

The Implications of Random Walk Hypothesis in Efforts to Increase Market Efficiency in the Stock Exchange: a Systematic Literature Review

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Abstract

The Random Walk Hypothesis implies that markets are highly efficient and that price movements of securities are unpredictable. Therefore, for investors, a passive investment approach, such as buying and holding, is more advisable than trying to find short-term profits by trying to identify patterns in price movements. However, this theory is also criticized by some who argue that markets are not always fully efficient, and that certain investor behaviors or events can produce more structured patterns in market prices. To determine the literature review on the implications of the hypothesis of random movements as an effort to improve the efficiency of the stock market. The application of Systematic Literature Review method in this study using prisma method with the help of Watase uake tools. The results showed that the random walk hypothesis phenomenon is influenced by various factors, including information asymmetry, market policies and regulations, market volatility, calendar anomalies, arbitrage and market manipulation, trading technology or algorithms, and macroeconomic conditions.

Keywords : Random Walk Hypothesis, Market Efficiency, and Stock Exchange.

INTRODUCTION

The decision to invest in the capital market is followed by risks, ranging from low return risk to high return risk. Investors assume that the market with conditions that can be said to be efficient if the financial information and the amount listed is adequate and accessible. Meanwhile, if investors feel dissatisfied with the availability of information or feel not in line with the announcement of financial data of a company, it cannot be concluded that the market or exchange is inefficient (Fama, 1970). The fact that the perception of individuals in this case investors have different points of view, according to Kubilay & Bayrakdaroglu (2016) that in analyzing the condition or state of the economy and probability is not entirely an individual doing the way and have the right view and appropriate in this context. In the theory of popular Efficiency Market Hypothesis by (Fama, 1970) that the stock price reflected from the exchange is fully reflect the financial information provided and announced by the company and describe the real conditions.

Discussing the inefficient stock market, simultaneously causing economic growth and economic crisis. In the argument of inefficient stock market makes economic growth higher, because there are anomalies that cannot be predicted by investors, it is considered “fair” if no one with the same purpose and purpose can predict it. In addition, the reason the stock market inefficient cause economic crisis is that asymmetric information where data is not spread evenly by the investors. Furthermore, the limitation in liquidating the assets of the investors where this is the ownership of shares is difficult to sell (Tiwari & Kyophilavong, 2014).

Jones (2023) revealed that in the stock market describes the long-term returns reflected from the market listing are not in line with random movements. If returns were not random, some segments would have significantly higher risk than others, and only a few stocks would be

dominated by one or more average return risks. From the previous explanation, we try to further examine what exactly is reflected in the stock price announced on the stock exchange and how the implications of the hypothesis of random movements as an effort to improve the efficiency of the stock market.

RESEARCH METHODS

Massaro, et al (2016) identified “literature reviews” varying from rapid reviews, characterized by few rules, to SLRs, where specific rules must be applied. Although the rapid review aims to summarize and interpret the findings emerging from previous studies, the SLR goes further by providing a transparent research methodology to assess and classify each study included in the review and propose future research directions. Starting from the research questions identified in the previous sections, other steps are required to develop a data set and analysis framework, as outlined in the following sections. The first step in the search for literature on the SLR methodology is the selection of Qualified Articles within the scope of capital market-based accounting. The literature search is based on the keywords “random walk hypothesis” or “random walk of the efficient market” or “market efficiency in the stock exchange” or “changes in stock price”. The following is the distribution of articles per year presented in chart form:

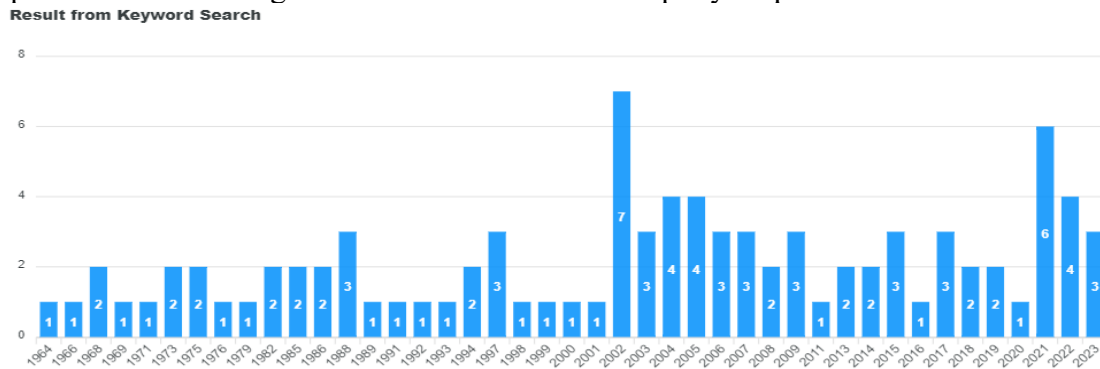


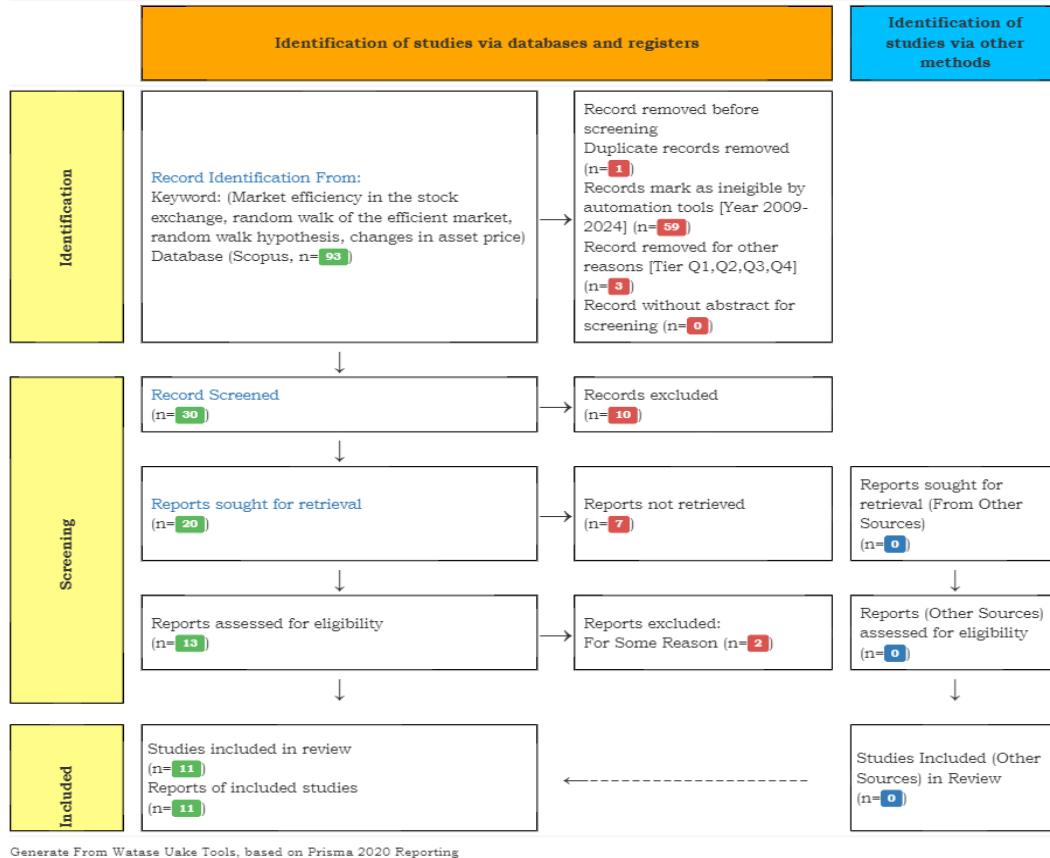
Figure 1 Distribution of articles per year. Source: Watase Uake

The library database used in this research is Scopus as an accredited database to support the credibility of this research through the Watase Uake website and tools. Several filters are used to limit the search to relevant articles. Firstly, the SLR method only uses articles, so other than that, conferences, proceedings, book chapters, and so on are not included. Second, only articles published in the last 15 years, namely 2009-2024, this period was chosen to include the latest articles, also bearing in mind that a stock market and share prices are constantly experiencing movements following the dynamics of an increasingly rapid era from a technological point of view. and information. Searches are based on journal publications that have rankings only (Journal Rank), namely Quartile 1, Quartile 2, Quartile 3 and Quartile 4.

The search is not limited to the domain of “accounting”, but also extended to related domains (such as economics, business, finance, management, technology and information systems). Therefore, in the Scopus database, the search is limited to the fields of accounting, economics, business, finance, management, and technology and information systems. In the Scopus database through the Watase Uake website, 93 articles were obtained that had not been

filtered by year, type of article, and discussion area based on the abstract search. The following is an overview of study identification through the PRISMA method database:

Prisma Reporting: The Implications Of The Random Walk Hypothesis In Efforts To Increase Market Efficiency In The Stock Exchange: A Systematic Literature review



Generate From Watase Uake Tools, based on Prisma 2020 Reporting

Figure 2 Prism Model Literature search, Sumber: Source: Watase Uake

RESULTS AND DISCUSSION

1. Basic Assumptions of Random Walk Hypothesis

Random Walk Hypothesis is a theory that states that stock price movements in the capital market are random and unpredictable. According to this hypothesis, changes in stock prices from one period to the next are independent and identically distributed. This means that the current stock price is not affected by the previous stock price, and any price changes are the result of a random process that cannot be predicted based on past information.

This concept was first proposed by Louis Bachelier in 1900 and was later further developed by economists such as Eugene F. Fama. This hypothesis supports the idea that the capital market is efficient, where all available information is already reflected in the current stock price, so that no advantage can be gained from technical or fundamental analysis. (Kubilay & Bayrakdaroglu, (2016b)

The distribution of price changes that follow a random walk pattern is often assumed to be a normal or Gaussian distribution, especially when the number of transactions is very large, based on the Central Limit Theorem. However, there is some empirical evidence that suggests that the

independence assumption in the random walk model may not be entirely accurate, although this does not necessarily reject the market efficiency hypothesis. (Jokung & Mitra, 2019).

The basic assumption of the random walk hypothesis is that price changes from one transaction to the next are independent and identically distributed with finite variance. If transactions are evenly distributed over time and the number of transactions per day, week, or month is very large, then the Central Limit Theorem leads to the expectation that these price changes will have a normal or Gaussian distribution. (Fama, 1970). The random walk hypothesis is said to be independent because price changes from one transaction to the next are assumed to be independent and identically distributed random variables. This means that price changes are not affected by previous price changes, and each price change is the result of a random process that cannot be predicted based on past information. (Kubilay & Bayrakdaroglu, 2016).

In a study conducted by Shah, et al. (2018) that In the context of this study, heuristic biases such as overconfidence, representativeness, availability, and anchoring can cause deviations from the market behavior expected by the random walk hypothesis. This bias can cause security prices to deviate from their intrinsic value, which means that the market is not completely efficient and price movements may not be completely random.

The assumption of the random walk hypothesis studied by Jones (2023) is that stock returns are independent and identically distributed (IID) processes over time. This means that future returns cannot be predicted from past returns, and any price changes are the result of new information that could not have been predicted in advance. In this model, monthly risk is generated by short-term volatility, such as daily or even shorter.

The random walk hypothesis in Tiwari & Kyophilavong's (2014) study was tested on the BRICS stock index using the wavelet-based unit root test developed by Fan and Gençay (2010), along with a series of other unit root tests. The results of the wavelet-based test showed that the random walk hypothesis was rejected for all BRICS countries except the Russian Federation. This suggests that the stock market indices in these countries can be predicted based on historical information. However, these results should be interpreted with caution as they are based on a relatively small sample of only 11 years of monthly observations. Furthermore, in a study conducted by Verma et al. (2022), it is assumed that the random walk hypothesis, which is a key indicator of market efficiency, does not apply to the cryptocurrency market. This is based on the finding that past prices can affect future price movements, indicating that the cryptocurrency market is not completely efficient and has predictable patterns. This provides an opportunity for investors to exploit trading strategies to gain abnormal profits. In line with the findings (Palamalai, et al. (2021) who evaluated the efficiency of the cryptocurrency market by testing the random walk hypothesis on the top ten cryptocurrencies. Using non-parametric and parametric testing methods, the results of the study showed that most cryptocurrencies do not follow a random walk pattern, indicating weak form market inefficiency. This inefficiency is associated with the presence of asymmetric volatility clusters. Asymmetric GARCH models, such as EGARCH and TGARCH, are used to capture volatility dynamics, showing that volatility shocks are persistent and bad news has a greater impact on future volatility than good news. These findings have significant implications for investors, portfolio managers, and regulators in the cryptocurrency market, highlighting the need for a better framework to improve market efficiency and attract more informed traders. The assumption regarding the random walk hypothesis (RWH) in the research of Yadav & Arora (2020) is that stock prices move randomly and cannot be predicted based on past price information. RWH states that stock price changes

are independent and identically distributed, meaning that future price movements cannot be predicted from past price patterns. In the context of this study, the variance ratio test is used to test this hypothesis, where if the variance ratio value is equal to one, then the RWH assumption is met. However, if the variance ratio value is different from one, this indicates autocorrelation and violation of RWH.

2. Implications of the Random Walk Hypothesis

The implications of the random walk hypothesis are as follows:

- a. **Market Efficiency:** This hypothesis supports the idea that capital markets are efficient because current stock prices reflect all available information. Because stock price movements are unpredictable and random, technical or fundamental analysis is not useful.
- b. **Investment Decision Making:** Because stock prices are unpredictable, investment strategies that attempt to beat the market by exploiting past price patterns tend to be ineffective. Instead, strategies such as buy and hold may be more appropriate in an efficient market context.
- c. **Testing the Efficient Market Hypothesis:** The random walk hypothesis is often used as a basis for testing the efficient market hypothesis. If stock prices follow a random walk, this suggests that the market is efficient in processing information.
- d. **Stock Price Distribution:** The assumption that stock price changes follow a normal distribution allows for the use of certain statistical tools for market analysis, although some evidence suggests deviations from pure independence in the random walk model.
- e. **Market Volatility:** This hypothesis also implies that market volatility can arise naturally from random processes, without the need for significant external or systemic factors. The random walk hypothesis has broad implications in financial theory and investment practice, especially in the context of market efficiency and optimal investment strategies.
- f. **The implications of the random walk hypothesis in Xu et al.'s (2022) research** are that increasing market efficiency through interactions on the SSEEI platform can affect the assumption that stock prices move randomly and unpredictably. By reducing information asymmetry and increasing the accuracy of earnings expectations, these interactions can make stock prices more accurately reflect available information. This means that although stock prices may still exhibit random behavior in the short term, in the long term, they are more likely to reflect true fundamental values because better and faster information is available to investors.

In a study conducted by Tiwari & Kyophilavong (2014), the implication of the random walk hypothesis is that the stock markets in BRICS countries, except the Russian Federation, do not fully follow a random walk pattern. This means that stock prices in these markets can be predicted based on historical information, indicating that the markets are not fully efficient in the weak form. This has important implications for investors and policymakers, as it suggests an opportunity to gain abnormal profits through technical or fundamental analysis. However, these results should be interpreted with caution as they are based on a relatively small sample of only 11 years of monthly observations.

Another implication of the random walk hypothesis is that its absence indicates inefficiency in the cryptocurrency market. This means that cryptocurrency prices are not completely random and predictable, providing investors with opportunities to exploit trading strategies to gain

abnormal profits. This finding has attracted the attention of investors, policymakers, academics, and portfolio managers because it is an instrument that can generate above-normal returns (Verma et al., 2022).

Stock prices will move randomly and unpredictably if the stock market follows RWH. This suggests that investors cannot make abnormal returns using trading strategies or technical analysis based on past price patterns. However, the results of this study suggest that the Indian stock market does not follow a random walk model, indicating the potential for investors to earn abnormal returns by exploiting market inefficiencies (Yadav & Arora, 2020)

The implication of the random walk hypothesis in this study is that the Indian stock market, especially the BSE stock market index, is inefficient in the weak form. This means that stock prices do not follow a random pattern and there is a possibility to predict stock price movements based on historical information. This finding adds to the growing literature on the efficient market hypothesis (EMH) and is consistent with many previous studies that have shown that stock markets in the Asia-Pacific region do not support the EMH (Elangovan et al., 2022). In addition, the implication of testing the random walk hypothesis in this study suggests that the cryptocurrency market is inefficient in the weak form. This means that there is an opportunity for investors to make more profits by exploiting non-random price patterns. These findings are important for portfolio managers, market participants, and regulators, as they indicate the need for a better framework to improve market efficiency and attract more informed traders. (Palamalai et al., 2021).

3. Random Walk Hypothesis in relation to stock market efficiency in various countries

In the context of market efficiency, the random walk hypothesis supports the idea that capital markets are efficient in processing information. Thus, stock prices follow a random pattern that reflects the market's reaction to new information quickly and accurately. This ensures that stock prices are always at a fair value based on available information, thereby reducing the possibility of profits being made from trading based on historical information or technical analysis

The random walk hypothesis increases market efficiency by stating that stock prices fully reflect all available information, so that price changes are random and unpredictable. This means that no investor can consistently make abnormal profits using information that is already available, because the information is already reflected in the current stock price. This efficiency also means that investment strategies that try to beat the market by exploiting past price patterns tend to be ineffective, and strategies such as buying and holding may be more appropriate in an efficient market context.

According to Shah, et al. (2018) financial markets are considered efficient if security prices reflect all available information. There are three forms of market efficiency described: weak, semi-strong, and strong. The weak form states that past prices or returns reflect future prices or returns. The semi-strong form states that security prices reflect not only historical information but also publicly available information. The strong form states that security prices reflect all available information, both public and private. However, this research also shows that behavioral biases can make financial markets less efficient by causing mispricing of securities, even when rational arbitrageurs try to bring security prices closer to their fundamental values.

The study presented by Jones (2023) that the relationship between mean-reversion risk and random walk hypothesis in the context of stock returns. The random walk hypothesis states that stock returns are independent and identically distributed (IID) processes over time, meaning

that future returns cannot be predicted from past returns. However, this study found that there are calendar anomalies that indicate long-term predictability, which violates the random walk hypothesis.

Digital signal processing to determine whether the variance spectrum of stock returns has a risk associated with a calendar time interval that is significantly different from random walk. The results show that some frequencies have higher risks, indicating that returns do not fully follow the random walk model. Mean-reversion risk is found at various calendar intervals, such as monthly, annually, and business cycles, indicating that stock returns can be affected by periodic information releases. Thus, this study suggests that the random walk hypothesis does not fully explain the behavior of stock returns, especially when considering the risk associated with a particular calendar time interval. In this study, the random walk hypothesis is used to test the efficiency of the stock market in BRICS countries. If the stock market follows the random walk hypothesis, it means that stock prices move randomly and cannot be predicted based on historical information. Thus, all available information is already reflected in the current stock price, indicating that the market is efficient in the weak form. However, there is a contradiction that the results of Tiwari & Kyophilavong's (2014) study showed that the random walk hypothesis was rejected for all BRICS countries except the Russian Federation, which means that stock prices in these markets are predictable and not completely efficient. By knowing that the market is not completely efficient, investors can use historical information to predict stock price movements and potentially earn abnormal profits. This suggests that there is room to improve market efficiency by ensuring that information is spread faster and more evenly among all market participants.

In the context of Xu et al.'s (2022) research, increasing market efficiency through interaction on the SSEEI platform can affect the assumptions behind the random walk hypothesis by reducing information asymmetry and increasing the accuracy of earnings expectations, so that stock prices more accurately reflect available information. The random walk hypothesis is used as a primary indicator to assess the efficiency of the cryptocurrency market. If the random walk hypothesis holds, it means that asset prices move randomly and cannot be predicted based on past information, indicating that the market is efficient. However, this study found strong evidence against the random walk hypothesis, indicating that the cryptocurrency market is not completely efficient. This inefficiency means that past prices can influence future price movements, allowing investors to predict price movements and exploit profit opportunities (Verma et al., 2022). In Yadav & Arora's (2020) research, the random walk hypothesis (RWH) serves as a framework to test market efficiency in its weak form. If the stock market follows the RWH, it indicates that stock prices reflect all available information and move randomly, so there is no opportunity for investors to gain abnormal profits from past price information. Thus, RWH can improve market efficiency by ensuring that stock prices are unpredictable and reflect all relevant information, thereby reducing opportunities for arbitrage and speculation that is not based on new information. Elangovan's (2022) research assumes that the BSE (Bombay Stock Exchange) stock market index should follow a random pattern if the market is efficient in the weak form. However, the results of the study show that the BSE stock market index does not follow a random pattern. This is evidenced by the negative Z value for all BSE market indices and the p-value which is smaller than alpha (0.05), so that the null hypothesis that the BSE market index follows a random walk is rejected at the 5% significance level. When the market follows a random walk, it indicates that the market is efficient in processing information, so there is no

opportunity to gain abnormal profits through technical analysis or historical patterns. Thus, the random walk hypothesis serves as an indicator that the market is working efficiently, where stock prices accurately reflect intrinsic value and available information. However, if the market does not follow a random walk, as found in a study of the Indian stock market, it indicates that the market is not efficient in the weak form. In this case, it is possible to predict price movements and profit from historical information, which means that the market does not fully reflect all available information (Elangovan et al., 2022).

The random walk hypothesis plays an important role in improving market efficiency by stating that asset prices in an efficient market follow random patterns, making it impossible to predict future price movements based on historical information. In an efficient market context, all available information is already reflected in current asset prices, so there is no opportunity to gain abnormal profits through technical analysis or historical patterns. Thus, the random walk hypothesis promotes market transparency and integrity, as asset prices reflect their true value based on available information (Palamalai et al., 2021). The results of this study indicate that Class B stocks in China's stock exchanges, especially in the Shanghai and Shenzhen exchanges, do not follow the random walk hypothesis, indicating significant inefficiency. In contrast, Class A stocks appear to be more efficient than Class B stocks. This study uses various variance ratio tests to assess weak-form market efficiency. These findings reflect the difference in efficiency between Class A and Class B stocks, which can be caused by factors such as liquidity, market capitalization, and information asymmetry. The study also notes that regulatory changes, such as bank re-entry and opening of B shares to domestic investors, have had varying impacts on market efficiency (Charles & Darné, 2009).

The results of Mishra et al. (2015) study show that the Indian stock market does not fully follow the random walk hypothesis, which implies that stock prices may be predictable. The study uses a more sophisticated unit root test that takes into account structural disturbances and heteroscedasticity. Traditional tests often fail to reject the null hypothesis of unit root, which suggests that stock prices may follow a random walk. However, the more sophisticated test shows that stock indices exhibit mean reversion, which challenges the notion of random walk and implies potential predictability in price movements. The importance of considering heteroscedasticity in high-frequency financial data when testing market efficiency. In addition, Mishra et al. (2015) study identifies structural disturbances in certain years that reflect domestic and international economic shocks, emphasizing the influence of global and domestic economic events on market behavior.

Ngene et al.'s (2017) study discusses the random-walk hypothesis in stock market indices in emerging markets using unit root tests, specifically the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. This article highlights the limitations of these tests, especially their low power against gradual mean-reversion and the potential bias of ignoring structural breaks. To address these issues, they use a model that takes structural breaks into account, including single and multiple mean shifts. The results show that most emerging markets exhibit random-walk behavior in stock prices, with only Turkey showing weak stationarity. However, when structural breaks are taken into account, most tests reject the random-walk hypothesis, showing evidence of mean reversion in many cases. These findings emphasize the importance of taking structural breaks into account in time series analysis to avoid misleading conclusions about market behavior. Ngene et al.'s (2017) study also examines stock market efficiency, especially weak form efficiency and random-walk hypothesis in emerging markets from 1959 to 2008.

Using data from December 1987 to April 2013, this study finds strong evidence of multiple structural breaks in all emerging markets studied. Although traditional tests often reject the random-walk hypothesis, the methodology that takes into account multiple breaks supports the random-walk hypothesis in many cases. This study is important because it challenges previous studies that only consider single structural breaks and highlights the importance of understanding stock price behavior for resource allocation and economic growth in emerging markets.

CONCLUSION

Random Walk Hypothesis (RWH) assumes that the price movement of assets or securities in the market is random and unpredictable, because it is influenced by unexpected factors. In this theory, future prices are considered unaffected by past prices, so there is no consistent pattern to predict market movements. RWH supports the concept of efficient markets, which states that all information is already reflected in market prices, and therefore, active investment strategies do not provide more benefits than passive approaches, such as investing in market indices. The implications of the Random Walk Hypothesis (RWH) in the stock market include, first, encouraging Market Efficiency, where RWH supports the concept of efficient markets, which means that all relevant information is already reflected in stock prices, so that the market is considered fair and transparent. This reduces the possibility of opportunities for price manipulation or imbalanced information. Second, the assumption that stock prices move randomly and unpredictably, RWH directs investors to prefer passive investment strategies, such as investing in market indices, which can reduce transaction and management costs compared to active investment approaches. RWH reminds investors that excessive market predictions or attempts to "beat the market" are often ineffective.

This can reduce overconfidence and excessive speculation, and encourage a more rational approach to investing. RWH provides a clear and simple view that market prices move randomly, without having to study or analyze complex historical patterns, making it easier to understand and make investment decisions. Avoiding Biases and Emotions: By focusing on efficient and random markets, RWH helps investors to be less influenced by short-term fluctuations or emotions, such as fear or greed, which can harm investment decisions

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