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EVIDENCE FOR AND AGAINST THE VALIDITY OF EFFICIENT MARKET HYPOTHESIS

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Review paper

Abstract: The concept of an efficient financial market, in literature known as efficient market hypothesis (EMH), has had a long and difficult development path from the idea itself to its final conception, as one of the central paradigms in modern finance. It has been tested and critically reviewed for decades, and the two basic types of problems it has encountered are theoretical paradoxes and market anomalies. The aim of the paper is to examine the validity of EMH through various financial market efficiency tests and the results of previous research. The intention is to answer the question of whether, despite theoretical paradoxes and market anomalies, the notion of validity can be attributed to the concept of an efficient financial market. In this regard, the paper presents plenty of evidence for and against the validity of weak, semi-strong, and strong form of EMH, to conclude that, even after more than half a century of research, financial literature has not reached a consensus on the presence or absence of the validity of this hypothesis.

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1. Introduction

Fama (1965a) was the first among financial theorists to give definition of an efficient market: "The efficient market is a market where a large number of rational participants are actively trading in order to maximise profits, with each participant striving to anticipate the future market price of individual securities". The same author, five years later, published in *"The Journal of Finance"* the first of three review articles on efficient markets, entitled *"Efficient Capital Markets: A Review of Theory and Empirical Work"*. The above publication has marked the establishment

of the efficient financial market concept, defined as a market on which prices always and fully reflect all available information (Fama, 1970, p. 383).

In the following period, many economists have contributed to a better understanding of *EMH*. Jensen (1978) argues that there is no hypothesis with more evidence of validity than *EMH*. Nevertheless, the author acknowledges that better data availability and advanced econometric analysis reveal anomalies and inconsistencies that call into question the validity of this hypothesis. Grossman and Stiglitz (1980) point out that prices only partially reflect information of sophisticated investors (arbitrators). In this way, those who bear the cost of obtaining information receive adequate compensation. If prices fully reflect all information, the financial incentive to obtain information will disappear. Consequently, market efficiency will also disappear, because the functioning of arbitrators who keep the market efficient will be gone. Given the above, in his second review article on the topic of efficient markets, Fama (1991) corrects the strict version of *EMH*, the one based on the assumption of no information and transaction costs. Only if the costs of obtaining information and transaction costs are equal to zero; investors will have the incentive to trade until prices fully reflect all available information. Since these costs are positive, i.e. greater than zero, a more realistic and more acceptable definition is that securities prices reflect the information available until the marginal usefulness of the use of information is equal to the marginal cost.

Finally, in the third review article on efficient markets, Fama (1998) attributes overreaction and underreactions in different circumstances to chance. The expected value of above-average return is zero, but chance generates anomalies in the form of overreaction and underreaction. Fama considers that many anomalies are the result of an inappropriate methodology and disappear when alternative measurement approaches are applied.

Summing up the above, it is concluded that *EMH* faces two types of problems. The first type of problem lies in theoretical paradoxes, i.e. theoretical inconsistencies. One of the key paradoxes is: if all participants on the financial market believed in its efficiency, the market would cease to be efficient. In such a situation there would be no detailed analysis of securities, i.e. there would be no disclosure of undervalued and overvalued securities. They would be free and lasting on the market. On the other hand, the greater the number of conducted market surveys and participants who do not believe in market efficiency, the more efficient the market but the less the benefits of research.

Also, as Grossman and Stiglitz (1980) claim, market participants who make the market efficient must get compensation for their efforts, and *EMH* denies the possibility of financial compensation. Without financial incentive for market participants, there is no market efficiency. The paradox is the absence of market efficiency in the opposite case, i.e. when market participants receive a financial

incentive in the form of above-average return. The reason for this is that *EMH* denies the possibility of achieving above-average return. Therefore, the existence of a financial incentive is in conflict with *EMH*, and at the same time it is a necessary requirement for achieving market efficiency.

It should also be noted that early versions of *EMH* claim that sophisticated investors exclude noise traders from the financial market. However, if information asymmetry and noise traders disappear from the market, symmetrical information and homogeneous expectations will result in lost trade motives and the absence of a mechanism to achieve market efficiency. Therefore, many authors (Grossman & Stiglitz, 1980; Black, 1986; Shleifer & Summers, 1990) indicate the importance of the simultaneous presence of differently informed investors (Leković, 2017).

Another type of problem *EMH* faces is hidden behind market anomalies. Anomaly is a deviation from the accepted paradigm, which is too widespread to be ignored, too systemic to be rejected as a random error, and too big to adapt to the existing normative system (Tversky & Kahneman, 1986, p. 252). An overview of market anomalies, as well as plenty of evidence supporting *EMH*, will be provided through the results of financial market efficiency tests: weak-form efficiency tests, semi-strong-form efficiency tests, and strong-form efficiency tests.

Bearing in mind the foregoing, the aim of the research is to find the answer to the question of whether, despite theoretical paradoxes and market anomalies, the notion of validity can be attributed to the concept of an efficient financial market. The paper will use a method of qualitative economic analysis based on analytic description. This methodological instrument will enable the study of relevant financial literature and the presentation of authors' views, all in order to come to valid conclusion on the research problem.

Taking into account the defined goal, the paper will, after introductory remarks, present weak-form market efficiency tests, as well as the results of numerous studies that both support and speak against the complete validity of weak-form *EMH*. Then, semi-strong-form market efficiency tests will be described, with inevitable analysis of market anomalies, as well as attempts and efforts to explain them. The penultimate part of the paper will consider strong-form market efficiency and examples of profitable insider trading. The final part of the paper, conclusion, will summarise the views expressed and consider questions opened, of importance for future research.

2. Weak-form market efficiency tests

Weak-form financial market efficiency implies that market prices of securities reflect only historical information, such as information on past securities prices, information on past return, information on the volume of trading, and the like. Knowing this past information, investors cannot "beat" the market and achieve

above-average return (return higher than expected), as all price expectations based on historical information are already included in current market prices.

Among weak-form market efficiency tests, also known as tests for return predictability, there are: correlation tests, runs tests, filter rule, moving average rule, channel rule/trading range breakout rule, and relative strength tests.

Correlation tests aim to examine the existence of linear correlation between current and past return on securities (Elton et al., 2011, p. 403):

$$r_t = a + br_{t-1-T} + e_t, \tag{1}$$

where:
r_t – return on securities in period t,
r_{t-1-T} – return on securities in period $t-1-T$, where T is the number of intervals (lags) between current and past return,
a – expected return on securities not affected by past return,
b – correlation coefficient between return on securities in period t and return on securities in period $t-1-T$,
e_t – random error.

If the correlation coefficient is equal to zero ($b=0$), then there is no correlation between the observed returns, and future return cannot be predicted on the basis of past return. This value of correlation coefficient speaks in favour of the validity of weak-form *EMH*. However, if correlation coefficient is different from zero ($b \neq 0$), then it is possible to predict return, which implies the absence of weak-form market efficiency. In particular, positive correlation between series of return on securities ($b>0$) indicates that positive and negative returns of one period will be repeated in the following period. This is the so-called inertia effect, which suggests investors to invest in securities that have been successful in the previous period, since it is expected that similar results will be achieved in the future. On the other hand, the effect opposite to inertia is reversal effect, which occurs in the case of negative correlation between series of return on securities ($b<0$). Negative autocorrelation implies that negative return will follow positive return on securities and vice versa. In this case, investors are invited to invest in securities with poor return in the previous period.

Numerous studies provide empirical evidence of the inertia and reversal effects, i.e. evidence of predictability of return on securities. Lo and MacKinlay (1988) find positive autocorrelation of weekly and monthly return. A study carried out by Jegadeesh (1990) confirms positive autocorrelation, but only in long-term time periods, while in short-term periods, a negative correlation is found between series of returns on securities. Nisar and Hanif (2012), using the Durbin-Watson test, find positive autocorrelation of daily, weekly, and monthly returns on the four largest capital markets of South Asia. Raquib and Alom (2015) also determine positive correlation between series of return on securities by testing the validity of

weak-form *EMH* on the capital market of Bangladesh. At the same time, De Bondt and Thaler (1985, 1987), Fama and French (1988) and Lehmann (1990) were among the first to prove negative autocorrelation and reversal effect. De Bondt and Thaler (1985, 1987) use data on monthly stock returns listed on the New York Stock Exchange (NYSE) in the period 1926-1982. They find that the "losing" portfolio of the initial period, which consisted of 50 stocks with the worst investment performance, surpassed the previous "winning" portfolio, which consisted of 50 stocks with the best investment performance, in the next five-year period, by, on average, 31.9%. Thus, the "losing" and "winning" portfolios switched places, which De Bondt and Thaler (1985, 1987) explain with the overreaction hypothesis. Investors receive the unexpected positive news with excessive optimism that raises the price of securities above the equilibrium level. On the other hand, to the unexpected negative news, investors react with excessive pessimism, which lowers the price below the equilibrium level. The reactions described above are, as a rule, followed by adjustment that involves reversal, i.e. the movement of prices in the opposite direction. The end result is the constant oscillation of securities prices around their equilibrium (fundamental) value. Fama and French (1988) find weak negative correlation in the case of daily and weekly return, while correlation in long-term periods is significant. Lehmann (1990) points to reversal effect as well. He finds that securities portfolios with positive return in one week record negative return in the following week (on average from -0.35% to -0.55%), while portfolios with negative return in one week have positive returns in the following (on average from 0.86% to 1.24%). Among recent research, studies by Gropp (2004), Cubbin et al. (2006), Goudarzi (2013), and others confirm negative correlation between series of return on securities.

The results of these studies suggest speak against the validity of weak-form *EMH*. However, in most cases, correlation coefficients are low and correlation between the observed variables is of no special economic and statistical significance. This means that trading based on inertia effect or reversal effect does not guarantee above-average return. Also, the validity of the results obtained is questioned, given the fact that correlation coefficients are strongly influenced by extreme sample values.

Bearing in mind the lack of correlation tests, runs tests have been used as an alternative in weak-form *EMH* studies. These tests focus on securities price change direction, with the price increase being marked with "+", falling price with"-", while the unchanged price level is "0". A series of successive price changes with the same mark is called run. Longer sequences of positive or negative marks indicate a smaller number of runs and positive correlation. On the other hand, shorter sequences of positive or negative marks indicate a greater number of runs and negative correlation. Here it is important to point out that only the number of runs significantly different from the expected number indicates the presence of correlation. Fama (1965b), Borges (2008), Nisar and Hanif (2012), and many

others use runs tests in their research. Fama (1965b), using the price of thirty stocks within the Dow-Jones Industrial Average (DJIA) stock market index, only in the case of one-day interval finds the difference between the actual and the expected number of runs. The actual number of runs (735.1) is less than the expected number of runs (759.8), indicating positive autocorrelation. However, the determined correlation, according to the author, is not strong enough to bring above-average return in trading. In all other cases, the actual and expected numbers of runs are approximately equal. In the case of four-day intervals, they are approximately 176, in the case of nine-day intervals 75, and in the case of sixteen-day intervals 42. The obtained results point to weak-form efficiency on the US capital market. Borges (2008) reaches similar conclusion by exploring the validity of weak-form *EMH* on the European capital market. He tests the efficiency of the capital markets of Great Britain, Spain, France, Germany, Greece, and Portugal over the period 1993-2007. The author proves the validity of weak-form *EMH* in all countries except for Greece and Portugal. On the other hand, runs tests performed by Gimba (2010) on the Nigerian Stock Exchange (NSE), Ananzeh (2014) on the Jordanian Market (Amman Stock Exchange – ASE), and others support the absence of validity of the weak-form *EMH*.

As part of weak-form market efficiency tests, special place belongs to the so-called "filter rule", which reads: buy securities when their price rises by X% above the lowest past price and keep them until their price drops by X% in relation to the next highest price. At that point, the investor should make a short-term sale of securities until the price rises by X% above the next lowest price (Fama&Blume, 1966, p. 228). According to the filter rule, when the price of securities increases by X%, it is expected that its growth will continue for some time, before the price drops. And vice versa, when the price of securities decreases by X%, it is expected to further drop, before the price increase is reached. Therefore, the filter rule can bring investment profit not only on the basis of growth in the price of securities, but also on the basis of its fall. The key question for applying this test is choosing the optimal limit, i.e. an optimal tolerance threshold in price movement. On the one hand, low tolerance threshold implies a large number of transactions and high transaction costs, while, on the other hand, high threshold of tolerance means that many profit opportunities will be late and missed. The reason is ignoring the change in prices lower than the defined limit. Alexander (1961) was among the first to apply the filter rule in the study of weak-form market efficiency. Testing covers the period 1897-1959, relying on closing price of securities in the DJIA and Standard and Poor's Industrials (S & P 500) stock exchange indices. The paper analyses the results of applying different limits with a value ranging from 5% to 50%, to conclude that using filter rule in trading achieves superior results in relation to the results of the passive "buy and hold" strategy. However, since the analysis does not include transaction costs, these results do not represent a significant counterargument to the validity of weak-form *EMH*. A few years later, Fama and Blume (1966) conclude that only trading based on 0.5% low-value limit

promises profits. However, since the low tolerance threshold implies a large number of transactions, even small transaction costs make this trading strategy unprofitable. The study carried out by Al-Abdulqader et al. (2007) shows the results of applying five different limits in transactions (1%, 2.5%, 5%, 7.5%, and 10%). Transactions based on these limits yields better results than the results of the passive "buy and hold" strategy, and the largest investment profit is achieved by applying a 10% limit. Angelov (2009) tests the validity of weak-form *EMH* using the filter rule. The author applies twenty-four different limits, the value of which ranges from 0.5% to 50%. In most cases, inferior results are achieved in relation to the results of the passive "buy and hold" strategy.

According to Brock et al. (1992), two of the simplest and most commonly applied trading rules behind weak-form market efficiency tests are moving average rule and trading range breakout rule. According to moving average rule, two moving averages generate buy and sell signals – short-term and long-term average in securities price movement. When short-term price average rises above long-term average, securities should be purchased. Conversely, when short-term price average falls below long-term average, securities should be sold. In practice, there are many variations of this rule: 1-50, 1-150, 5-150, 1-200, and 2-200, where the first number indicates the duration of a short period, and the second number the duration of a long period in days. The most popular moving average rule is 1-200, where the short period lasts for 1 day and the long period for 200 days. Brock et al. (1992) show that this rule, when applied to the American capital market for the period 1897-1986, yields above-average return. The obtained results give evidence of the superiority of technical analysis strategies, i.e. evidence of the absence of weak-form market efficiency. Recent studies also confirm (Metghalchi et al., 2012; Hung et al., 2014; Almujamed et al., 2015) superiority of the moving average rule in relation to the passive "buy and hold" strategy.

Another simple trading rule used to test the validity of weak-form *EMH* is the trading range rule. According to technical analysts, when the price reaches the highest value, most investors are ready to sell, which makes it more difficult to increase prices above the achieved maximum. However, if the price still rises above the highest past level, securities should be purchased. On the other hand, when the price reaches the lowest value, most investors are ready to buy, which makes it more difficult to fall below the achieved minimum. If the price falls below the lowest past level, securities should be sold. The maximum and minimum prices are most often determined for the past period of 50, 150, or 200 days. Thus, the trading range rule suggests the purchase of securities as soon as the price rises above the highest price reached in the past 50, 150, or 200 days, i.e. the sale of securities as soon as the price is lower than the lowest price reached in the past 50, 150, or 200 days. Above-average return realised using trading range rule finds support in studies carried out by Brock et al. (1992), Hatgioannides and Mesomeris (2007), and others. In this way, the authors prove the absence of validity of weak-

form*EMH*. On the other hand, some researchers, such as Zhu et al. (2015), claim the opposite. More specifically, they find that trading range rule does not yield better results than the passive "buy and hold" strategy.

The weak-form market efficiency tests, i.e. return predictability tests, also include relative strength tests. Levy (1967) defines the relative strength of securities in the following way:

$$PR_{jt} = P_{jt}/\bar{P}_{jt}, \tag{2}$$

where:
PR_{jt} – relative strength of securities$j$at time$t$,
P_{jt} – price of securities$j$at time$t$,
$\bar{P}_{jt}$ – average price of securities $j$during the 27 weeks preceding time$t$.

The author proposes to invest an equal amount of money in X% of securities with the highest relative strength. If the relative strength of the selected securities in the coming period falls below the relative strength of K% of securities, the selected securities should be sold and the money reinvested in the new X% of securities with, at that moment, highest relative strength. In his study, Levy (1967) uses closing price data on 200 stocks listed on the NYSE between 24 October 1960 and 15 October1965. The obtained results show that among the different X and K values, the greatest return comes from trading strategies when X = 10%, K = 80%, and X = 5%, K = 70%. The first strategy results in return of 20%, and the second strategy in return of 26.1%, against the return of 13.4% of the passive "buy and hold" strategy. This suggests the absence of weak-form market efficiency. However, Jensen and Bennington (1970), repeating the previously described research, include transaction costs in the analysis, and return achieved using the relative strength strategy does not differ significantly from the return of the "buy and hold" strategy. Risk-weighted return eventually results in its inferiority relative to the passive strategy return. The proven lack of superiority of the relative strength rule is a confirmation of the weak-form market efficiency. Recent studies have also resulted in contradictory findings about the relative strength rule. For example, Wong et al. (2003), in the case of Singapore's capital market, show that the relative strength rule yields above-average returns, while Chen and Metghalchi (2012), in the case of the capital market of Brazil, prove that the rule described fails to "beat" the passive strategy.

By summarising the results of all the previously described tests, it is concluded that complete validity cannot be attributed to the weak-form *EMH*. Support comes from the aforementioned research findings, which provide empirical evidence of inertia effect and reversal effect, as well as studies that prove that different trading rules yield above-average return.

3. Semi-strong-form market efficiency tests

Semi-strong form of financial market efficiency means that all publicly available information is included in the price of financial assets, such as information found in companies' financial statements, dividend announcement, financial, business, and political news. This form of efficiency suggests that the investor cannot "beat" the market knowing what the rest of the investment community knows.

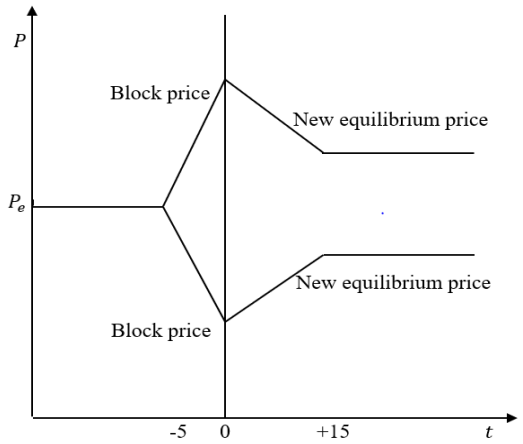
The main task of semi-strong-form market efficiency tests, also known as tests of announcements, or event studies, is to determine whether a change in the value of securities occurs before, during, or after the announcement of important events such as: initial public offering (IPO), company acquisition, block trade, change in discount rate, stock split, company earnings disclosure, and the like.

According to Ball (1978), stock prices slowly adjust to information on earnings, which allows investors to achieve above-average return. The investor can achieve above-average return by waiting for positive (negative) news about the company earnings, and then only make stock purchase (sale). The strategy described is in collision with semi-strong-form market efficiency. On the other hand, Blake (2000) claims that, in companies with good news on earnings, an average of about 90% of securities price growth occurs 12 months before disclosure of financial statements, and only 10% in the next 6 months of the statement disclosure. Similar applies to companies with bad news on the amount of earnings. Therefore, the market accurately predicts changes in earnings before they are disclosed, which points to semi-strong-form market efficiency.

Agrawal et al. (1992) investigate company performance in the post-acquisition period. The survey covers almost all acquisitions among companies listed on the NYSE and the American Stock Exchange (AMEX) in the period 1955-1987. Shareholders of the company that made the acquisition, in the next five-year period, achieved statistically significant loss of wealth of 10%. The negative post-acquisition return indicates that a change in the stock price occurred after the announcement of acquisition, which indicates the lack of validity of the semi-strong-form *EMH*.

Studies also focus on the reaction of securities prices to the announcement of block trade. The sale of a large block of securities leads to a fall in their price to a new equilibrium level (Figure 1). However, if the market overreacts to the announcement of block trade, the price of securities will drop below the new equilibrium price, followed by adjustment, i.e. price rise to an equilibrium level. Overreaction followed by adjustment gives the possibility of earning above-average return. The investor will realise earnings in the form of a price difference if they buy securities at the block price at the moment of block trade announcement and then sell them at a higher equilibrium price after the adjustment is made.

Figure 1. Reaction of securities prices to the announcement of block trade



Source: Author, based on Blake, 2000, p. 396

On the other hand, buying a large block of securities can also lead to market overreaction followed by adjustment. In this case, the investor realises above-average return through short-term sale. They sell securities at a higher block price, and then cover a short position by purchasing the same securities at a lower equilibrium price. The difference between the higher selling and the lower purchase price represents the investor's earnings (Figure 1). However, according to Blake (2000), the process of price adjustment lasts only for 15 minutes, which tells how quickly financial markets adapt to new information. Financial markets are efficient in the semi-strong form, as above-average return is only available a few minutes after the announcement of block trade.

It is not difficult to conclude that conducted studies provide varying evidence for and against the validity of semi-strong-form *EMH*. Some authors point to the abundance and importance of anomalies, while others try to explain them and thus defend this hypothesis. Among the anomalies of the semi-strong-form market efficiency there are: P/E effect (price-earnings effect), size effect or small firm effect, liquidity effect, neglected firm effect, January effect, Monday effect, day-end effect, holiday effect, intra-month effect, turn of the month effect, B/M effect (book to market effect), etc.

Numerous studies, among which the most important is the one undertaken by Bas (1977), show that, investment in stocks with a low P/E ratio, i.e. low stock price relative to its per-stock earnings, produces above-average return. Financial literature knows this phenomenon as the P/E effect. Basu (1977) analyses more than 1400 companies with stocks traded on the NYSE in the period 1957-1971. Investment in stocks with low P/E ratio generates higher both absolute and risk-weighted returns, compared to investment in stocks with high P/E ratio. The author points to frictions

in the process of incorporating publicly available information in securities price, which testify to the absence of semi-strong-form market efficiency. Kelly et al. (2008) confirm the P/E effect on the capital market of Australia, Bistrova and Lace (2009) on the Baltic capital market, Lakshmi and Roy (2012) on the capital market of India, etc. On the other hand, semi-strong-form *EMH* advocates point to the shortcoming of methodological nature, in terms of inadequate risk-return adjustment procedure. The reason for the low P/E ratio is a high risk that implies stock sale at a lower price, so the P/E ratio of high-risk stocks is low. This is risk that is not fully reflected in the beta coefficient of the Capital Asset Pricing Model (CAPM). Thus, in the opinion of the semi-strong-form *EMH* advocates, high stock return with low P/E ratio is due to high risk, not market inefficiency.

Inadequate risk measurement methods also explain the size effect or the small firm effect. Basically, this effect occurs when small firm stocks bring significantly higher risk-adjusted return, compared to large company stocks. Banz (1981) and Keim (1983) were among the first to identify size effect, establishing stock return superiority of small market capitalisation firms. However, semi-strong-form *EMH* advocates say that the returns identified are not adequately risk-adjusted. In their opinion, above-average return on investment in stocks of small-cap companies is not due to market inefficiency, but is a risk premium that is not fully reflected in the beta coefficient of the CAPM model. Small businesses are, as a rule, more risky due to lower stock liquidity, limited availability of information, higher leverage, lower probability of survival in economically difficult times, and the like.

The lower stock liquidity forms the basis of liquidity effect, while the limited information availability is the essence of the neglected firm effect. Liquidity effect is a market anomaly that implies above-average return by investing in less liquid stocks. This anomaly is explained by the more difficult stock marketability and higher trading costs, which require premium in the form of above-average return.

On the other hand, the neglected firm effect suggests that uncovered stocks offer higher return than covered stocks. Beard and Sias (1997) investigate this effect on a sample of 7,117 companies listed on the NYSE, the AMEX, and the over-the-counter market in the period 1982-1995. The authors find that return on neglected company stocks exceed return on normal company stocks, pointing to negative correlation between the degree of neglect and market capitalization of companies as the reason for above-average return. In other words, above-average return, in their opinion, is not a consequence of the neglected firm effect, but of the small firm effect. In the case of companies of approximately the same size, no evidence of the neglected firm effect has been found. Akkoc et al. (2009) also point to this effect, testing the semi-strong-form market efficiency on the Istanbul Stock Exchange. The analysis relies on data on monthly stock return during the ten-year period 1999-2008. In order to examine the neglected firm effect, three portfolios are created: neglected, normal, and popular stock portfolio. The survey finds return of -1.00% on the neglected portfolio, 0.88% on the normal portfolio, and 2.89% on

the popular portfolio. Based on the obtained results, the authors conclude that the neglected firm effect does not exist on the Istanbul Stock Exchange. On the other hand, the study by Lee et al. (2011) gives evidence in favour of the neglected firm effect. The study shows that uncovered stocks make monthly by 0.46%, i.e. annually by 5.66% higher returns compared to covered stocks. The first group of stocks is further divided into neglected stocks and dumped stocks, with the conclusion that better performance of neglected stocks in relation to covered stocks loses statistical significance when liquidity risk is included in the analysis. On the other hand, dumped stocks continue to achieve superior performance even after excluding illiquid stocks from the sample.

The size effect is related to the January effect. According to Keim (1983), about 50% of the size effect appears in January, while more than 50% of the January effect appears in the first trading week, especially during the first trading day. The January effect is a market anomaly where stock return in January is significantly higher than the one in other months of the year. The most common explanation of the January effect lies in the tax-selling hypothesis. At the end of the fiscal year, investment advisers propose the sale of securities bearing capital losses, in order to reduce the overall tax burden on investors. Investors invest money from sales in securities at the beginning of next year, which rapidly increases the demand for them and causes price rise, which, in turn, brings a January effect. However, the validity of this explanation is questionable, since the January effect has also been found in countries where there is no capital gains tax, such as Belgium and Japan. This effect is also present in Australia, where the fiscal year does not coincide with the calendar (Elton et al., 2011, p. 402-403). Some authors, such as Rogalski and Tinic (1986), explain substantially higher stock return of small businesses in January by the increased risk this month. However, others point out that the higher January risk does not fully explain this anomaly, since the return achieved is significantly higher than the level guaranteed by extra risk. Among recent research, Haug and Hirschey (2006), Agnani and Aray (2011), Alrabadi and AL-Qudah (2012) and others provide evidence in favour of the January effect. At the same time, Gu and Simon (2003), Mylonakis and Tserkezos (2008) point to the weakening of this effect, while some researchers, such as Patel (2016), claim that the January effect no longer exists.

The previously described January effect is one of calendar effects, along with the Monday effect, day-end effect, holiday effect, intra-month effect, and turn of the month effect. Many researchers, such as Rodriguez (2012), note that return on securities on Mondays is significantly lower compared to other days of the week. Return drops most in the first forty-five minutes of trading on Monday, after which its trend is no different from the return on any other day of the week. It is also noted that securities prices every working day, including Monday, increase in the last thirty minutes of stock exchange trading. Also, return on securities two working days before the national holiday is significantly higher than the annual

average (Elton et al., 2011, p. 399). Finally, it is found that return in the first half of the month is higher than return in the second half of the month, and that return is significantly higher at the turn of the month– the last few days of the one and first few days of the next month (Alrabadi&AL-Qudah, 2012).

An important anomaly of the semi-strong-form market efficiency is the B/M effect. This effect involves achieving an above-average return by investing money in stocks with high B/M ratio (book to market ratio), i.e. stocks with a high ratio of book to market value. The results of numerous studies (Chan et al., 1991; Lakonishok et al., 1993) show that return on stocks with high B/M ratio outperform stock return with low B/M ratio. This leads to the conclusion that B/M ratio is an indicator of future stock investment performance.

By summarising the results of the abovementioned research, it is concluded that financial literature has not reached consensus on the validity of the semi-strong-form *EMH*. Researchers on different capital markets have come up with various findings that make it impossible to draw final conclusion. Some authors point to plenty of evidence against the validity of semi-strong-form *EMH*, while others defend this hypothesis.

4. Strong-form market efficiency tests

Strong-form financial market efficiency implies that securities prices fully reflect all relevant information, both historical and public, and private or insider information. Prices immediately react to new information, so the chances of finding undervalued and overvalued securities are random. The above implies that the market is "unbeatable" and that active investment strategies are in vain.

The basic task of strong-form market efficiency tests, also known as tests for private information, is to determine whether insider-based trading yields above-average return. Numerous studies (Jaffe, 1974; Finnerty, 1976; Seyhun, 1986; Betzer&Theissen, 2009) give the affirmative answer, i.e. prove that insider trading brings risk- and transaction-cost-weighted above-average return. With the help of privileged information, insiders buy stocks before their price rises and sell them before the price drops. The results of these studies provide evidence against the validity of strong-form *EMH*.

However, this is evidence based on unlawful behaviour, which significantly diminishes its value. Insiders cannot make high returns without taking the risk of being arrested, because insider trading in many world countries (for example, in the UK since 1980) is forbidden by law.

Alternative evidence relates to the performance of mutual funds. These institutional investors invest knowledge, time, and money to collect information about the company performance. The collected information is not publicly available, as it is private, and it, unlike insider information, is not in conflict with

the law. Numerous studies claiming that mutual funds fail to generate above-average return are solid proof of the validity of strong-form *EMH*. On the other hand, studies suggesting that mutual funds can "beat" the market are a counter argument to the validity of strong-form *EMH*.

As an example of profitable insider trading, studies dealing with finance often point to transactions carried out on the American capital market by one of the most successful arbitrators of all time, Ivan Boesky. Boesky invested money in stocks of companies expected to be taken over by other companies. His continued success was secured by privileged information about the takeover, which he received from an investment banker, whose bank organised the financing of such transactions. When a banker found out that a company planned the takeover, he would inform Boesky thereof, who bought company stocks being taken over and sold them after the stock price rose. Boesky was profitable because he knew about the company takeover before the rest of the market. The U.S. Securities and Exchange Commission (SEC) quickly accused him of insider trading, for which he was sentenced to three years in prison, a fine of 100 million dollars, and a ban on trading in securities (Mishkin & Eakins, 2012).

Many brokers have brought large sums of money to their clients by trading on the basis of privileged information provided by Value Line employees. Value Line is an information centre that provides advisory services to investors, classifying companies in five groups, depending on the assessment of their future performance. The employee who prepares press information knows the Value Line recommendations before the press and official publication. They may sell the unpublished data to brokers of large brokerage houses, who use it when trading for their clients, thus achieving excessive returns. Many brokers earned large sums of money in this way, after which they were arrested (Elton et al., 2011, p. 423).

Seyhun (1986) also tests insider trading profitability, based on 60,000 insider transactions conducted on the US capital market during the period 1975-1981. He concludes that, with the help of privileged information, insiders successfully anticipate changes in stock prices and achieve high return. At the same time, the author tests the claim that investors can earn above-average return by simply reading the Official Summary, which the SEC publishes based on company reports. However, research results indicate that outsiders, by tracking publicly distributed insider information, cannot generate risk- and transaction-cost-weighted above-average return. In other words, outsiders cannot make use of publicly available information on insider transactions to achieve above-average return. These results are in favour of the validity of semi-strong-form market efficiency. Seyhun (1986) points out that different insiders have information of different quality. Insiders who are in a better position in the company and who are better informed about overall company developments, such as department managers, board chairman, etc., are more successful in anticipating future stock price changes, compared to small shareholders and company employees.

It is generally accepted that perfectly efficient markets are not a realistic picture of reality. Laws that prohibit insider trading confirm the absence of the validity of strong-form *EMH* best. Previously described studies showing that insider trading yields above-average return support the absence of the validity of strong-form market efficiency.

5. Conclusion

No theory is a factual state, but an abstraction of reality. Even greater abstraction lies in models applied, which implement basic theoretical ideas using detailed and specific assumptions. No theory can explain everything. Every theory abounds in anomalies. However, anomalies do not mean theory rejection as long as it is more useful than its best alternative. In other words, a theory that will "beat" a valid theory is needed (Ball, 2009).

Bearing in mind the whole previous presentation, it can be concluded that, despite numerous applications in the real world, the debate about *EMH* validity is far from over. In addition to theoretical paradoxes and market anomalies, to which some authors point out, while others try to explain them, the so-called "joint hypothesis" is an obstacle to making the final conclusion. According to the "joint hypothesis", *EMH* cannot be tested in isolation, but only together with the corresponding equilibrium model. Test results that do not support *EMH* can always be attributed to an inadequate asset valuation model, which makes it impossible to reject *EMH*. Therefore, the impossibility of isolated *EMH* testing implies that it cannot be rejected. The general conclusion of the study is that financial literature has still reached no consensus on the validity of this hypothesis.

It is also important to note that many market anomalies have not lived long after appearing in financial literature. For example, after being documented in early 1980s, the size effect completely disappeared until the end of the decade. Similarly, the B/M effect attracted investors' attention in early 1990s, but did not give the expected results by the end of that decade (Bodie et al., 2009, p. 259). Schwert's (2003) research confirms that many anomalies disappear and get weaker after appearing in financial literature. Logical explanation is that sophisticated investors use the anomaly as a possibility to make profit and then eliminate it. Accordingly, the abovementioned effects are anomalies in the true sense of the word until they reach public. When anomaly is detected as a possibility to make profit, it, as a rule, disappears.

This paper, through the study of relevant literature, carried out a theoretical, but not an empirical analysis of the *EMH* validity, which is its key limitation, but at the same time an idea for future research. The views expressed indicate that more than five decades of research has not been enough for the final judgment on the validity of the financial market efficiency concept.

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DOKAZI ZA I PROTIV VALIDNOSTI HIPOTEZE EFIKASNOG TRŽIŠTA

Apstrakt: Koncept efikasnog finansijskog tržišta, u literaturi poznat kao hipoteza efikasnog tržišta (*Efficient Market Hypothesis – EMH*), imao je dug i težak razvojni put od idejnog začetka, do njegovog konačnog utemeljenja, kao jedne od centralnih paradigmi u savremenim finansijama. Decenijama je bio izložen testiranju i kritičkom preispitivanju, a dve osnovne vrste problema sa kojima se susretao su teorijski paradoksi i tržišne anomalije. Cilj rada je da se kroz predstavljanje različitih testova efikasnosti finansijskog tržišta i rezultata sprovedenih istraživanja, ispita validnost *EMH*. Namera je da se dâ odgovor na pitanje da li se, uprkos teorijskim paradoksima i tržišnim anomalijama, konceptu efikasnog finansijskog tržišta može pripisati epitet validnosti. S tim u vezi, u radu su predstavljeni brojni dokazi za i protiv validnosti slabog, polujakog i jakog oblika *EMH*, sa zaključkom da, ni posle više od pola veka istraživanja, u finansijskoj literaturi nije postignut konsenzus o prisustvu ili odsustvu validnosti ove hipoteze.

Ključne reči: testovi slabog oblika *EMH*, testovi polujakog oblika *EMH*, testovi jakog oblika *EMH*

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