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Market efficiency, anomalies and behavioral finance: A review of theories and empirical evidence

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Abstract

The efficient-market hypothesis (EMH) has been a cornerstone of financial theory for over a century, but persistent anomalies in stock markets challenge its validity. This review explores market efficiency, defining the concept and outlining its evolution through weak, semi-strong, and strong-form tests. It also examines key market anomalies—including the Winner–Loser Effect, Momentum Effect, calendar anomalies, and the Equity Premium Puzzle—that question the rationality of market participants. Theories from Behavioral Finance, such as investor heuristics, overconfidence, and herd behavior, are evaluated in explaining these inefficiencies. This analysis is valuable for academics developing financial models, investors optimizing portfolios, and policymakers regulating stock market stability. By bridging EMH with anomalies and Behavioral Finance, the study offers a nuanced understanding of market dynamics and the interplay between rational and irrational investor behavior.

Keywords: Efficient Market Hypothesis (EMH); Market Anomalies; Behavioral Finance; Momentum Effect; Winner–Loser Effect; Calendar Anomalies; Speculative Bubbles

1. Introduction

The Efficient Market Hypothesis (EMH) has been one of the most extensively examined concepts in economics and finance over the past century. The traditional financial framework supporting EMH is founded on several key financial theories, including the arbitrage principle [1-3], portfolio theory [4], the Capital Asset Pricing Model [5-9], arbitrage pricing theory [10], and option pricing theory [11]. Adam Smith [12] argued that a rational economic agent strives for maximum personal profit. When applied to stock markets, such an agent transforms into a rational investor whose primary goal is to optimize profits from stock trading.

However, investor rationality is contingent on stringent assumptions. If not all stock market participants behave rationally, these assumptions may be adjusted to account for "irrational" investors who trade in a random and independent manner. In such cases, the effects of these trades cancel each other out, leading to no significant impact on asset prices [13].

A crucial question arises: what if these "irrational" investors do not trade randomly and independently? Under such conditions, Fama [13] and others have suggested that rational arbitrageurs would intervene by buying undervalued assets and selling overvalued ones, thereby correcting price distortions. However, Fama and French [14] acknowledged that financial literature presents numerous instances of market anomalies. Some researchers argue that market anomalies and Behavioral Finance stem not from irrational investors alone, but from the presence of various investor types with diverse strategies and decision-making approaches.

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This paper describes market efficiency and anomalies by defining EMH and reviewing its theoretical foundations. It examines critiques of EMH, highlighting instances where investors do not necessarily engage in the dynamic optimization prescribed by classical finance theories. Instead of following purely logical, rational economic decision-making, investors often rely on heuristics and psychological biases when processing complex information, as suggested in [15].

The discussion extends to various market anomalies, including the Winner–Loser Effect, reversal effect, Momentum Effect, and calendar-based irregularities such as the January effect, weekend effect, and reverse weekend effect. Other anomalies examined include the book-to-market effect, value anomaly, size effect, Disposition Effect, Equity Premium Puzzle, herd behavior, ostrich effect, speculative bubbles, and different trading strategies rooted in technical analysis.

This explores different Behavioral Finance theories that seek to explain these anomalies. This review is valuable for academics in advancing financial theories that integrate EMH, market anomalies, and Behavioral Finance. It also benefits investors by aiding in the selection of investment products and strategies aligned with their risk tolerance and behavioral tendencies. Understanding these concepts helps policymakers design regulations that mitigate excessive market fluctuations and promote stability in financial markets.

2. Market Efficiency

Market efficiency is a financial market condition in which asset prices fully and rapidly incorporate all relevant information, making it impossible for investors to consistently achieve higher-than-average returns through investment strategies. This section provides a detailed definition of market efficiency, reviews existing literature on the subject, and examines various models that attempt to explain how market efficiency operates.

2.1. Definition of Market Efficiency

Market efficiency was first discussed in Gibson's (1889) book The Stock Markets of London, Paris and New York, where he noted [16] that when stock information becomes publicly available in an open market, its value reflects the consensus judgment of the most knowledgeable investors.

In 1900, Louis Bachelier, a French mathematician, introduced a groundbreaking concept in his Ph.D. thesis, Théorie de la Spéculation (Theory of Speculation). He observed that past, present, and even anticipated future events influence market prices, but these do not exhibit a clear pattern that can be used to predict future price fluctuations. He stated that the expected gain of a speculator is zero, a concept later supported by Samuelson [17], who framed efficient markets in terms of a martingale process. This implies that asset price movements follow a random pattern, making them inherently unpredictable. Bachelier's ideas on market efficiency gained attention when his work was translated into English by Cootner [18] and analyzed by Fama [19].

2.2. Early Developments in EMH

Kendall and Hill [20] analyzed weekly stock price data and discovered that prices largely followed a random walk pattern, with nearly zero autocorrelation. Working [21] and Roberts [22] found that stock return movements resembled a random walk, while Osborne [23] provided evidence that the logarithms of stock prices followed a Brownian motion, demonstrating the square root of time rule.

If stock prices truly follow a random walk, then forecasting future price movements is practically impossible. Studies by Cowles [24, 25] and working [26] indicated that professional market forecasters could not consistently predict price movements or outperform the market. Granger and Morgenstern [27], using spectral analysis, found that short-term price fluctuations adhered to the random walk hypothesis, though long-term trends exhibited some deviations. Cowles and Jones [28] provided evidence of serial correlation in stock prices, which was later reassessed by Cowles [29] after correcting errors introduced by averaging [30].

2.3. Recent Developments in Market Efficiency

Eugene Fama, a key figure in financial economics and a 2013 Nobel laureate, significantly contributed to the theoretical and empirical development of market efficiency. According to Fama [31], an efficient market is characterized by numerous rational, profit-driven investors who actively compete to forecast asset values using available information. Due to this competition, stock prices at any given time reflect all publicly available data, ensuring they are close to their intrinsic values.

The intrinsic value of an asset is based on a company's expected future earnings, which remain uncertain. However, in a market with many competing traders, the actual asset price fluctuates randomly around its intrinsic value. These random fluctuations lead to price changes that are independent of one another, which is a key characteristic of an efficient market.

A market where security prices change independently is referred to as a random-walk market [31]. Fama [32] linked this theory to empirical studies on market efficiency, arguing that price changes should follow a probability distribution. Since new market information emerges randomly, price changes reflect only current news and are independent of past price movements. Fama [32] employed statistical techniques such as serial correlation tests, run tests, and Alexander's [30] filter rule and found no evidence supporting the predictability of price movements. Consequently, he concluded that no trading strategy based solely on past price data could consistently outperform a buy-and-hold strategy.

Fama [32] explored the statistical properties of price changes and found that a Paretian distribution with characteristic exponents below two provided a better fit for stock market data than the Gaussian distribution, a conclusion aligned with Mandelbrot's [33] findings. This suggests that asset prices experience extreme variations more frequently than would be expected under a normal distribution.

2.4. Efficient Market Hypothesis (EMH)

A comprehensive review of market efficiency theory and empirical evidence was first conducted by Fama [34]. He defined an efficient market as one where asset prices at any given time fully incorporate all available information. He proposed three levels of market efficiency, each based on the extent of information available to investors:

2.5. Factor Models Explaining Market Efficiency

Under classical financial theory, an asset's price should reflect its fundamental value—the discounted sum of expected future cash flows. An efficient market ensures that no investment strategy consistently earns excess risk-adjusted returns. If EMH holds, market volatility should align with changes in real investment values [38].

For instance, research on the U.S. stock market from 1871 to 1986 attributed changes in total real investment value to three factors: dividend changes, real interest rate fluctuations, and inter-period marginal substitution rates [39]. Several factor models have been developed to explain variations in stock prices and returns:

2.5.1. Fama–French Three-Factor Model

Fama and French [40] introduced the Three-Factor Model, which builds on Merton's Intertemporal CAPM [41] and Ross's Arbitrage Pricing Theory [42]. This model explains asset returns using three factors: market risk premium (RMRF), size factor (SMB—Small Minus Big), and book-to-market ratio (HML—High Minus Low). Empirical studies, such as Ali et al. [43] have found this model useful in explaining stock returns, particularly in markets like Pakistan.

2.5.2. Carhart Four-Factor Model

Carhart expanded the Fama–French model by adding a momentum factor (PR1YR) to account for short-term trends in asset prices [44]. This model improves explanatory power for time-series variations in stock returns.

2.5.3. Fama–French Five-Factor Model

Fama and French refined [45] their model by incorporating profitability and investment factors, improving its ability to explain stock returns across different markets.

2.5.4. Factor Models in Chinese Markets

Chinese stock market studies, such as Liu et al. [46], developed a modified Three-Factor Model using the earnings-to-price ratio (EP) instead of the book-to-market ratio. Liu's Seven-Factor Model have been used to study herding behavior in China's A-share market [46].

3. Market Anomalies

There are many market anomalies that are important areas of theoretical and practical interest in Behavioral Finance. As many market anomalies have been observed that EMH cannot explain, many academics have to think of a new theory to explain market anomalies found, and this make a very important new area in finance, Behavioral Finance, which can

be used to explain many market anomalies. We discuss some market anomalies in this section and discuss Behavioral Finance in the next section.

3.1. Winner–Loser Effect/Reversal Effect

De Bondt and Thaler [47] found that investors are too pessimistic about the past loser portfolio and too optimistic about the past winner portfolio, resulting in the stock price deviating from its basic value. After a period of time, when the market is automatically correct, past losers are winning positive excess returns, while past winners are having negative excess returns, which support the Winner–Loser Effect. Stocks used in the experiment of De Bondt and Thaler [48] are those top 35 and those worst 35 in the long-term (five years period), then a return reversal happens in the next three years. Thus, a new method can be advanced to predict stock returns: using reversal strategy to buy the loser portfolio in the past three to five years and sell the winner portfolio.

This strategy enables investors to obtain excess returns in the next three to five years. Further, Jegadeesh [49] and Lehmann [50], respectively, proved that return reversal also happens in the short-term. The representative heuristic [51], for example, people tend to rely too heavily on small samples and rely too little on large samples, inadequately discount for the regression phenomenon, and discount inadequately for selection bias in the generation or reporting of evidence [52], can be used to explain the Winner–Loser Effect.

Thus, due to the existence of representative heuristics, investors show excessive pessimism about the past loser portfolio and excessive optimism about the past winner portfolio, that is, investors overreact to both good news and bad news. This will lead to the undervaluation of the loser portfolio price and the overvaluation of the winner portfolio price, causing them to deviate from their basic values.

3.2. Momentum Effect

At the moment when more and more empirical evidences are gathered to testify Winner–Loser Effect, Jegadeesh and Titman [53] found that stock returns are positively correlated in the period of 3–12 months, i.e., the Momentum Effect. If stock returns are examined over a period of six months, the average return of the "winner portfolio" is about 9% higher than that of the "loser portfolio". Chan et al. [54] enlarged Jegadeesh and Titman's [55] research samples and obtained the same results.

Research conducted by Rouwenhorst [56] showed that the Momentum Effect also exists in other developed markets and some emerging stock markets. Moskowitz and Grinblatt [57] studied the Momentum Effect of portfolio selected by industry, and they found that the industry portfolio has significant Momentum Effect in the US stock market, and the abnormal return is larger than that of individual portfolio.

Unlike other researchers in the literature, Asness et al. [58] challenged the existence of momentum itself, instead of explaining it by claiming the limitation of momentum. They proved that momentum return is small in size, fragmentary, under the concern of disappearing, and only applicable in short position. In the second place, momentum itself is unstable to rely on, behind which there is no theory. Last but not least, momentum might not exist or be limited by taxes or transaction costs, and it provides various results, depending on different momentum measures in a given period of time.

3.3. Calendar Anomalies—January Effect, Weekend Effect, and Reverse Weekend Effect

3.3.1. January Effect

The January Effect was first discovered by Wachtel [59]. In further research, Rozeff and Kinney [60] found that the return of NYSE's stock index in January from 1904 to 1974 was significantly higher than that of other 11 months. Gultekin and Gultekin [61] studied the stock returns of 17 countries from l959 to l979, and found that 13 of them had higher stock returns in January than in other months. Lakonishok et al. [62] found that, between l926 and l989, the smallest 10% of stock returns exceeded those of other stocks in January. Nippani and Arize [63] found strong evidence of the January Effect in the study of three major US market indices: corporate bond index, industrial index, and public utility index from, 1982 to 2002. However, according to Riepe [64], the January Effect is weakening.

The most important explanations for the January Effect are the Tax-Loss Selling Hypothesis [61] and the Window Effect Hypothesis [65]: the Tax-Loss Selling Hypothesis holds that people will sell down stocks at the end of the year, thereby offsetting the appreciation of other stocks in that year, in order to achieve the purpose of paying less tax. After the end

of the year, people buy back these stocks. This collective buying and selling leads to a year-end decline in the stock market and a January rise in the stock market the following year.

The Window Effect Hypothesis holds that institutional investors want to sell losing stocks and buy profitable stocks to decorate year-end statements. This kind of trading exerts positive price pressure on profitable stocks at the end of the year, and negative pressure on losing stocks. When the selling behavior of institutional investors stops at the end of the year, the losing stocks that were depressed in the previous year will rebound tremendously in January, leading to a larger positive trend of income generation.

3.3.2. Weekend Effect and Reverse Weekend Effect

In distinguish or test between the Weekend Effect and Reverse Weekend Effect is easy. When one gets higher returns on Friday than on Monday, it is regarded as the Weekend Effect, and when one gets higher returns on Monday rather on Friday, it is called the Reverse Weekend Effect. Weekend effects have been identified in the foreign-exchange and money markets, as well as in stock market returns by many scholars. Based on daily data from 1990 to 2010, in the world, Europe, and other countries, Bampinas et al. [66] investigated the weekend effect of the Securitization Real Estate Index and concluded that the average return rate on Friday is significantly higher than that on other days of the week. Chan and Woo [67] found the evidence of reverse weekend effect when Monday exhibited the highest returns for the H-shares index in Hong Kong from 3 January 2000 to 1 August 2008.

However, Olson et al. [68] examined the US stock market with cointegration analysis and breakpoint analysis and concluded that, after the discovery of the weekend effect in 1973, the weekend effect tends to weaken and disappears in the long run. In the United States, although the effect appears to be stronger in the 1970s than in earlier or later times, there already exist various explanations for stock market behavior on weekends. For example, the regular Weekend Effect has been attributed to payment and check-clearing settlement lags.

Kamstra et al. [69] claimed that the importance of daylight-saving-time changes indicated in their paper makes the issue something well worth sleeping on, and a matter that is as worthy of further study as to other explanations of the weekend anomaly The Reverse Weekend Effect was found: (1) The main stock indexes have the Reverse Weekend Effect. (2) The Weekend Effect tends to be related to small firms, while the Reverse Weekend Effect tends to be related to large firms. During the period in which Reverse Weekend Effect is observed, the Monday returns of large firms tend to follow the positive Friday returns of last Friday, but they do not follow the negative Friday returns. (3) After 1988, both the broad market index and the industry index showed positive returns on Monday. Returns were regressed, with Monday as a dummy variable, in Brusa et al.'s [70] research, and they emphasized that the Reverse Weekend Effect is widely distributed in large companies, not just a few.

3.4. Herd Effect and Ostrich Effect

Patel et al. [71] introduced two behavioral hypotheses to help explain financial phenomena: Barn Door Closing for mutual fund purchases and Herd Migration Behavior for debt–equity ratio. Barn Door Closing, in the horse protection sense, refers to undertaking behavior today that would have been profitable yesterday. Herd Migration in finance occurs when market conditions change, so that individual decision-makers wish to alter their holdings substantially. Their transition is slowed because they seek protection by traveling with the herd. Herd behavior (i.e., people will do what others are doing rather than what is optimal, given their own information) refers to behavior patterns that are correlated across individuals—but could also be caused by correlated information arrival in independently acting investors. Herding is closely linked to impact expectations, fickle changes without new information, bubbles, fads, and frenzies. Barber et al. [72] compared the investment decisions of groups (stock clubs) and individuals. Both individuals and clubs are more likely to purchase stocks that are associated with good reasons (e.g., a company that is featured on a list of most-admired companies). However, stock clubs favor such stocks more than individuals, even though such reasons do not improve performance. The mentioned Seven-Factor model by Li et al. [73] also indicates that herd behavior in the Chinese A-share market is more prevalent in times of market turmoil, especially when the market falls.

Hon [74] found a significant correlation between the reasons given by small investors for changing their current security holdings and the reason given for the sharp correction in the bank stock market. This empirical finding suggests that herding behavior occurred frequently among small investors, and they tend to sell their stocks during the sharp correction period. Hon [75] found that there was a change in the behavior of small investors during and immediately after the buoyant stock market of January 2006 to October 2007 in Hong Kong. During the buoyant market, small investors were overconfident and bought stock. The small investors also exhibited herd behavior, and, once the sharp correction to the market began after October 2007, they sold the stock.

In Galai and Sade [76], it is recorded that government Treasury bonds provide higher maturity rates than non-current assets with the same risk level in Israel. Additional research shows that liquidity is positively correlated with market information flows. As ostriches are thought to deal with obvious risk situations by hopefully pretending that risk does not exist, the ostrich effect is used to describe the above investors' behavior. Karlsson et al. [77] presented a decision-theoretical model in which information collection is linked to investor psychology. For a wide range of plausible parameter values, the model predicts that the investor should collect additional information conditional on favorable news, and avoid information following bad news. Empirical evidence collected from Scandinavian investors supports the existence of the ostrich effect in financial markets.

3.5. Bubbles

Bubbles feature large and rapid price increases, which result in the rise of share prices to unrealistically high levels [78]. Bubbles typically begin with a justifiable rise in stock prices, possibly due to a technological advance or a general rise in prosperity. If this rise is substantial and prolonged, it leads to members of the public believing that prices will continue to rise.

People who do not normally invest begin to buy shares in the belief that prices will continue to rise. More and more people, typically those with no knowledge of financial markets, buy shares. This pushes prices up even further, causing euphoria and manic buying, which drives further price increases.

This creates a self-fulfilling prophecy, where the belief that prices will rise leads to buying. People with no knowledge of investing often believe that if share prices have risen recently, those prices will continue to rise in the future [79]. A speculative bubble can be described as a situation where temporarily high prices are sustained largely by investors' enthusiasm, rather than by consistent estimations of real value. The essence of a speculative bubble is a feedback loop—from price increases to increased investor enthusiasm, to increased demand, and hence further price increases. According to the adaptive expectations version of the feedback theory, feedback takes place because past price increases generate expectations of further price increases.

According to an alternative version, feedback occurs as a consequence of increased investor confidence in response to past price increases. However, a speculative bubble is not indefinitely sustainable. Prices cannot go up forever, and when price increases end, the demand that fueled those increases dissipates. Downward feedback may replace the upward feedback.

Shiller [80] presented evidence on two types of investor attitudes that change over time, with significant consequences for speculative markets. The paper explores changes in bubble expectations and investor confidence among institutional investors in the US stock market from 1989 to 1998, and individual investors at the beginning and end of this period.

Since current owners believe they can resell the asset at an even higher price in the future, bubbles refer to asset prices that exceed the asset's fundamental value. There are four main strands of models that identify conditions under which bubbles can exist. The first category assumes rational expectations and identical information, generating the implication that bubbles must follow an explosive path. The second category suggests that bubbles can emerge under more general conditions when investors are asymmetrically informed.

The third strand of models focuses on the interaction between rational and behavioral traders. Bubbles can persist because limits to arbitrage prevent rational investors from eradicating the price impact of behavioral traders. The fourth class of models suggests that bubbles can emerge if investors hold heterogeneous beliefs, often due to psychological biases, and disagree about the fundamental value of assets.

Abreu and Brunnermeier [81] employed experiments to test the validity of different mechanisms that may lead to or rule out bubbles. West [82] suggested that the parameters needed to calculate the expected present discounted value of dividends can be estimated in two ways. Testing for speculative bubbles involves examining whether two estimates are the same. When applied to US stock market data, the test typically rejects the null hypothesis of no bubbles.

Craine [83] suggests that the fundamental value of a stock is the sum of the expected discounted dividend sequence. Bubbles represent deviations from this fundamental value. Rational bubbles satisfy an equilibrium pricing restriction, implying that agents expect them to grow fast enough to earn the expected rate of return. The explosive growth causes the stock price to diverge from its fundamental value.

Chan and Woo [84] employed a new test to detect stochastic explosive root bubbles. If a speculative bubble exists, the residuals from the regression of stock prices on dividends will not be stationary. Their data series, which includes stock price indices, dividend yields, and price indices for several Asian markets (Taiwan, Malaysia, Indonesia, the Philippines, Thailand, and South Korea), provides evidence of bubbles in the stock markets of most countries, but no evidence in South Korea.

Homm and Breitung [85] proposed bubble-testing methods applied to NASDAQ and other financial time series. They concluded that a Chow-type break test provides the highest power and performs well relative to the power envelope. This method also allows for monitoring speculative bubbles in real time.

In order to explore bubbles further, in the next section, we introduce several factors underlying the bubble that help explain bubbles.

3.5.1. The Internet

Investors, in general, and online investors, in particular, now make decisions in a very different environment than investors in the past. They have access to far more data via the Internet. They often act without personal intermediaries. They can conduct extensive searches and comparisons on a wide variety of criteria. A critical and largely unexplored research question is how this different environment affects the decision-making of investors (Barber and Odean 2001b).

Barber and Odean (2002) analyzed 1607 investors who switched from phone-based to online trading during the 1990s. Those who switched to online trading performed well prior to going online, beating the market by more than 2% annually. After going online, they traded more actively, more speculatively, and less profitably than before, lagging the market by more than 3% annually.

Reductions in market frictions (lower trading costs, improved execution speed, and greater ease of access) do not explain these findings. Overconfidence—augmented by self-attribution bias and the illusions of knowledge and control—can explain the increase in trading and reduction in performance of online investors.

3.5.2. Derivatives

Hon (2013a) attempted to identify the ways that the Hong Kong companies in the Hang Seng Index Constituent Stocks manage their financial risk with derivatives. By analyzing the companies' annual reports and financial reviews, it was found that 82.6% of these companies used derivatives in 2010. Specifically, 58.7% of them used swaps to hedge interest rate risk, and 54.3% of them used forward contracts to hedge foreign-exchange risk. The results are largely consistent with the prediction that companies use derivatives to manage their financial risk.

By investing in stocks, bonds, and other financial assets, people have been able to build up a buffer in case of being dismissed. Firms have tilted their compensation packages to management away from fixed salaries toward participation and result-based compensations, such as stock options. With such options, management has an incentive to do everything possible to boost share prices. They have an incentive to maintain an appearance of corporate success and a corporation working its way toward an impressive future with increasing profits. It seems as a strategy to boost the stock value and to refine the company's objectives and announcing that it was a part of the e-business society.

Heath et al. (1999) investigated stock-option-exercise decisions by over 50,000 employees at seven corporations. Controlling for economic factors, psychological factors influence exercise. Consistent with psychological models of beliefs, employee exercise in response to stock price trends—exercise is positively related to stock returns during the preceding month and negatively related to returns over longer horizons. Consistent with psychological models of values that include reference points, employee exercise activity roughly doubles when the stock price exceeds the maximum price attained during the previous year. Options have no purchase price to serve as a reference point.

Employees do not purchase options; they receive them at a strike price that is equal to the stock price on the date of the grant. Because employees can only exercise their options when the stock price exceeds the strike price, reference points, if they exist, will be dynamically determined by stock price movement after the grant.

CEO compensation has grown dramatically. Average CEO compensation as a multiple of average worker compensation rose from 45 in 1980, to 96 in 1990, and to an astounding 458 in 2000. A large portion of this compensation comes in the form of stock options. Economists fear that managers will behave more conservatively than is in the best interests of shareholders because managers' careers are tied to the firm. Executive stock options mitigate this problem by

rewarding managers when the firm's share price goes up but not punishing them when it goes down. Such convex compensation contracts encourage managers to take risks.

Gervais et al. (2011) argued that executives are likely to be overconfident and optimistic, and thus biased, when assessing projects, and that many shareholders are under-diversified and do care about specific risk. A manager may further manipulate investor expectations by managing earnings through discretionary accounting choices. Furthermore, research indicates that earnings manipulations can affect prices.

Derivatives are a new segment of secondary market operations in India. Ganesan et al. (2004) found that a buoyant and supporting cash market is a must for a robust derivative market. Hon's (2015a) found that the majority of respondents who invested in their derivative investments during January 2013 to January 2014 in Hong Kong were relatively younger. More than 58.1% of the respondents had tertiary education for their derivatives investments. Males preferred to invest in warrants more than females did, while females preferred to invest in stock options more than males did.

Hon (2015c), based on the survey results, derived the ascending order of importance of reference group, return performance, and personal background (reference group is the least important and personal background is the most important) in the Hong Kong derivatives markets. The results of Hon's paper (Hon 2013c) indicate that small investors mostly tend to trade Callable Bull/Bear Contacts (35% of total) and warrants (23% of total). Hon (2012) identified five factors that capture the behavior of small investors in derivatives markets in Hong Kong. The factors are personal background, reference group, return performance, risk tolerance, and cognitive style.

3.5.3. Feedback Models

The essence of a speculative bubble is the familiar feedback pattern—from price increases to increased investor enthusiasm to increased demand and, hence, to further price increase. The higher demand for the asset is generated by the public's memory of high past returns and optimism the high returns generate for the future (Shiller 2002).

When speculative prices go up, creating successes for some investors, this may attract public attention, promote word-of-mouth enthusiasm, and heighten expectations for further price increases. The talk attracts attention that justifies the price increases. This process, in turn, increases investor demand and thus generates another round of price increases. If the feedback is not interrupted, it may produce after many rounds a speculative "bubble", in which high expectations for further price increases support very high current prices. The high prices are ultimately not sustainable, since they are high only because of expectations of further price increases, and so the bubble eventually bursts, and prices come falling down.

The feedback that propelled that bubble carries the seeds of its own destruction, and the end of the bubble may be unrelated to news stories about fundamentals. The same feedback may also produce a negative bubble, downward price movements propelling further downward price movements, promoting word-of-mouth pessimism, until the market reaches an unsustainably low level (Shiller 2003).

3.5.4. Smart Money

The efficient markets theory, as it is commonly expressed, asserts that when irrational optimists buy a stock, smart money sells, and when irrational pessimists sell a stock, smart money buys, thereby eliminating the effect of the irrational traders on market price. From a theoretical point of view, it is far from clear that smart money has the power to drive market prices to fundamental values. For example, in one model with both feedback traders and smart money, the smart money tended to amplify, rather than diminish, the effect of feedback traders, by buying in ahead of the feedback traders in anticipation of price increases they would cause (Shiller 2003). In addition to search costs, investors might choose mutual funds with high expenses if high-expense funds provided better service than other funds.

Barber et al. (2005) asserted that different levels of service are unlikely to explain their results, since first-rate service and low expenses are not mutually exclusive. For example, Vanguard, which is well-known for its low-cost mutual fund offerings, has won numerous service awards. Barber and Odean (2003) concluded that either models of optimal asset location are incomplete or a substantial fraction of investors are misallocating their assets. Though tax considerations leave clear footprints in the data they analyzed, many households could improve their after-tax performance by fully exploiting the tax-avoidance strategies available on equities.

3.5.5. The Media

Media may well have an important role in directing this public attention toward markets, which may consequently result in abnormal market behavior. Stock-market price increases generate news stories, which generate further stories about new-era theories that explain the price increases, which, in turn, generate more news stories about the price increases (Shiller 2002). In the United Kingdom, Diacon (2004) found that lay investors perceive higher risks in investing in financial services products than do their financial advisers (coupled with an inherent optimism about likely benefits) has substantial ramifications in the light of recent reports, such as the "Sandler Review". This may have the effect of encouraging consumers to deal directly with providers rather than via independent financial advisers.

Dispensing with the services of financial advisers is likely to lead consumers to make more conservative investment choices: for example, by investing too little in equities and too much in fixed-income assets when saving retirement. As a result, consumers may find themselves with surprisingly inadequate levels of savings to meet future commitments such as a pension on retirement. Hon (2013b) studied the investment attitude and behavior of the small investors on derivatives markets in Hong Kong. He found that the most decisive factor that could influence small investor's decision making is highly accessible and updated. In total, 37.8% and 25.8% of respondents considered the Internet and news/magazines/newspaper, respectively, as the decisive factor.

3.5.6. Emotions and Sentiments

There are serious questions concerning whether the phenomenon on excess volatility exists in the first place and, and if it does, whether abandonment of assumptions of rational expectations in favor of assumptions of mass psychology and fads as primary determinants of price changes is the best avenue for current research (Kleidon 1986). Using common sense, one knows that the stock market could repeat the performance of recent years. That possibility seems quite real, just as real as the possibility of a major correction in the market. The question is how the private investor feels when he fills out his choice of mutual funds for his retirement scheme. How this person feels depends on his experiences in investing.

If one has been out of the market without participating in earning money that other investors may have done, one may be feeling a sharp pain of regret. Regret has been found by psychologists to be one of the strongest motivations to make a change in something. Envy is another dominant characteristic: To see other people having made more money in the stock market than oneself has made from work is a painful experience, especially since it diminishes one's ego. In case the other people were smarter, one feels like a fool, and even if they were not any smarter, just lucky, it may not feel any better.

A common feeling in this situation is that if one can participate just one more year in rising stock market everything will be much better and mitigate the pain. One may also think that the potential loss will be much more diminishing to one's ego than the failure to participate has already been. One may also realize that one takes the risk of entering the market just as it begins a downward turn. However, the psychological cost of such a potential future loss may not be so much greater relative to the very real regret of having been out of the market in the past.

Barberis et al. (1998) presented a parsimonious model of investor sentiment, or of how investors form expectations of future earnings. The model they proposed was motivated by a variety of psychological evidence; in making forecasts, people pay too much attention to the strength of the evidence they are presented with and too little attention to its statistical weight. Loewenstein et al. (2001) proposed an alternative theoretical perspective, the risk-as-feelings hypothesis, which highlights the role of affect experienced at the precise moment of decision-making. Drawing on research from clinical, physiological, and other subfield of psychology, they showed that emotional reactions to risky situations often diverge from cognitive assessments of those risks. When such divergence occurs, emotional reactions often drive behavior. The risk-as-feelings hypothesis is shown to explain a wide range of phenomena that have resisted interpretation in cognitive–consequentialist terms.

If one participates in the market today for a while and ponders whether get out or not, he has a fundamentally different emotional frame of mind. This person feels satisfaction and probably pride in his past successes, and he will certainly feel wealthier. One may feel as gamblers do after they have "hit big-time", i.e., that one is gambling with the "house money", and therefore has nothing to lose emotionally by wagering again. The concept of gambling with the house money is a theory about people's risk preferences and is related to mental accounting. Investors will generally become more risk-averse in the case of prior losses and less risk-averse in the case of prior gain (Barberis and Thaler 2003); they will also take greater risks as their profits grow.

This provides support for the notion that successful traders are more likely to be overconfident. The emotional state of investors when they decide on their investment is no doubt one of the most important factors causing bull market. From the neuroscience literature, Peterson (2002) demonstrated correlations between reward anticipation and the arousal of affect (feelings, emotions, moods, attitudes, and preferences). He briefly outlined an investment strategy for exploiting the event-related security-price pattern described by the trading strategy "buy on the rumor and sell on the news".

In their research, chow et al. (2015) conducted a survey to examine whether the theory developed in Lam et al. (2010, 2012) and Guo et al. (2017a) holds empirically, by studying the behavior of different types of Hong Kong small investors in their investment, especially during financial crisis. They found that determinants of the Hong Kong small investors' investment decision have uniform views as to the ascending order of importance of time horizon, sentiment, and risk tolerance. Time horizon is the least important factor, and risk tolerance is the most important factor.

4. Conclusion

The debate on market efficiency remains unresolved as financial markets continue to exhibit inefficiencies despite theoretical predictions of rational pricing. While EMH provides a strong theoretical foundation, the existence of anomalies suggests that psychological and behavioral factors influence stock prices. This review has highlighted key anomalies such as momentum effects, size and value effects, and behavioral biases like overconfidence and loss aversion. Furthermore, factor models like the Fama–French Five-Factor Model and Behavioral Finance theories have contributed to better understanding these market irregularities. While certain anomalies may diminish over time due to market adaptation, new ones emerge, reflecting the evolving nature of financial markets. The findings suggest that neither EMH nor Behavioral Finance alone can fully explain stock market behavior. Instead, a hybrid approach integrating elements of both may provide a more comprehensive framework for future research and policy decisions.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

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