the stocks making up this index. He showed that the actual prices are affected by factors that are not related to fundamentals.
- Mean Reversion**:** This anomaly refers to a predictable change in the stock's future price, which also contradicts EMH. This predictability stems from the observation that stocks with low returns today tend to have high returns in the future, and vice versa (Poterba and Summers, 1988;Engel and Morris 1991, Jegadeesh and Titman, 1993).
- Calendar effects: Calendar effects are a group of anomalies that occur at particular times or on particular dates throughout the year so that stock market returns fluctuate significantly between these certain days or months. The first researcher to mention this

anomaly was French (1980) who found a weekend effect on the US stock market. The most researched calendar effects are the Monday effect, turn of the month, January effect, day of the week effect, and holiday effect.

- Momentum effect: This effect refers to the recent stock market 'winners' continuous upward trend to outperform the 'losers'. In other words, stocks with a strong upward trajectory are likely to continue to rise in the short to medium term. Jegadeesh and Titman (1993; 2001) consider the price momentum of individual stocks. They found that an investor can earn superior returns by holding a zero-cost portfolio that consists of long positions in stocks that have outperformed in the past which are called "winners" and short positions in stocks that have underperformed during the same period which are called "losers". This anomaly is accepted as one of the biggest challenges to asset pricing (Fama and French, 1996; Fama, 1998).
- Post-earnings-announcement drift-PEAD: This refers to a pattern that stock returns that will continue to move in the direction of surprise earnings for an extended period. Empirical evidence (Chordia and Shivakumar, 2002;Kim and Kim, 2003) showed that good-news firms, i.e., those with high unexpected earnings outperform bad-news firms even for a longer period that comes up to 60 days in practice. The results demonstrate that investors underreact to the information of earnings, and be able to make consistent returns in the markets. This is also known as the PEAD anomaly (Sadka, 2006).
- Value effect: This anomaly could be one of the most investigated anomalies in EMH literature (Zhang, 2005; Fama and French, 2006; Choi, 2013, Fama and French, 2021). This anomaly refers to the tendency of value stocks to outperform growth (glamour) stocks on the market. Value (glamour) stocks are known for low past sales growth, high (low) book-to-market (B/M), high (low) earnings-to-price (E/P), and high (low) cash flow-to-price (C/P) ratios. They are known to earn positive (negative) future abnormal returns (Desai, Rajgopal, and Venkatachalam, 2004). After Rosenberg, Reid, and Lanstein's (1985) proposition of a strategy that buys stocks with a high ratio of book value to market price and sells stocks with a low book/price ratio, many empirical studies have investigated this anomaly and found that value premium exists. Historically, growth stocks earn lower average returns than value stocks. This is against rational expectations because according to conventional wisdom, growth options depend on future economic conditions and, therefore, riskier than assets in place (Zhang, 2005). Also, if the market value per share is higher than the book value, a stock is marked as overvalued, and while this would usually

cause the market to correct, because of the value effect traders behave opposite to this correction practice and buy shares that are technically overvalued.

- Firm Size Anomaly: One of the best-known anomalies is, probably the size anomaly and it refers to a size premium for smaller companies. The outperformance of smaller companies has been documented in many studies since it was first reported by Reinganum (1981) and Banz (1981). They demonstrated that before 1980, US small-cap stocks had substantially higher returns compared to large-cap stocks even after adjusting for risk via CAPM. This anomaly is considered a rejection of the joint hypothesis that CAPM is correct and the market is efficient. Then it quickly created a fruitful field for the academicians to investigate this effect and if it exists in the markets (Brown, Kleidon, and Marsh, 1983; Keim, 1983; Barry and Brown, 1984; Chan, Hamao, and Lakonishok, 1991, Berk, 1995; Horowitz, Loughran, and Savin, 2000; Jacobsen, Mamun, and Visaltanachoti, 2005).

Since anomalies are the patterns in stock returns that are not explained by differences in systematic risk exposures, as measured by existing asset pricing models (Kumar, Motahari, and Taffler, 2023) it was only possible with the development of the CAPM that scholars were able to quantify these differences in returns. The violations of the CAPM have produced research into various explanations. Some explanations are from sentiment perspective (Baker and Wurgler, 2006; Hirshleifer, Hou, and Teoh, 2006; Stambaugh, Yu, and Yuan, 2012; Akbas, Armstrong, Sorescu, and Subrahmanyam 2015; Leung, Evans, and Mazouz, 2020); some from the demand of lottery like assets (Kumar, 2009; Bali, 2011; Jiang, Wen, Zhou, and Zhu, 2023); some from the preference for skewness (Schneider, Wagner, and Zechner, 2020; Kumar, Motahari, and Taffler, 2023); and some from market imperfections such as short-sale constraints (Nagel, 2003, 2005; Goel, Dash, Brooks, and Subramaniam, 2022). MacKinlay (1995) in his paper classified the possible explanations into two categories, risk-based and non-risk-based. The risk-based category assumes that the source of deviations from the CAPM is either missing risk factors or the misidentification of the market portfolio. The non-risk-based category includes biases introduced in the empirical methodology, the existence of market frictions, or explanations arising from the presence of irrational investors. Examples are data-snooping biases, biases in computing returns, transaction costs, liquidity effects, and market inefficiencies (MacKinlay, 1995).There has not yet been a consensus on the underlying reasons for these anomalies, whether they stem from mispricing or rational risk premiums (Shi, Wang, Xia, and Zhen, 2023). However, there is considerable empirical

literature linking anomalies to mispricing some of which are presented below since the intensity of the literature is beyond the scope of this thesis study.

2.2.1. A Brief Literature on the Anomalies and Mispricing

Shi et al. (2023) examined the arbitrage asymmetry effect on six well-known anomalies in China's stock market and found that anomalies are effective among overpriced stocks, but weaker or even reversed among underpriced stocks. Their finding suggests that arbitrage constraints stem mostly from short-sale constraints increasing the inefficiency of the stock market. Leung, Evans, and Mazouz (2020) investigated the risk versus mispricing explanations for the R&D anomaly and found that the R&D anomaly does not arise from the correction of stocks mispriced by investor sentiment. Stambaugh and Yuan (2017) construct a four-factor model with two mispricing factors in addition to market and size factors, which are the average of 11 prominent anomalies. They found out that the size factor reveals a substantially larger small-firm premium than usual estimates and anomalies reflect mispricing and possess common sentiment effects. In other words, all mispricing factors exhibit a significant relation to lagged investor sentiment. Li, Sullivan, and Garcia-Feijoo (2016) explored whether the anomalous returns associated with low-volatility stocks can be attributed to market mispricing or compensation for higher systematic factor risk. The results indicated that the relatively high returns of low-volatility portfolios cannot be viewed just as compensation for systematic factor risk. Akbas, Armstrong, Sorescu, and Subrahmanyam (2015) examined the price departures from fundamentals and provided evidence that dumb money (mutual funds) exacerbates stock market anomalies and smart money (hedge funds) attenuates them. Hirshleifer, Hou, and Teoh (2006) studied the accrual anomaly and documented considerable return comovement associated with accruals after controlling for other common factors. This finding favored a behavioral explanation for the accrual anomaly. Desai, Rajgopal, and Venkatachalam (2004) investigated whether the accruals anomaly is a manifestation of the glamour stock phenomenon documented in the finance literature. We find that a new variable, operating cash flows measured as earnings adjusted for depreciation and working capital accruals, scaled by price (CFO/P) captures mispricing attributed to the four traditional value-glamour proxies and accruals. Bernard, Thomas, and Wahlen (1997) examined six anomalies to decide if the anomalies represent market mispricing or reflect premia for unidentified risks. Their results indicate that earnings momentum anomaly reflects market mispricing, where two value-glamour and two computerized fundamental analysis

anomalies are more likely to reflect risk premia. Evidence on price momentum anomaly is mixed.

2.2.2. Investor Sentiment, Mispricing, and Small Firm Effect

Lee, Shleifer, and Thaler (1991) defined sentiment as the component of expectations about asset returns not warranted by fundamentals. Brown and Cliff (2004) explained sentiment as the representation of the expectations of market participants relative to a norm. Baker and Wurgler (2007) defined sentiment as beliefs about future cash flows and investment risks that are not justified by the facts at hand. Another definition belongs to Edelen, Marcus, and Tehranian (2010); investor sentiment is the general attitude or mood of investors toward a particular security or the market as a whole. All in all, the investor sentiment concept is at odds with standard finance and EMH which predicts that stock prices reflect the discounted value of expected cash flows and that irrationalities among market participants are erased by arbitrageurs (Schmeling, 2009). Sentiment can roughly be linked to speculative bubbles (Smidt, 1968), biased expectations (Zweig, 1973), social dynamics (Shiller, 1984), and noise (Black, 1986) in its early versions. Smidt (1968) argued that there are systematic dependencies in price changes and these dependencies may result from dependencies in the underlying information-generating process, the cost of transactions, the cost of acquiring and processing information, and, in general, all the frictions and lags that tend to be ignored in abstract discussions of perfectly competitive markets. Zweig (1973) developed a theory of investor expectations in which stock prices behave as a random walk within reflecting barriers. He showed that the returns of a closed-end fund predictive model significantly beat random returns. Shiller (1984) presented evidence that social movements, fashion, and fads might be the dominant cause of speculative asset price movement. Black (1986) suggested that what causes the market prices to be less efficient is noise and noise trading. Noise is anything against information; it can be in the form of uncertainty about the future or in the form of expectations that do not follow rational rules. It is adversified array of causal factors that explains what happens in the real world. He also argued that information traders (arbitrageurs) will offset the prices which includes noise. Eventually, the price of a stock will move back toward its value, but the move will often be so gradual that it is unperceivable. However, many researchers (Shleifer, 2000; Brown and Cliff, 2005; Barber, Odean, and Zhu, 2009) argue that sentiment is a persistent effect and demand shocks of uninformed noise traders are correlated over time, so they give rise to persistent and systematic mispricing.

The first argument of why EMH will not be able to fully correct the prices in the market is related to the highly correlated and persistent behavior of the noise traders so that the deviations from rationality are often in the same direction. This argument, together with the limited arbitrage theory makes investor sentiment a building block of the behavioral finance field and why it could be amongst one of the most possible reasons for the anomalies to exist in the markets. Limited arbitrage theory asserts that there is no perfect substitution between two risky securities, so there will be no risk-free arbitrage and there will be a limit to it. In real life, except for derivative instruments, arbitrage without risk is not possible because there is no perfect substitute for that security. Therefore, arbitrageurs, who are thought to bring the prices of securities closer to their fundamental values, also be limited in that function.

Shleifer and Vishny (1997) showed that performance-based arbitrage is particularly ineffective in extreme circumstances, where prices are significantly out of line and arbitrageurs are fully invested. Shleifer (2000) demonstrated that there will always be two different sources of risk in arbitrage transactions; the first one is the noise trader risk. Noise trader risk refers to the idea that both noise traders and arbitrageurs limit their demands for the asset because the price at which they can sell depends on the uncertain beliefs of the young noise traders. This uncertainty about the price afflicts all investors and limits the extent to which they are willing to beta gainst each other. On the other hand, if the price were certain, they would hold different beliefs about expected returns with certainty, and they would try to take infinite bets against each other. An equilibrium would not exist in either case. Noise trader risk limits all investors' positions and in particular, keeps arbitrageurs from driving prices to fundamental values. The second source of risk is the fundamental risk. An arbitrageur who sells an overpriced stock in the market and replaces it with a similar but fairly priced stock might encounter any unexpected news about the asset he sold and may be faced with the challenge that the price changes are not in line with his earlier expectations.

The efficiency of the markets is not fully functioning due to the limited arbitrage theory. However, which form of efficiency prevails in the market cannot be understood simply by knowing that arbitrage is limited. In this case, investor sentiment, which is the second foundation of behavioral finance, is needed. Investor sentiment theory reveals how investors form their beliefs in the real world, and what norms and values provide a foundation for their decision-making process. Investor sentiment theory, along with limited arbitrage, can help predict security prices and returns (Shleifer, 2000).Several articles provided information on systematic mispricing because of the sentiment effect in the financial markets (Shiller, 1981;

Daniel and Titman, 1997; Nealand Wheatley, 1998; Shleifer, 2000; Wang 2006) and evidence of mispricing affecting the asset prices (Otto, 1999; Brown and Cliff, 2004; Baker and Wurgler, 2006; Chung, Hung, Yeh, 2012).The evidence that sentiment influences the mispricing of the assets is in line with the common sense of valuation. If investors have all the available information, the market price should be equal to the intrinsic value. However, research showed that investors are led by their emotions and use shortcuts when making risky decisions, therefore they do not rationally process information (Kahneman, Slovic, and Tversky, 1982). This deviation from rationality would lead to the possibility that the prices that are formed in the market do not accurately reflect even the public information. If this public information is not fully reflected in stock prices, then it would not be wise to expect the intrinsic value of a common stock to be equal to its market price (Titman, Keown, and Martin, 2018, 245)**.** Because of the presence of irrational traders, sentiment exists in the markets, so prices are not always at their fundamental values (Lee, Shleifer, and Thaler, 1991). In other words, investor sentiment drives stock prices away from fundamental values. The behavior of noise traders is correlated, and the prices of assets that are owned by noise traders may deviate from their intrinsic values for extended periods making it difficult to capture the true value of the stocks (DSSW, 1990; Shleifer and Vishny, 1997). As a result, mispricing arises out of the combination of two factors: a change in investor sentiment on the part of the irrational traders, and a limit to arbitrage from the rational ones leaving some stocks over-valued, and some under-valued (Baker and Wurgler, 2007).

Recent empirical studies have found that small capitalization firms yield higher average returns than large firms even when their riskiness is equal (Banz, 1981; Reinganum, 1981; Barry and Brown, 1984; Chan, Hamao, and Lakonishok, 1991, Berk, 1995; Horowitz, Loughran, and Savin, 2000). The debate has been on the disproportionate effect of the mispricing of small firms due to investor sentiment; and whether noise traders are putting noise, cumulatively on small capitalization firms to the extent that is higher than large capitalization firms. There is evidence that individual investors mostly trade on noise (Black, 1986)and fail to diversify, instead holding a small stock or several small stocks (Lease, Lewellen, and Schlarbaum, 1974). Lee, Shleifer, and Thaler (1991) argued that noise traders are mostly individual investors, and these individual investors own small stocks as opposed to institutions. Following these arguments this thesis study's focus is on the mispricing of small and large firms and if there is a disproportionate effect of the valuation amongst them from the perspective of investor sentiment.

Lee, Shleifer, and Thaler (1991) are among the first researchers to investigate the size effect from the sentiment perspective and found that the small firm effect may be clientele-related. First, the authors wanted to empirically present an alternative explanation for the closed-end fund puzzle. Their analyses showed that closed-end fund discounts are a measure of investor sentiment of individual investors. Accordingly, they hypothesized that if sentiment affects closed-end fund discounts, and closed-end funds are primarily held by individual investors suggested by Weiss (1989), it should also affect other securities that are held and traded by individual investors. The authors examined small capitalization firms since individual investors specialize in holding smaller stocks. They discovered that the same sentiment affects returns on smaller capitalization stocks as well. Their findings demonstrated that sentiment is widespread to affect the small stocks prices as well as the prices of closed-end funds. Therefore, different levels of sentiment make funds riskier than the portfolios they hold and cause average underpricing of funds relative to fundamentals. Since the same investor sentiment affects smaller stocks and makes them riskier, *smaller stocks must also be underpriced relative to their fundamentals.*

Neal and Wheatley (1998) investigated the explanatory power of three different investor sentiment measures in predicting returns. These measures are the level of discounts on closed-end funds, the ratio of odd-lot sales to purchases, and net mutual fund redemptions. Using data from1933 to 1993, authors discovered that fund discounts and net redemptions successfully predict the size premium.

Glushkov (2004) examined the "hard-to-value, difficult-to-arbitrage" (HV-DA) hypothesis of noise trader behavior during the period 1975-1999 and found evidence to support HV-DA. Stocks with higher sentiment tend to be smaller, younger, and more liquid stocks with lower earnings, cash flows, and dividend yields as well as greater volatility and short sales constraints. Glushkov also investigated the role of arbitrageurs which are presumed to be institutional investors and be able to correct mispricing caused by noise traders so he conducted regression analysis in different sub-periods. He discovered in the 80's institutions were avoiding exposure to the stocks with higher noise trader risk while in the 90's, institutional behavior changed to investing in stocks with higher noise trader risk to exploit the predictable patterns in the noise trader demand.

Brown and Cliff (2005) investigated whether sentiment can affect asset valuation. They constructed two hypotheses. The first hypothesis is that excessive optimism leads to periods

of market overvaluation and the second is that high current sentiment is followed by low cumulative long-run returns as the market price reverts to its intrinsic value. This research is different from others in the way that they use a direct sentiment measure such as a survey instead of using sentiment proxies. Their empirical tests concentrate on relating sentiment levels directly to stock price deviations from fundamental value and on the long-run effects of sentiment on stock returns. To test their first hypothesis, they use Dow Jones Industrial Average pricing errors to proxy mispricing. Regression results supported both hypotheses that sentiment is related to mispricing and it is also related to long-run stock returns. Their findings showed that a high level of sentiment results in lower returns over the next 2 or 3 years. They have also found out that this effect is concentrated in large capitalization growth stocks.

Kumar and Lee (2006) examined the patterns in stock returns in retail trading and showed that the activities of retail investors contain a common component—when retail investors buy (sell) one group of stocks, they tend to buy (sell) other groups. In addition, authors found that retail investor sentiment changes affect small stocks, value stocks, stocks with low institutional ownership, and stocks with lower prices. The relationship between the small stock return and sentiment changes in the same direction. When retail investors are bullish (bearish), the stocks in these portfolios have higher (lower) excess returns. These results are in support of the noise trader hypothesis in which the systematic activities of retail investors affect the returns of those stocks which tare mentioned above.

Lemmon and Portniaguina (2006) explored the effect of investor sentiment on small stocks. Investor sentiment is proxied by consumer confidence survey. The main assumption behind this research is that the small stocks are disproportionately held by individual investors as opposed to institutions therefore individual investors are more likely to be affected by sentiment. The results revealed that investor sentiment explains the returns of small stocks and stocks with low institutional ownership as the noise trader model suggested between 1978 and 2004.Authors also found that the mispricing is negatively correlated with the sentiment and small stocks earn low returns relative to large stocks following quarters when the sentiment is high. This result is consistent with the behavioral perspective that investors overvalue small stocks during periods of optimism and vice versa. The results supported the view that stocks owned by individual investors are more prone to mispricing that rises from changes in sentiment.

Baker and Wurgler (2006, 2007) studied how investor sentiment affected the cross-section of stock returns and *which* stocks were likely to be *most* affected by sentiment between 1962 through 2001. Mispricing is examined through the systematic patterns of mispricing *correction* by forming a conditional characteristics model and investor sentiment is represented by an index that is based on the common variation in 6 determinants; the closed-end fund discount, NYSE share turnover, the number and average first-day returns on IPOs, the equity share in new issues, and the dividend premium. The results revealed that a wave of investor sentiment has larger effects on securities whose valuations are highly subjective and difficult to arbitrage. They showed that when sentiment is low, subsequent returns are relatively high for small stocks, young stocks, high volatility stocks, unprofitable stocks, non-dividend-paying stocks, extreme growth stocks, and distressed stocks. These stocks are appealing to optimists and speculators but unappealing to arbitrageurs. When sentiment is high, small stocks earn relatively low subsequent returns. The most important finding of their research is that several firm characteristics that display no unconditional predictive power actually have strong conditional patterns that become visible only after conditioning on sentiment.

Schmeling (2009) investigated the relationship between investor sentiment and future stock returns for 18 industrialized countries. The author used consumer confidence surveys to represent investor sentiment. Panel regression results showed that sentiment negatively forecasts aggregate stock market returns on average across countries. When sentiment is high, future stock returns tend to be lower and vice versa and the predictive power of sentiment is most pronounced for short and medium-term horizons of one to six months and washes out over longer horizons of 12 to 24 months. The authors also examined if the effect of sentiment on returns is stronger for stocks that are hard to value and/or hard to arbitrage, like growth stocks, value stocks, and small stocks. They found out that sentiment has also an effect on the returns of value stocks, growth stocks, and small stocks.

Ben-Rephael, Kandel, and Wohl (2012) investigated aggregate net exchanges of equity funds as sentiment and its effect on aggregate stock market excess returns via VAR analysis. The analysis period ranges from February1984toDecember2008 and results indicated positive contemporaneous relation between the variables. Findings also suggested that net exchanges as a sentiment measure have a stronger effect on smaller stocks and on growth stocks.

Hribar and McInnis (2012) investigated the effect of inaccurate analysts' forecast errors on the changes in investor sentiment and found that sentiment affects the earnings expectations of hard-to-value firms. When sentiment is high, analysts' earnings forecasts and long-term earnings growth become more optimistic for "uncertain" or "difficult-to-value" firms which are considered to be small, young, unprofitable, and highly volatile. This finding provides direct support for the notion that investor sentiment affects the earnings expectations of hard-to-value firms.

Yang and Zhou (2015) examined the roles of investors' trading behavior and investor sentiment on asset prices. They used four different proxies to construct a sentiment index by employing a principal component analysis. These proxies are the relative strength index (*RSI*), psychological line index (*PSY*), trading volume (*VOL*), and adjusted turnover rate (*ATR*).They measured the trading behavior of investors as the aggregate buy and sell imbalance. Results revealed that both investor trading behavior and investor sentiment have significant effects on excess returns and this effect is more prevalent on the small stocks compared to large stocks.

Stambaugh and Yuan (2017) examined the systematic changes in realized returns by constructing a four-factor model. This model includes mispricing factors, in addition to market and size factors. Mispricing factors are the long-short return spreads which partly reflect mispricing and also possess common sentiment effects. The sample period is from 1967 through 2013. The model revealed that investor sentiment predicts the mispricing factors, particularly their short (overpriced) legs but not the size factor. Though size factor revealed a larger small-firm premium than usual estimates.

Qadan and Aharon (2019) examined whether investor sentiment has an explanatory power on the size premium. They used market-based, press-based, and survey-based measures to represent investor sentiment between 1965 and 2017. They demonstrated that investor sentiment correlates with the size premium and also serves as a tool for predicting the premium. As a result, authors have demonstrated that investors overvalue small stocks relative to large stocks when the investor sentiment is strong, and the opposite is correct as well.

Wang, Su, and Duxbury (2021) investigated the impact of investor sentiment on future stock returns in world-wide stock markets. They used the consumer confidence index to proxy the investor sentiment. Panel regression results documented a negative relationship between sentiment and future stock returns at the global level. Another important finding of the study

is the time horizon that sentiment prevails which is from 1 to 12 months in emerging markets as opposed to 2 to 36 months in developed markets. This result suggested that the impact of investor sentiment is much more immediate in emerging markets whereas it is more persistent in developed markets. Evidence also showed that small stocks and value stocks are more affected by investor sentiment compared to large stocks and growth stocks in both developed and emerging markets.

Investor sentiment may influence financial markets in the presence of limited arbitrage. Along with noise trading, limits to arbitrage drive the prices of the securities to deviate from their fundamental values. This makes investor sentiment a possible candidate for the explanation of anomalies in the market, size premium anomalies to be specific. Much of the evidence cited above points out that market participants tend to overvalue small stocks relative to large stocks during the waxing period of sentiment. We, therefore, hypothesize that there is a difference in the deviations from intrinsic values relative to their market prices between small and large firms. The expectation is straightforward. If anomalies reflect mispricing and mispricing has mutual factors across stocks as investor sentiment (Stambaugh and Yuan, 2017) then it is only logical to expect that the deviations between the intrinsic values and market prices would be higher in the small firms compared to large firms. Besides, the difference in deviations, if exists, is expected to be statistically significant. The next section will present the methodology of this research.

3. RESEARCH METHODOLOGY

Fundamental analysis is a method of assessing the intrinsic value of a stock. What determines the value is that the company's ability to generate cash flows, now and in the future. The ability to generate cash flows is the lifeblood of a company and the basis for its fundamental analysis. When the expected future cash flows incorporate all relevant information in other words, when the markets are efficient, the value is called the intrinsic or fundamental value (Brigham and Ehrhardt, 2020). Fundamental value analysis is essential in three ways. First, by looking at the price chances of the company's shares we can decide if the company is financially safe and sound. If the stock price is used to assess the performance, then a better understanding of what determines the price is needed the most. Second, even if a company is not quoted in the exchange markets, it may still wish to find out about its own worth as if it were traded as a public company. And lastly, a firm that acts in its shareholders' interest should accept capital investments that increase the value of their stake in the firm. To do this, the financial manager needs to understand what determines the value of the firm's shares (Brealey, Myers, and Allen, 2020).

There are many ways to calculate the fundamental value of the stocks such as the discounted cash flow model, dividend discount model, comparable method, residual income method, and so on. Regardless of the method, common stock is the most burdensome to value in practice for at least three reasons. First, there is no way of knowing the cash flows before they occur. Second, the valuation horizon is eternal since common stock has no maturity. And third, there is no easy way to measure the rate of return that the market requires.

Dividend Discount Model is a valuation method that is used for valuing a stock. It is based on determining the residual share that belongs to common stockholders. The dividends per share are the cash flows that go directly to the holder of the stock, so if the dividends are discounted at the rate of return required by the stockholders, the result is the intrinsic value of the stock (Brigham and Ehrhardt, 2020). The difficulty with this model is to come up with a stock price off into the future forever. The current price of the stock is written as the present value of the dividends beginning in one period and extending out forever. The formula is shown as

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \ldots$$

To calculate the current price of the stock according to the formula a simplifying assumption about the pattern of future dividends has to be made. Other than the dividends have a zero

growth rate and a nonconstant growth rate; the assumption that dividends grow constantly, is a model called the Constant Growth Model. If the dividend grows at a stable rate, then the problem of forecasting an infinite number of future dividends is solved but an other problem occurs which is to find a single growth rate. However, determining a single growth rate is a simpler problem. In this case, if *D*0 is the dividend just paid and *g* is the constant growth rate, the value of a share of stock can be written as

$$P_0 = \frac{D^1_{0(\{1+g)\}}}{(1+r)^1} + \frac{D^2_{0(\{1+g)\}}}{(1+r)^2} + \frac{D^3_{0(\{1+g)\}}}{(1+r)^3} + \ldots$$

As long as the growth rate, *g* is less than the discount rate, *r*, the present value of this series of cash flows can be written as

$$P_0 = \frac{D_0 * (1+g)}{r-g} = \frac{D_1}{r-g}$$

This model assumes that the price of the stock would grow at the same rate as the dividends grow. Therefore if the dividends of the stock grow at at a steady rate, so does the value of that investment (Ross, Westerfield, & Jordan, 2023).

Estimating g which is the growth rate in dividends is the difficulty of this model. There are a few ways to come up with a decent figure. Expected growth in the long term is strongly linked with long-term sales and profits. Long-term sales and profit are associated with inflation, growth in population, and productivity. Inflation is important because it has an effect on the dollar value of the sales. Population growth is important because unit volume goes up with the increase in population, and productivity is important because it has a direct effect on the profits of the company. So the first way to calculate the dividend growth rate is to add up inflation and population growth (Brigham and Ehrhardt, 2020). Another way is to refer to the views of financial analysts who study companies' private and public information thoroughly. Historical dividend data can also be used to come up with a single estimation of expected growth. One last common practice is to relate the payout ratio**,** to earnings per share (Brealey, Myers, and Allen, 2020, 88). It is calculated as follows:

$$\text{Dividendgrowthrate} g = \text{plowbackratio} * \text{ROE}$$

$$\text{Plowbackratio} = 1 - \text{payoutratio} = 1 - \frac{Div}{EPS}$$

$$\text{ROE} = \frac{EPS}{bookequitypershare}$$

After deciding on the best estimation of the growth rate in dividends, *r* the discount rate in the denominator needs to be calculated. *r* is the market capitalization rate or cost of equity capital, which is the alternative name for the opportunity cost of capital, defined as the expected return on all other securities within the same risk group as the stock in valuation. It is also called the fair return on equity, which at the same time, is the cost of equity—that is, the rate offered by securities that have the same risk as the company's common stock in the valuation process. The cost of equity can be calculated in two ways. The first one is the DDM. The second method is the Capital Asset Pricing Model (CAPM). CAPM is a theory that describes the relationship between systematic risk and the expected rate of return on risky investments. The expected rate of return for an investment that involves risk is determined by three factors. These are the risk-free rate, the beta to represent the systematic risk of the company, and the market rate of return.

$$\text{Cost of Common Equity} = \text{Risk free rate} + \text{Equity Beta Coefficient} * (Expected\ return\ on\ the\ market\ portfolio - Risk\ free\ rate)$$

The model is easy to understand and calculate hence it has a wider applicability (Titman, Keown, and Martin, 2018).

This thesis study aims to calculate the deviations between the intrinsic values and the market prices of selected firms, quoted in Turkish Exchange markets to detect if there is mispricing due to small firm anomaly, as the investor theory suggests so. DDM model, specifically the Gordon Growth model is used to calculate the intrinsic values. The required rate of return is proxied by return on invested capital (ROIC). ROIC is a profitability measure of the return earned on the capital invested in all the projects that the firm has on its assets in place. ROIC is mostly used for the comparison with the firm's cost of capital to conclude whether the firm has collectively invested in good projects (Damodaran, 2007). It is calculated as:

$$\text{ROIC} = \backslash frac\{\{Operating\ Income\}_{t(1-tax)}\}\{\{Book\ Value\ of\ Invested\ Capital\}_{\{t-1\}}\}$$

$$\text{After tax Operating Income} = \text{EBIT}(1 - tax)$$

$$\text{Invested Capital} = \text{Fixed Assets} - \text{NonCash Working Capital}$$

$$\text{NonCash Working Capital} = \text{Current Assets} - \text{Current Liabilities} - \text{Cash}$$

This is a ratio of how good a company is doing in transforming its capital into income. Investors use this measure to assess whether their contributed capital is being used effectively and in the optimum manner. It is practically the rate of return on the firm's existing operations. ROIC is used in the valuation calculation. The basic assumption for that is if a firm is generating higher returns on its investments relative to its cost this means that it is earning excess returns which will lead the company to trade at a premium when compared to a firm that does not earn excess returns. Therefore, for a firm to sustain its presence, its ROIC should be as minimal as its cost of capital. Discounting the future cash flows, dividends in our case make sure the investment is attractive relative to the capital's opportunity cost, the return on the next best alternative (Mauboussin and Callahan, 2022).

In this study dividend growth rate is calculated historically. To be mathematically correct three basic filters are applied to the data. First, only the companies that paid dividends were selected. In BIST there are two different indices are calculated for the companies that regularly pay dividends. The first one is the ISE Dividend Index. This index consists of the stocks of 44 companies traded on the Stars, Main, and Submarket, all of them having distributed cash dividends in the last 3 years, and has been calculated since July 2011. The other index is the ISE Dividend 25 Index. This index consists of 25 stocks placed in the first 2/3 slice in the ranking of the constituents of the ISE Dividend Index in descending order according to dividend yield as of the review day and has the highest average free float market value. ISE Dividend Index is used to proxy the small-cap firms whereas ISE Dividend 25 Index is used to capture the large-cap firms. The second filter is to include the companies whose growth in dividends does not exceed their ROIC rates utilized due to the DDM model's restriction. And third, instead of 3, companies with at least 5 years of cash dividend distributions are included in the analysis. Having the companies sorted out on these filters would leave the data with 34 companies of which 21 of them belong to the ISE Dividend Index and 13 to the ISE Dividend25 Index. After filtering the companies according to the restrictions mentioned above ISE Dividend 25 and ISE Dividend Index Companies are as follows:

Table 1. ISE Dividend Index and ISE Dividend 25 Index Companies

ISE Dividend 25 Index Companies			**ISE Dividend Index Companies**	
	Name	**Sector**	**Name**	**Sector**
1	ANADOLU EFES	FOOD, BEVERAGE AND TOBACCO	ACIPAYAM SELULOZ	MANUFACTURING
2	AKSA	MANUFACTURING	AKCANSA	MANUFACTURING
3	ALKIM KIMYA	MANUFACTURING	ALKIM KAGIT	MANUFACTURING
4	BIM MAGAZALAR	WHOLESALE AND RETAIL TRADE	ARENA BILGISAYAR	INFORMATION TECHNOLOGY
5	COCA COLA ICECEK	FOOD, BEVERAGE AND TOBACCO	ARZUM EV ALETLERI	FABRICATED METAL PRODUCTS MACHINERY
6	EGE ENDUSTRI	FABRICATED METAL PRODUCTS	BOSCH FREN SISTEMLERI	FABRICATED METAL PRODUCTS MACHINERY
7	EREGLI DEMIR CELIK	MANUFACTURING	CEMTAS	MANUFACTURING
8	FORD OTOSAN	FABRICATED METAL PRODUCTS	DEVA HOLDING	MANUFACTURING
9	OTOKAR	FABRICATED METAL PRODUCTSMACHINERY	EGE GUBRE	MANUFACTURING
10	TURKCELL	FABRICATED METAL PRODUCTS	EGE SERAMIK	MANUFACTURING
11	TOFAS OTO. FAB.	FABRICATED METAL PRODUCTS	ERBOSAN	MANUFACTURING
12	TURK TRAKTOR	FABRICATED METAL PRODUCTS	F-M IZMIT PISTON	FABRICATED METAL PRODUCTS MACHINERY
13	VESTEL BEYAZ ESYA	FABRICATED METAL PRODUCTS	KARTONSAN	MANUFACTURING
14			KAFEIN YAZILIM	INFORMATION TECHNOLOGY
15			NUH CIMENTO	MANUFACTURING
16			POLITEKNIK METAL	MANUFACTURING
17			TURK PRYSMIAN	FABRICATED METAL PRODUCTS MACHINERY
18			SARKUYSAN	MANUFACTURING
19			SELCUK ECZA DEPOSU	MANUFACTURING
20			TAT GIDA	FOOD, BEVERAGE AND TOBACCO
21			YUNSA	TEXTILE, WEARING APPAREL AND LEATHER

To be able to calculate the deviations between the intrinsic values and the market prices of the firms that are presented in Table 1 to detect the mispricing in the Turkish Exchange markets, companies' ROIC and growth in dividends are calculated. ROIC rates belong to the last month of 2022 (12/22) to represent P0. This rate is taken from a software called Stockeys Pro which belongs to a popular financial data distributor, FINNET group. Past dividend distributions of the companies are also taken from Stockeys Pro and the growth rates are calculated accordingly. The last dividend per share (D0) and planned dividend distribution for the current year are retrieved from IŞ INVESTMENT. Before moving on with the analysis the discount rates and growth rates are presented in Table 2.

Table 2. ISE Dividend Index and ISE Dividend 25 Index Companies' Discount & Growth Rates

ISE Dividend 25 Index Companies				**ISE Dividend Index Companies**		
	Name	**r-ROIC**	**g-min 5 ys**	**Name**	**r-ROIC**	**g-min 5 ys**
1	ANADOLU EFES	0,2853	0,2578	ACIPAYAM SELULOZ	0,2944	0,2160
2	AKSA	0,6228	0,2809	AKCANSA	0,3167	0,2844
3	ALKIM KIMYA	0,876	0,4160	ALKIM KAGIT	1,2479	0,3801
4	BIM MAGAZALAR	0,3017	0,2837	ARENA BILGISAYAR	0,3248	0,2019
5	COCA COLA ICECEK	0,2941	0,1864	ARZUM EV ALETLERI	0,2838	0,1747
6	EGE ENDUSTRI	0,4638	0,3905	BOSCH FREN SISTEMLERI	0,7338	0,3198
7	EREGLI DEMIR CELIK	0,18	0,0834	CEMTAS	0,5546	0,4658
8	FORD OTOSAN	0,4442	0,3725	DEVA HOLDING	0,2023	0,1961
9	OTOKAR	0,1519	0,1185	EGE GUBRE	0,4871	0,32
10	TURKCELL	0,207	0,1075	EGE SERAMIK	0,4243	0,2834
11	TOFAS OTO. FAB.	1,38	0,7472	ERBOSAN	0,333	0,2891
12	TURK TRAKTOR	1,08	0,9528	F-M IZMIT PISTON	0,5531	0,4440
13	VESTEL BEYAZ ESYA	0,2115	0,1394	KARTONSAN	0,7247	0,5504
14				KAFEIN YAZILIM	0,2412	0,1814

Table 2. ISE Dividend Index and ISE Dividend 25 Index Companies' Discount&Growth Rates(Continued)

15				NUH CIMENTO	0,3995	0,2802
16				POLITEKNIK METAL	0,7725	0,5705
17				TURK PRYSMIAN KABLO	1,21	0,5080
18				SARKUYSAN	0,2277	0,1094
19				SELCUK ECZA	0,5317	0,3455
20				TAT GIDA	0,1357	0,0535
21				YUNSA	1,0213	0,8797

As seen from Table 2 all the companies that are included in two different indices have higher r values compared to their growth rates. Then companies' intrinsic values can be calculated with the Gordon Growth Model. Section 5 presents the analysis results according to the model that is employed in the analysis and a statistics test, Welch t-test to capture the differences between these two groups of companies' market and fundamental values.

4. ANALYSIS RESULTS

This section covers a detailed evaluation of the results of Welch's t-test analysis in search of the significant difference in between the deviations of small-cap and big-cap firms' market and intrinsic values that are quoted in Turkish exchange markets as per the investor sentiment theory suggests so. To find out if two groups of companies that are placed in two different market indices representing the small and large-cap firms have significant deviances from their market values, intrinsic values should be calculated first. Intrinsic values are calculated with the Gordon Growth Model. Table 3 reports the intrinsic and the market values of ISE Dividend 25 Index Companies intrinsic and market values and the differences between them.

Table 3. ISE Dividend 25 Index Companies' Difference in Inrinsic & Market Values

ISE Dividend 25 Index Companies					
	Name	**P0-Intrinsic Values**	**P0-Market Values**	**Difference**	**Over/Under Values**
1	ANADOLU EFES	48,75	66,53	-17,78	Undervalued
2	AKSA	9,03	89,01	-79,98	Undervalued
3	ALKIM KIMYA	2,85	38,08	-35,23	Undervalued
4	BIM MAGAZALAR	214,17	135,25	78,92	Overvalued
5	COCA COLA ICECEK	32,47	202,04	-169,57	Undervalued
6	EGE ENDUSTRI	1308,25	6101,69	-4793,44	Undervalued
7	EREGLI DEMIR CELIK	49,91	41,26	8,65	Overvalued
8	FORD OTOSAN	272,81	512,35	-239,54	Undervalued
9	OTOKAR	697,49	207,6	489,89	Overvalued
10	TURKCELL	11,44	37,8800	-26,44	Undervalued
11	TOFAS OTO. FAB.	16,57	160,27	-143,70	Undervalued
12	TURK TRAKTOR	604,16	329,48	274,68	Overvalued
13	VESTEL BEYAZ ESYA	37,06	71,25	-34,19	Undervalued

As seen from Table 3, out of 13 only four companies are overvalued according to the Model. Table 4 presents ISE Dividend Index Companies' intrinsic and market values and the differences between them.

Table 4. ISE Dividend Index Companies' Difference in Inrinsic & Market Values

ISE Dividend Index Companies					
	Name	**P0-Intrinsic Values**	**P0-Market Values**	**Difference**	**Over/Under Values**
1	ACIPAYAM SELULOZ	2,33	76,73	-74,40	Undervalued
2	AKCANSA	51,93	60,63	-8,70	Undervalued
3	ALKIM KAGIT	0,85	36,40	-35,55	Undervalued
4	ARENA BILGISAYAR	1,01	21,08	-20,07	Undervalued
5	ARZUM EV ALETLERI	5,01	25,39	-20,38	Undervalued
6	BOSCH FREN SISTEMLERI	77,48	3950,00	-3872,52	Undervalued
7	CEMTAS	8,25	12,76	-4,51	Undervalued
8	DEVA HOLDING	28,84	68,94	-40,10	Undervalued
9	EGE GUBRE	11,49	103,13	-91,64	Undervalued
10	EGE SERAMIK	20,58	9,10	11,48	Overvalued
11	ERBOSAN	33,04	184,55	-151,51	Undervalued
12	F-M IZMIT PISTON	19,32	195,78	-176,46	Undervalued
13	KARTONSAN	16,35	96,71	-80,36	Undervalued
14	KAFEIN YAZILIM	2,00	31,31	-29,31	Undervalued
15	NUH CIMENTO	49,36	114,97	-65,61	Undervalued
16	POLITEKNIK METAL	15,62	1400,00	-1384,38	Undervalued
17	TURK PRYSMIAN KABLO	0,37	36,12	-35,75	Undervalued
18	SARKUYSAN	2,34	25,10	-22,76	Undervalued
19	SELCUK ECZA DEPOSU	1,81	40,20	-38,39	Undervalued

Table 4. ISE Dividend Index Companies' Difference in Inrinsic & Market Values (Continued)

20	TAT GIDA	4,29	36,00	-31,71	Undervalued
21	YUNSA	67,90	40,03	27,87	Overvalued

As seen from Table 4, out of 21 only two companies are overvalued according to the Model. It is apparent that there is mispricing exists in both groups of companies. This can either be explained by the behavioral factors or the information asymmetry. To be able to find out which group has more price deviations between the calculated intrinsic value and its matching market value, the Welch t-test is used. Before the test results, descriptive statistics are presented in Table 5 for the sample populations.

Table 5. Descriptive Statistics of ISE Dividend 25 and ISE Dividend Index Firms' Deviations in Values

	DIF	DIF25
Mean	-292.60	-257.40
Median	-35.75	-34.19
Maximum	27.87	489.89
Minimum	-3872.52	-3452
Std. Dev.	871.88	978.65
Jarque-Bera	173.16	52.03
Probability	0.0000	0.0000
Observations	21	13

When the means of the two groups are compared, small-cap firm data's mean is seen to be higher. The negative number indicates the undervaluation in both groups. In order to capture the difference in deviations between intrinsic values and market values in both groups, Welch's t-test is employed. Welch's t-Test is a two-sample test which is used to test the (null) hypothesis that two populations have equal means and the samples are drawn from different populations or population variances of the two groups are not the same (Rajaretnam, 2015). The test statistics of Welch's t-test are as follows.

$$t = \frac{\Delta\bar{X}}{s_{\Delta\bar{X}}} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{s^2_{\bar{X}_1} + s^2_{\bar{X}_2}}} \qquad (5)$$

The first thing to be investigated with the Welch T-test is if the observations from one of the populations tend to be smaller/larger than the observations from the other population. With t-tests, we can make inferences about the two common measures of central tendency namely, the mean and the median. Textbooks recommend using Student's *t*-test if either the two sample sizes are similar or the two sample variances are similar, and to use Welch's *t*-test only when both of the above conditions are violated. However, a more recent recommendation seems to be to use Welch's *t*-test unconditionally. Delacre, Lakens, and Leys (2017) declared that Welch's *t*-test performs better than the Student's *t*-test whenever sample sizes and variances are unequal between groups and gives the same result when sample sizes and variances are equal.

The sample data is not distributed normally. This can be spotted from the Jarque Bera test statistics presented in Table 4.6. However, to be able to employ the Welch T test normality assumption is to be fulfilled. So, data is scanned, and outliers are omitted. Fagerland and Sandvick (2009) stated that if the date is skewed then the mean can be a poor measure of central tendency because the outliers inflated its value. This issue can be resolved by removing the equal number of smallest/largest values from each tail and using the trimmed means. Descriptive statistics of the trimmed data are as follows.

Table 6. Adjusted Descriptive Statistics of ISE Dividend and ISE Dividend 25 Index Firms' Deviations in Values

	DIF	DIF25
Mean	-46,72	8,80
Median	-35,55	-30,31
Maximum	27,87	489,89
Minimum	-176,46	-239,54
Std. Dev.	51,1690	199,41
Jarque-Bera	4,8219	3,67
Probability	0.0897	0.1590
Observations	19	12

Now it is even more apparent that small-cap firm data's mean is higher indicating the deviations between the fundamental price and the market price are more extreme. To assess if this difference in means is statistically significant, Welch t-test results are presented in Table 7.

Table 7. Test for Equality of Means Between Series-Welch's t-Test Results

Sample: 1 21			
Included observations: 21			
Method	df	Value	Probability
t-test	29	1.1652	0.2534
Satterthwaite-Welch t-test*	1,1192	0,8936	0,3633
Welch F-test*	(1,29)	1.3577	0.2534
*Test allows for unequal cell variances			

Table 7 reports the data that comes from employing Welch's t-test in the Eviews 12 software program. T values are high and probability values larger than 0,10. We can therefore fail to reject the null hypothesis of equality in means. Although descriptive statistics show the numeric difference in means and variances; the standard error of the means is high to the point where t statistics is not high enough to accept the possibility of not equal means in two populations. It can be concluded that two groups of data are overlapping and there is no significant small firm effect as the investor sentiment theory declared.

5. DISCUSSION AND CONCLUSION

Capital markets have made important contributions to the countries' economies (Stiglitz, 2000; Lenee & Oki, 2017). With the presence of efficient capital markets, companies can operate and develop their businesses, and governments can finance their economic activities to further increase the prosperity of their citizens. Efficient capital markets also promote economic growth through capital accumulation and technological progress by increasing the savings rate, mobilizing, and pooling savings, producing information about investment, facilitating and encouraging the inflows of foreign capital, as well as optimizing the allocation of capital (The Worl Bank, 2019).

Understanding investor sentiment is critical to both academicians and practitioners for two reasons. First, if sentiment implies the general opinion, feelings, or mood of investors toward a specific stock or the market as a whole (Edelen, Marcus, and Tehranian, 2010), it can drive the prices that are irrelevant of the fundamentals or changes in the investment opportunity set. Thus, investors must be alert to the changes in sentiment since the value of their portfolio can change even without the presence of news related to underlying fundamentals. Second, investor sentiment can spread quickly through the market as a whole impacting the investors' portfolio selection independently from the measures of fundamental value. Thus, the role of sentiment in the prediction of some rare events in the markets such as crashes, manias, bubbles, and black swans would be highly important for the authoritative regulators to monitor their country's economic conditions (Ahmed, 2020).

This thesis study aims to calculate the deviations between the intrinsic values and the market prices of selected firms, quoted in Turkish Exchange markets in 2022 to detect if there is mispricing due to small firm anomaly, as one of the main theories in behavioral finance, investor theory suggests so. The primary motivation to research on this specific subject is to provide information on the small size anomaly from a behavioral perspective in an emerging country such as Turkey. To our knowledge, an investigation on a small firm anomaly from investor sentiment theory's point of view has not been done before neither in Turkey nor in any other developing country. Therefore, to provide empirical data on investor sentiment which is a source of risk that cannot be eliminated by diversification (DSSW, 1990) would help both foreign and domestic investors in their investment decisions. Moreover, the allocation of capital has the utmost importance for economies. It can only be done optimally if the market prices approximate the true intrinsic prices. Lastly, a firm's stock price can reflect

the views of investors who are too optimistic (Stambaugh and Yuan, 2012). And if small stocks are affected by sentiment disproportionately when sentiment is estimated to be high, they tend to earn relatively low subsequent returns. This will facilitate investors to exploit abnormal returns by following sentiment indexes and/or proxies in Exchange markets. Besides, security issuance, initial public offerings (IPO) to be specific, will be affected by the sentiment in the market.

Research results showed that out of 34 only six companies are overvalued according to the DDM that is used in the analysis. The company data are examined in two subgroups. The first set of companies is taken from the ISE Dividend 25 Index. This index consists of 25 stocks placed in the first 2/3 slice in the ranking of the constituents of the BIST Dividend Index in descending order according to dividend yield as of the review day and has the highest average free float market value. Since the index consists of the first 25 company which has the highest market value, this group is included in the analysis to proxy the large-cap companies. The second set of companies is taken from the ISE Dividend Index. This index consists of the stocks of companies traded on the Stars, Main, and Sub Market while having distributed cash dividends in the last 3 years. This group is included in the analysis to capture the small-size effect. Although the means of the two groups would indicate a difference in the deviations between these two groups of companies in favor of the small-cap firms, Welch's t-test results indicate otherwise. We fail to reject the null hypothesis of equality in means. Although descriptive statistics show the numeric difference in means and variances; the standard error of the means is high to the point where t statistics is not high enough to accept the possibility of not equal means in two populations. It can be concluded that two groups of data are overlapping and there is no significant small firm effect as the investor sentiment theory declared.

These results contradict with behavioral research which found that when sentiment is low (high), subsequent returns are relatively high (low) for small stocks; but in line with traditional finance that there is an absolute absence of predictable behavior in the markets. Fama (1998) pointed out that there should be about as many cases of perversity as of persistence of an anomaly. Many anomalies disappear when they are measured differently or are not consistent towards the test of time. Dimson and Marsh (1998) pointed out that smaller companies can underperform and small firm premium can go into reverse. And this reversal can stem from the fundamentals instead of sentiment. Therefore, not having found the small firm effect in the BIST Dividend Index does not exclude the fact that sentiment prevails in the

markets. All in all, this research underlined the growing importance of investor behavior as a critical element in the finance field while demonstrating the shortcomings in identifying and measuring it in developing countries' behavioral finance literature.

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