Financial portfolio management between Markowitz analysis and behavioral finance

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Abstract:

The purpose of this study is to examine the theoretical and practical evolution of financial portfolio management from the normative foundations of Markowitz's Modern Portfolio Theory (MPT) to the descriptive insights of behavioral finance. Using an analytical descriptive approach, this article argues for a necessary synthesis of these paradigms. The main findings demonstrate that while MPT provides an essential quantitative framework for optimization, its core assumptions of rationality and market efficiency are systematically violated by documented investor behaviors such as loss aversion, mental accounting, and herding. Conversely, behavioral finance, through constructs like Prospect Theory and Behavioral Portfolio Theory (BPT), accurately describes these behaviors but lacks a unified normative standard for portfolio construction. The study concludes that a synthesized framework, which integrates the mathematical rigor of mean-variance optimization with adjustments for cognitive biases and psychological utility, produces superior outcomes. This integration yields theoretical models with greater explanatory power for market anomalies and practical strategies that enhance client adherence and goal attainment by designing portfolios that are both efficient and behaviorally robust. Ultimately, the research finds that behavioral finance has profoundly grounded portfolio theory in psychological reality, though declaring its outright superiority over MPT remains premature, highlighting a fertile domain for future empirical research.

Keywords : behavioral finance; psychological factors; mental account; moral benefits; emotional benefits.

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I Introduction:

The traditional financial theory, whose pillars were represented by the principles of arbitrage, the principles of Markowitz's financial portfolio management, the capital asset pricing model, and the options pricing model, was based on a basic assumption of market efficiency, the content of which is that the prices of financial assets equal their basic values, using limited analytical instruments for developing a cohesive theory that enables it to address all questions in the financial field. Since every theoretical construction requires experimental studies, the traditional financial theory faced several puzzles in its experimental studies that it was unable to explain. In its solution, it faced the problem of the principle of complete rationality of agents upon which all models of market equilibrium in this theory were based, which shows the flaws that this theory suffers from and highlights the urgent need for a theoretical reconstruction based on considering more realistic studies of agents' behavior.

Thus, the behavioral finance approach emerged, which was built on a set of tools, some of which were used by traditional financial theory, and others differed in that they reflected different patterns of heterogeneous behavior of agents. These tools were taken from other social sciences, such as psychology and sociology, and they mainly revolved around the psychology of agents in their financial transactions, because a substantial amount of psychological research shows that people do not act logically in many aspects of their lives. As a result, some contend that we shouldn't hold people to logical investment behavior.

In reality, choosing the optimal financial portfolios is not completely consistent with the "return-risk" analysis. Although investors resort to portfolio theory, they only apply it partially or incorrectly in reality. On the other hand, some experiments have proven the ability of investors to build portfolios that lie close to the efficient frontier and tend to match efficient portfolios over time. In this study, we will focus on the most prominent distortions observed when applying Markowitz's "return-risk" analysis in reality, then address the most important behavioral theories in building the optimal financial portfolio.

Based on the above, the following problem can be raised: **How can portfolio management frameworks be adapted to account for the empirically-documented irrationalities of investor behavior without sacrificing the analytical rigor and diversification benefits of formal optimization models?**

this article tests the following central hypothesis:

A portfolio management framework that explicitly integrates the normative optimization principles of Markowitzian finance with the descriptive psychological insights of behavioral finance will produce theoretical models and practical strategies that are superior in explaining market phenomena, predicting investor behavior, and achieving sustainable client outcomes compared to frameworks relying exclusively on one paradigm.

This hypothesis is predicated on the proposition that neither a purely rational model nor a purely behavioral description is sufficient. The former fails due to its flawed psychological premises, while the latter lacks a systematic normative standard for optimization. The expected superiority of an integrated framework lies in its ability to generate portfolios that are both mathematically sound (efficient) and behaviorally robust (adhered to by clients).

1. Behavioral factors affecting investment decisions.

Most financial and economic theories assert that when making an investment decision, a person acts rationally and weighs all available information to make an investment decision. However, behavioral finance believes that an investor acts irrationally. Studies have shown that (Kahneman & Tversky, 1979) and (Waweru, Munyoki, & Uliana, 2008) Emotional, psychological, and behavioral aspects all play a role in investor decisions. The experimental results of studies conducted by (Chen, Kim, Nofsinger, & Rui, 2007) Behavioral biases cause investors to make bad trading and investment choices. It has been discovered that a wide range of behavioral characteristics affect how people, organizations, and groups make decisions (Ricciardi & Simon, 2008). In addition, the study conducted by (Qureshi , Rehman, & Hunjra, 2012) Behavioral factors are important in increasing investor confidence and favorably influence investment choices. The behavioral factors affecting investment decisions can be summarized as follows:

1.1. Inference theory.

Heuristics are the application of knowledge and real-world experience to solve problems or enhance performance. This is because decision makers are receiving an increasing amount of information more quickly; thus, things become more complex in financial markets. This implies that using heuristics more frequently is frequently an unavoidable strategy. There are several elements of heuristics when making investment decisions: representativeness and habituation, historical cost, risk, and emotional bias (Tversky & Kahneman, 1974). Rules of thumb also facilitate decision-making, but they can also introduce biases, especially in a complex and uncertain business environment. This can lead to making less-than-desirable investment choices (Ritter, 2003, p. 431).

The extent to which an occurrence blends It is known as representation into its community (De Bondt & Thaler, 1995, p. 390), Additionally, representation is a choice based on patterns (typing items as similar even though they are actually different). Even if a company's performance and operational efficiency are superb, its stock price may be so high that investors will not purchase it. At the same time, a company's stock may be bought because its value has declined in the hope that it will rise again (Hagstrom, 2007).

The representation process may be biased, such as when some individuals invest their money based on their personal experience and ignore the rates of returns and their long-term trends; Additionally, in the realm of financial markets, the representation method is used when an investor likes to purchase hot stocks and avoid stocks with poor performance and trade activity (De Bondt & Thaler, 1995, p. 390).

The concept of familiarity refers to owning a very high percentage of domestic stocks, even though most investors believe that international stock markets will offer returns that are either better or equal to domestic stocks (Tourani- Rad & Kirkby, 2005). As a result, the investor favors local markets over global or regional ones because he thinks they are safer and he knows more about their characteristics than he does about global financial markets. This leads to very little diversification in financial portfolios, due to the tendency to invest a lot in what is familiar to one.

Many studies have shown that errors in judgment occur because people are generally overconfident. Confidence in itself is not bad; however, overconfidence is something else that can cause harm, especially when it comes to financial matters. Investors that are overconfident not only make stupid decisions; they also have a strong impact on the entire

market (Hagstrom, 2007, p. 263). Overconfidence explains why many investors make incorrect financial decisions; they trust the data they collect and believe they are more truthful than they actually are.

Overconfidence explains why many investors make poor financial decisions; they trust the information they gather and believe it to be more accurate than it actually is. Emotional bias is a phenomenon; in which When faced with negative news, individuals often overreact and slow down to good news, a phenomenon psychologists call the overreaction bias. If a short-term earnings report is bad, The usual reaction from investors is a sudden, unplanned overreaction, with a negative impact on stock prices (Hagstrom, 2007, p. 264). Overuse of easily accessible information is another example of emotional bias. Despite the widespread practice of diversifying and managing portfolios to improve profits, this bias shows up in stock trading when investors choose to invest in local companies that They understand or can readily access (Waweru, Munyoki, & Uliana, 2008, p. 28).

The original (historical) cost is used when investors resort to the original cost in building their estimates of stock price trends. When deciding whether to sell or simply examining the movements of listed companies, investors in the financial markets base their decisions on the initial purchase price. Investors use historical cost to assess stock prices or the company's worth based on past stock price movements (Waweru, Munyoki, & Uliana, 2008, p. 28).

1.2. Expectancy theory.

The basic foundation of any rational decision-making process is the theory of expected utility, which forms the main focus of the analysis of the variables that influence risky decision-making. However, this theory has not been able to elucidate the reasons for human attraction to gambling when choosing an investment.

Expectancy theory expresses a different approach to decision making, focusing on decisions influenced by the value system of investors, while expected benefit theory focuses on the expectations of the rational investor (Filbeck, Hatfield, & Horvath, 2005, p. 170). Expectancy theory also identifies the factors that influence the investment decision-making process, including: regret avoidance, loss avoidance, and mental processes (Waweru, Munyoki, & Uliana, 2008, p. 28).

The traditional definition of regret, which has been examined in a variety of settings, is a bad feeling brought on by the realization that an alternative course of action might have produced a better result than the one that was ultimately chosen. Therefore, regret can be expected prior to any action, but it can only be completely experienced after the occurrence. Since the agony of perceiving a loss was thought to be higher than the pride of achieving a gain, Shefrin and Statman included regret as a component of the disposition effect. The choice to seek gains or losses, however, is influenced by additional regret-related factors. Two elements make up regret: a sense of self-blame for making a bad decision and an assessment of the result obtained in relation to some alternative (Fogel & Berry, 2006, p. 66).

As a result, individual investors regret selling a winning stock too soon more than they regret keeping a losing stock for too long. This result implies that individual investors are aware of the consequences of the investment strategy they are being cautio ned against, at least in retrospect.

The pain of loss is much more intense than the joy of gain. Many experiments have shown that people need two positives to overcome one negative. Also, people do not risk anything in a bet, even if the odds are equal; unless the chances of winning are twice the chances of losing. This is referred to as asymmetric loss aversion, in which the negative aspects have a bigger effect than the positive. When in relation to the stock market, we find that investors feel twice as sad about what they lost as they are happy about what they won (Hagstrom, 2007, p. 265).

Mental processes or intellectual accounting, which refers to our habit of changing our view of money as a change in the circumstances surrounding us. So we tend to put money in our thinking within different "accounts", and this determines the way we think about using it (Hagstrom, 2007, p. 266). Expectancy theory, which explains people's propensity to assign various mental accounts to certain occurrences based on surface characteristics, also includes mental processes. Decision makers' propensity to divide the many probabilities they run into distinct accounts and then apply the principles of probability theory to every account throughout while disregarding potential interactions between the accounts is the central theme of basic mental processes. It is possible to separate mental processes both in terms of substance and time (Shiller, 1999, p. 11).

1.3. herd behavior.

It means the same thinking among individuals. It is a phenomenon that describes the way investors behave in making their decisions, so that if you have any experience investor invests in any stock, others will follow the same investment category. (Scharfstein & Stein, 1990) examined a few factors that might suggest herd investment behavior. They noted that in certain situations, managers blindly imitate the investment decisions made by other managers while managing underlying private information. While this behavior is socially inefficient, The practice of market participants prioritizing group agreements over individual judgments when making investment decisions is known as herding behavior. The tendency of market players to rely their investment decisions only on group agreements, disregarding their individual opinions, is the basis for herding behavior. Herding behavior is also predicated on investors' propensity to adhere to the same information sources, methodically assess market signals, and support comparable financial choices. Therefore, networked types of behavior emerge when people have access to the same information sources or interpret them similarly (Haritha & Uchil, 2016, p. 31).

The existence of herd behavior in the financial market is backed by a number of factors, the most significant of which are the size of investments and investor confidence. When investors are confident, they base their decisions on their own information and are therefore not influenced by herd behavior, but when investments are large, they tend to follow the actions of others to lower risks. Nevertheless, individual investors' propensity to engage in herd behavior is still higher than that of institutional investors (Goodfellow, Bohl, & Gebka, 2009, p. 213).

Herd behavior in financial markets is often described as an investor's behavioral tendency to mimic the actions and behavior of others, relying on collective rather than private information; this can cause stock prices to deviate from their true value and potentially miss out on profitable investment opportunities. The behavioral effects associated with stock price movements can also affect risk and return characteristics; thus,

they have implications for capital asset pricing models (Tan, Chiang, Mason, & Nelling, 2008, p. 62).

1.4. Market factors.

Price fluctuations, market knowledge, historical stock price trends, customer preferences, excessive response to price adjustments, and the type and quality of stocks are some of the market elements that affect investors' decisions in the financial market, according to (Waweru, Munyoki, & Uliana, 2008, p. 37). They made the point that stock price fluctuations can be viewed by investors as intriguing market events and that they do, to some extent, influence investment behavior.

Active trading is also considered an investment strategy; it affects the investor's decisions, since the goal of this technique is to profit from transient price changes. It frequently concentrates on highly sought-after financial products like equities, derivatives, currencies, and options. One of the riskiest trading techniques is active trading, so the active trader is not keen to expose investments to short-term losses; or miss the opportunity for short-term profit. Active traders also see the average return over the long term as not a gain that can be achieved. The trader realizes that the profit potential in the markets must be considered to outperform their performance, due to the increasing importance of short-term activity. The more active the trader is; the opportunity for good capital gains arises from market movements. Therefore, the time frame is determined by the investor who is looking for price movement trends through the trader's style. A previous study by (MERTO, 1987) additionally demonstrated the dangers of active trading and discovered that active traders have poor market performance and are linked to overconfidence (Haritha & Uchil, 2016).

In general, since the market is one of the external elements influencing investors' decisions, it is not regarded as one of the behavioral factors influencing investors. On the other hand, rational investors' decisions are influenced differently by the market element. Since many academics have examined the market element as one of the behavioral factors influencing investment decisions, it is imperative to include it among the behavioral factors (Waweru, Munyoki, & Uliana, 2008).

II Building a financial portfolio according to risk-return analysis

Harry Markowitz, awarded the Nobel Prize in 1990 for his influential work in corporate finance and financial economics, is credited with establishing the foundation of portfolio theory. His seminal contributions appeared in his 1952 article 'Portfolio Choice' in the Journal of Finance and were later expanded in his 1959 book Portfolio Selection: Efficient Diversification. These works laid the groundwork for what became known as Modern Portfolio Theory (MPT). Subsequently, William Sharpe, also a Nobel laureate, advanced the theory further through his 1964 development of the Capital Asset Pricing Model (CAPM), which provided a framework for evaluating the pricing of financial assets.

1. Modern Portfolio Theory.

From a technical standpoint, Modern Portfolio Theory (MPT) is built upon the foundational assumptions introduced by Markowitz regarding portfolio selection, alongside William Sharpe’s influential input in modeling financial asset pricing, which later evolved into what is now known as the Capital Asset Pricing Model (CAPM). This theory offers a comprehensive framework for constructing investment portfolios, seeking to reduce risk

exposure while enhancing the anticipated return on investments. (Fabozzi, Gupta, & Markowitz, 2002).

The elegance of MPT is to minimize portfolio variance for a given level of expected return, or equivalently, maximize return for a given variance. For a portfolio of n assets:

Expected Return: $E(R\square) = \Sigma\, w_i\, E(R_i)$, where w_i is the weight and $E(R_i)$ is the expected return of asset i.

Portfolio Variance: $\sigma\square^2 = \Sigma\, \Sigma\, w_i\, w\square\, \sigma_i\square$, where $\sigma_i\square$ is the covariance between assets i and j. The optimization problem is then: Minimize $\sigma\square^2$ subject to $E(R\square) = \mu\_target$ and $\Sigma\, w_i = 1$.

Underlying Hypotheses and Assumptions:

Investor Rationality: Investors are rational, risk-averse expected utility maximizers.

Mean-Variance Decision Criterion: Investor utility is defined over the first two moments (mean and variance) of the portfolio return distribution. This is a critical simplifying hypothesis.

Distributional Assumption: Asset returns are jointly normally distributed, or investor preferences are quadratic. These are the validity conditions for mean-variance analysis to be consistent with expected utility theory.

Frictionless Markets: No taxes, transaction costs, or constraints on short selling. All assets are infinitely divisible.

Common Knowledge: All investors share identical estimates of expected returns, variances, and covariances, and have a common investment horizon.

The Crucial Quadratic Utility Link: The hypothesis that investors care only about mean and variance is formally valid under two conditions: normally distributed returns or quadratic utility.

The quadratic utility function takes the form:

$$U(W) = aW - bW^2, \text{ where } W \text{ is wealth and } a, b > 0.$$

Under this function, expected utility, $E[U(W)]$, depends solely on $E(W)$ and $E(W^2)$, which translates into a function of mean and variance since $\sigma^2 = E(W^2) - [E(W)]^2$. However, this polynomial function has two well-known pathological properties that violate broader rationality axioms:

it exhibits increasing absolute risk aversion (wealthier individuals become more risk-averse) and, more damningly, satiety (utility decreases after a certain wealth level). These properties undermine its descriptive realism, revealing (MPT) as a model whose mathematical tractability depends on strong-and often empirically invalid-validity conditions regarding either return distributions or the shape of the utility function.

2. Return and risk.

Return and risk are traded off while making investment decisions. If the anticipated an asset's return is high enough to offset the risk, investors should be prepared to purchase it. The negative and positive aspects of risk are represented by the combination of opportunity and risk (crisis). A realized return is the actual return during a previous time, whereas an expected return is the return in a future period. The uncertainty surrounding the actual return on an investment is known as risk (Jones, Siddharta , Buddi , Irwan , & Rachman , 2009). There are two parts to return; yield and capital gain. Cash flow is

measured by yield to the price of a security. Capital gain refers to capital gains (or losses); it is the increase (or depreciation) in the price of an asset due to a change in prices.

Historical performance is frequently looked at in attempt to forecast the future returns (anticipated return) of an asset or portfolio. The definition of expected return is the "average of a probability distribution of potential returns." The first stage in the Markowitz portfolio selection model is to calculate expected return. Just take a look at the expected return, which is the historical average of a stock's return over a specific time period. It is sometimes referred to as the average return or mean. The weighted average of the individual predicted returns is calculated for a portfolio of securities (two or more).

Markowitz suggested that mathematical expectation be used to calculate the expected return, while risk could be calculated through the variance or standard deviation of the actual return.

An alternative definition of financial risk is the departure from anticipated returns over a specified time frame. According to Markowitz's theory of portfolio selection, "the fundamental aspect of asset risk is not the risk of each individual asset, but the contribution of each asset to the overall portfolio risk." There are two methods for analyzing security risk:

- On the basis of the financial asset itself (considering the asset alone);
- On the basis of the portfolio (where the financial asset is part of a group of assets);

In this context, the overall risks associated with investing in securities can be divided into two main components (Mangram, 2013, p. 62):

2.1.Systematic risk: at the macro level, systematic risk is a type of risk that has an impact on many assets to varying degrees. Systematic risk variables include general economic conditions including GDP levels, interest rates, unemployment rates, inflation, and currency rates. To some degree, practically all securities are impacted by these kinds of economic conditions. Systematic risk is therefore unavoidable.

2.2.Unsystematic risk: Since risk variables only have an impact on one asset or a small subset of assets, it is a type of micro-level risk. Only certain securities or assets are impacted, and only one economic sector is included. It also entails unique risks that are unrelated to other hazards. Unsystematic risks can include things like a company's credit rating, unfavorable press coverage of the company, or a strike that impacts a specific company.

All portfolios are susceptible to both forms of risk. The variation of the various assets, especially the connection between the investment asset and its weight in the portfolio, determines how much risk is reduced. In other words, the portfolio's risk reduction increases with the percentage of uncorrelated assets. Because it accurately gauges the variation in asset pair returns, correlation is a crucial indicator of the diversification impact. A pair of securities' standard deviations and shared variance are divided by the correlation coefficient. The variables are classified as positively correlated if the correlation between securities is positive, negatively correlated if it is negative, and uncorrelated if it is zero. Covariance, however, is relevant since it impacts portfolio risk, portfolio correlation coefficients are more useful because they assess shared variance. Generally speaking, "imperfect" correlations (between +1.00 and -1.00) signify reduced portfolio risk. Portfolio

pairs with smaller correlation coefficients are less risky than those with higher levels. Thus, these risk factors must be chosen carefully because the correlation between assets and risk factors is not always clear. However, The association may exist even if the worker and the origin are not in the same sector or industry (Mangram, 2013, p. 65).

3. Diversification (Markowitz diversification).

The concepts of "diversification" and "diversification effect" describe how correlation and portfolio risk are related. The foundation of Markowitz's portfolio selection theory, a risk-reduction idea that entails distributing investments among various financial instruments, sectors, and other investment classes, is diversification (Nick , 2024).

So, through making investments in a range of assets that will respond differently to the same event or events, diversification aims to optimize returns and decrease risk. It is crucial that portfolio diversification techniques incorporate a variety of asset classes in addition to stocks from both inside and outside the same industry (Nick , 2024).

Markowitz argues that diversification cannot eliminate all risk. Systematic risk (market risk) cannot be eliminated or reduced by diversification because it stems from external factors such as recessions, rising interest rates, war, or inflation, which affect most companies systematically. It is improbable that any degree of diversification will completely eliminate all risk since there are just too many variables, even if a genuinely diversified portfolio can frequently increase returns and greatly lower unsystematic risk. Furthermore, systematic risk, which impacts all or most businesses and marketplaces simultaneously, cannot be eliminated or reduced by diversification. Markowitz proposed rational diversification, which is essentially done by taking into account the correlation between securities, then the total number of possible portfolios, and selecting the ones that maximize returns for a given level of risk, specifically those positioned along the efficient frontier.

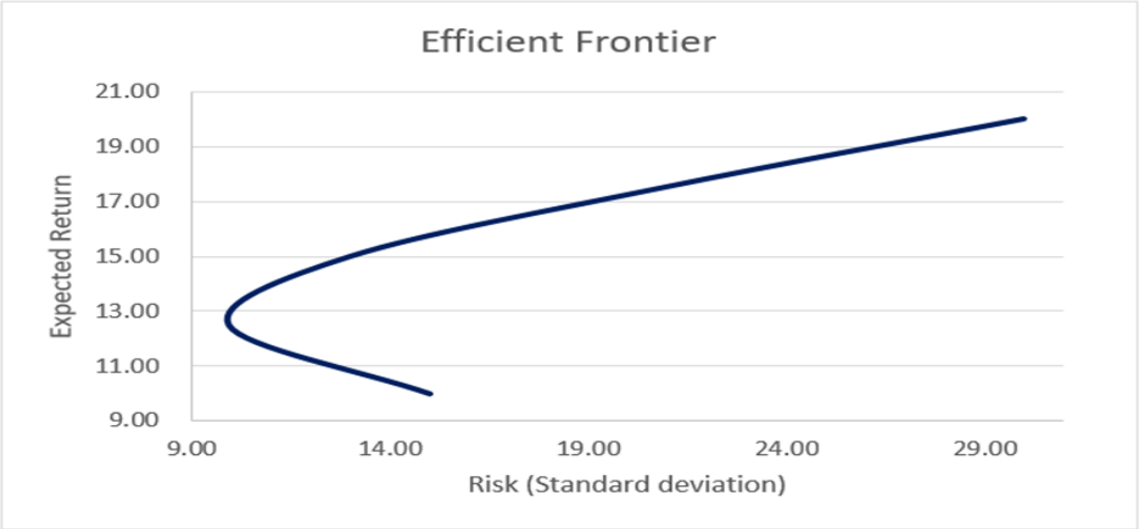
4. Efficient limits and efficient portfolio.

An efficient portfolio, also known as an "optimal portfolio, is one that provides the best expected return for a given level of risk, or one that achieves the minimum risk for a given expected return. If the expected returns are not met, given a given level of risk, or if the risk required to achieve that expected level of return is too high, it is called an "inefficient portfolio" (Logue, Harry Markowitz and modern portfolio theory, 2024).

According to Markowitz, an investor holding an efficient portfolio cannot achieve a higher expected return without simultaneously accepting a greater level of risk. As defined by the Nasdaq Business Dictionary, a Markowitz efficient portfolio "also referred to as a mean-variance efficient portfolio" is one that yields the maximum expected return for a specific risk level. Markowitz also emphasizes that such a portfolio should include a combination of at least two securities positioned above the minimum variance portfolio, which represents the lowest achievable risk for a given expected return (Logue, Harry Markowitz and modern portfolio theory, 2024).

For the efficient frontier; it is a set of efficient portfolios that provide the highest possible expected return for a given level of risk or the lowest risk to achieve a desired expected return. Portfolios below the efficient frontier are suboptimal, because they do not provide sufficient returns for their levels of risk (Dobromir , 2020).

Figure (1): Limits of efficiency.



source : (Dobromir , 2020).

Returns depend on the aggregate investments in the portfolio. Those to the right of the efficient frontier have higher levels of risk for a given rate of return. Risk-seeking investors will look at these portfolios, while risk-averse investors will look at those to the left.

Risk is commonly assessed by calculating the standard deviation of an asset's return. When the variability among the assets within a portfolio is reduced, this results in a lower overall standard deviation for the portfolio. Consequently, portfolios that are considered optimal and fall along the efficient frontier typically exhibit greater levels of diversification. When investment assets exhibit lower correlations, this typically leads to reduced variance, thereby decreasing both the standard deviation and the associated risk. Achieving a favorable balance between risk and return through such diversification places the portfolio along the efficient frontier curve. This curve is vital in illustrating how diversification enhances the investor's understanding of the return-to-risk trade-off. It also reveals that the relationship between risk and return is not linear; as additional risk is taken on, the incremental gains in return gradually diminish, creating a curved shape where each extra unit of risk contributes progressively less to overall returns (Dobromir , 2020).

III Building a financial portfolio according to the behavioral trend.

In his second article (Markowitz, 1952), Markowitz pointed out that the variance criterion may not be the best criterion for measuring risk, and he tried to propose a solution to this defect by introducing other criteria. However, this paved the way for the emergence of completely new concepts in portfolio construction, the first nucleus of which was in the "forecast theory" of (Kahneman & Tversky, 1979), such as the emergence of the concept of "loss aversion" instead of the "risk aversion" hypothesis that was prevalent at the time. This was followed by shedding light on realistic behaviors that do not conform to what the theory stipulates, such as insufficient diversification and neglecting the correlations that may exist between securities in a single portfolio. Therefore, the behavioral trend was no longer limited to merely trying to explain the distortions observed in reality, but rather went beyond this in an attempt to build a behavioral portfolio that takes into account the observed distortions, and at the same time provides a way to build the portfolio without neglecting the irrational behaviors of individuals.

1. Distortions observed when applying the "return-risk" analysis.

Many opponents contend that the fundamental assumptions and modeling of financial markets are not in many respects consistent with reality, even if modern portfolio theory is crucial for the study of "risk-return" (mathematical expectation-variance). One could argue that none of the fundamental presumptions of modern portfolio theory are entirely true. Generally speaking, some of the primary objections include:

1.1. Rationality of the investor.

It is assumed that investors are prudent or rational and aim to minimize risk and maximize returns. In contrast, market participants are observed to be influenced by "herd behavior" while making investments. For example, markets periodically boom or bust as a result of speculative excesses, and investors usually rush to "hot" areas (Mangram, 2013).

1.2. Higher risks for higher returns.

Investor behavior often challenges the notion that individuals accept higher risk solely in pursuit of greater expected returns. In some cases, investment strategies may require taking on riskier assets-such as futures contracts-not necessarily to increase expected profits, but to reduce overall portfolio risk. However, conveying the merits of such sophisticated strategies to investors unfamiliar with modern portfolio management techniques can prove difficult (McClure, 2024).

1.3. Higher risks for higher returns.

Markowitz's theoretical basis for modern portfolio theory is rooted in the assumption of fully efficient markets. Nonetheless, since this theory heavily relies on asset pricing, it remains vulnerable to various market fluctuations influenced by social, strategic, environmental, and individual investor factors. Moreover, the theory overlooks significant market imperfections such as asymmetric information, the existence of public goods, and externalities that are not reflected in market prices. Historical occurrences of financial bubbles, booms, crashes, and crises throughout centuries strongly challenge the idea of consistently efficient markets (Mangram, 2013).

1.4. Efficient diversification and efficient portfolios.

Many studies have shown that there is a deficiency in diversification when building individual portfolios compared to what is stipulated by portfolio theory, as trends in diversification have emerged that are not related to the "return-risk" analysis, as it was found, for example, that employees tend to acquire securities issued by the institutions in which they work to the extent that they constitute the largest proportion in their portfolios, according to (Holden & VanDerhei, 2001), and some studies have shown that the selection of portfolios in reality is not completely consistent with the "return-risk" analysis, as despite investors resorting to portfolio theory, they do not apply it in reality except partially or incorrectly. On the other hand, some experiments have shown the ability of investors to build portfolios that fall close to the limits of efficiency and tend to match efficient portfolios over time, which highlights the existence of the learning effect, but this does not negate the fact that investors generally resort to other criteria to choose the securities that make up their portfolios, which revolve mainly around "avoiding losses in addition to distorting probabilities" (Angelovska, 2015).

2. Behavioral portfolios as an alternative to portfolio construction.

Behavioral portfolio management aims to build superior portfolios based on pricing distortions resulting from investor emotional behavior. The core of behavioral portfolio management focuses on the details of how to build portfolios based on behavioral factors.

2.1. Safety first or minimum return.

Roy was the first to propose this concept in 1952, as each individual is characterized according to this concept by a special threshold called the "minimum level of return", this portfolio is built in a way somewhat similar to the method of building a portfolio according to the risk-return analysis, where the investor deals with both portfolios in total (as a single mental calculation), i.e. takes the common variance between the assets that make up the portfolio, the investor chooses according to the behavioral financial portfolios with a single mental calculation; the efficient portfolio by maximizing the utility function U , i.e. seeking to obtain the highest value of the expected wealth $\max E(\tilde{w})$ while working to reduce the probability of bankruptcy $P(\tilde{w} < A) \leq \alpha$, In contrast; the investor works according to the risk-return analysis to maximize the mathematical expectation of the final wealth, and reduce the corresponding standard deviation (Bourachnikova & Burger-Helmchen, 2012, p. 88).

In this case, the behavioral portfolio has a very special design, as these portfolios consist of two types of assets: risky assets that allow securing the investor's ambition level A (the minimum level of return) with a probability of bankruptcy (acceptable to the investor, which means the probability of not reaching the minimum level of return) that does not exceed α (insurance policies), and the second asset is lottery coupons (risky).

However, we note that the transformation of objective probabilities does not apply in calculating the probability of bankruptcy, which means that the investor calculates the probability in a different way, as he calculates the probability of bankruptcy under objective probabilities, but distorts the probabilities when determining the hope of wealth. (Shefrin & Statman, Behavioral Portfolio Theory, 2000) consider that the investor can be rational or irrational, and this is what the behavioral portfolio theory addressed.

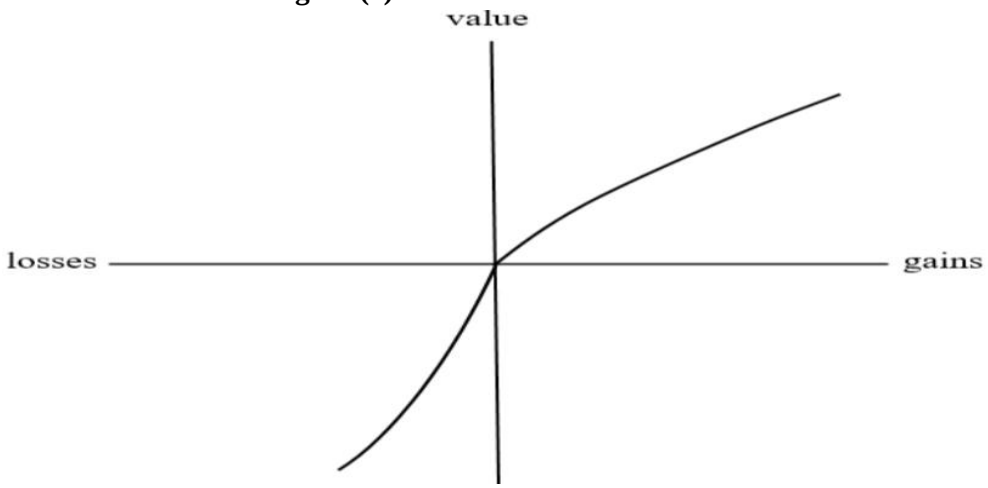
2.2. Choice theory under uncertainty

(Shefrin & Statman, Behavioral Portfolio Theory, 2000) point out that the two theories of choice under uncertainty, namely prospect theory, formulated by (Kahneman & Tversky, 1979), and SP/A theory, developed by (Lopes L. L., 1987), served as the basis for the development of behavioral portfolio theory.

Prospect theory describes how individuals make choices when faced with uncertainty. It is distinguished by an asymmetrical approach to risk. Prospect theory states, investors have different attitudes regarding the chance of gain and loss. The investor reacts differently to scenarios with equal risk based on whether the hazards are in the profit or loss zone.

The investor's risk-seeking preference in the loss zone is actually the only way to avoid the loss and turn it into a profit, while the risk-aversion in the profit zone is the best way to preserve and secure the profits achieved. Regarding the loss zone, investors are prepared to take on the possibility of more losses in an effort to completely prevent the loss. In contrast, investors in the profit zone are not prepared to take on excessive risk in order to boost their earnings. Because of this, the usual probability theory value function resembles the letter " S " since it is convex beneath the point of reference that the origin represents and concave above it (Lekovic, 2019, p. 258).

Figure (2): Default Values Function.



source : (Kahneman & Tversky, 1979, p. 279)

Kahneman and Tversky (1979) proposed a two-part model: a value function $v(x)$ defined over gains and losses relative to a reference point, and a probability weighting function $\pi(p)$ that distorts objective probabilities.

The S-Shaped Value Function: This is the antithesis of the smooth, concave utility function of neoclassical theory.

$$v(x) = \begin{cases} x^{\alpha} & if\ x \geq 0 \quad (gains) \\ -\lambda(-x)^{\beta} & if\ x < 0 \quad (losses) \end{cases}$$

Where $0 < \alpha, \beta < 1$; control the curvature (diminishing sensitivity), and $\lambda > 1$ is the loss aversion coefficient, formalizing the hypothesis that "losses loom larger than gains." The function is concave in the domain of gains and convex in the domain of losses, creating an S-shape. This directly challenges the mean-variance hypothesis by positing that investors are not uniformly risk-averse; they are risk-averse in gains but risk-seeking in losses when trying to avoid a sure loss.

Probability Weighting Function: This captures the observation that people do not treat probabilities linearly. A typical weighting function is:

$$\pi(p) = \frac{p^{\gamma}}{[p^{\gamma} + (1-p)^{\gamma}]^{\left(\frac{1}{\gamma}\right)}}; \qquad \gamma \approx 0.65$$

where γ is a parameter. This function overweights small probabilities and underweights moderate to large ones, explaining phenomena like simultaneous lottery ticket and insurance purchase.

Unlike the traditional finance theory view, which considers humans to be fully rational, economically minded beings, the SP/A theory, which was first proposed by (Lopes L. L., 1987) and developed by (Lopes & Oden, 1999), argues that our goals and feelings, such as fear and optimism, have an impact on the decisions we make on a daily basis, particularly those related to investments. Our desire for security is driven by fear, whereas our interest for the potential to maximize riches is driven by optimism. The three fundamental components of the SP/A theory are as follows: A stands for ambition, which is the pursuit of a certain objective; P for possibilities, which is the desire to increase riches; and S for security, which is the desire to escape poverty.

Along with prospect theory, SP/A theory is a decision theory; however, it describes the decision-making process rather than establishing rules. The emotional dimensions of making decisions under ambiguity are the focus of SP/A theory, as opposed to the theory of prospects, which concentrates on cognition, or the mental processes involved in making choices, including how individuals interpret and respond to decision scenarios framed within contexts of potential gains or losses. A broad framework for decision-making is offered by SP/A theory, which highlights the impact of human emotions (Shefrin, 2016) asserts that SP/A theory aims to equalize the way the three primary emotions-aspiration, hope, and fear-interact (Lekovic, 2019, p. 259).

Since investors frequently mix extremely safe and risky assets when building investment portfolios, the SP/A theory is one of the fundamental tenets of behavioral portfolio theory. This helps investors understand the portfolio as a collection of distinct sub-portfolios, or an investment pyramid with multiple layers.

Because SP/A theory better explains how people make decisions and why a behavioral portfolio may contain a mix of high-risk and risk-free assets, it also has several advantages over prospect theory and provides a stronger foundation for the development of behavioral portfolio theory. (Shefrin, Behavioral Risk Management: Managing the Psychology That Drives Decisions and Influences Operational Risk, 2016) noted that because cognition and emotions are interwoven, both SP/A theory (which emphasizes emotions) and prospect theory (which emphasizes cognition) are equally significant. To put it another way, the aforementioned ideas are two aspects of the same subject regarding the role of psychology in decision-making and can be viewed as complementary to one another (Lekovic, 2019, p. 259).

2.3. mental accounting portfolio theory

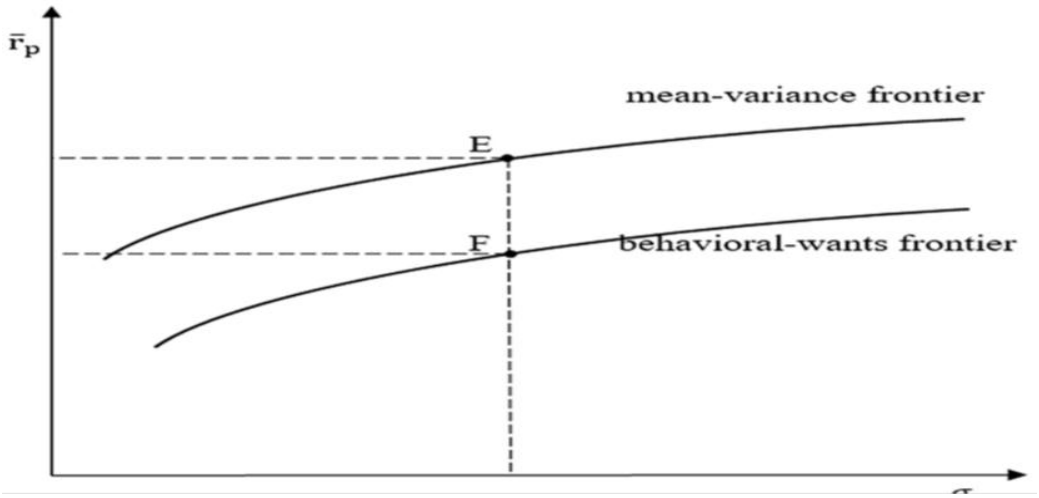
According to behavioral portfolio theory, investors' objectives are connected to particular layers of mental math (goal-based approach). This segmentation is not merely descriptive; it has prescriptive consequences for equilibrium prices. Barberis and Huang demonstrate that when investors engage in narrow framing it leads to an asset pricing model where the volatility and skewness of individual stocks are priced, a direct departure from the CAPM (Barberis & Huang, 2001, p. 1248). The goal of typical (irrational) investors is to construct a large number of portfolios on the efficiency and mean-variance frontiers. Creating a core portfolio that satisfies the objectives listed in each step of the portfolio pyramid is their ultimate objective. According to (Statman, 2014, p. 68), typical (irrational) investors initiate the procedure of building portfolios of behavior by splitting the primary portfolio into three tiers of the portfolio pyramid that represent mental arithmetic. The pyramid's base, or first mental arithmetic, is meant to protect against poverty; the middle layer, or second mental arithmetic, can be used for education; and the top layer, or the third mental arithmetic, is meant to maximize the wealth of the investor. Because bonds make up the majority of the assets on the bottom layer, the risk aversion of the investor is what defines the initial mental arithmetic. Because the intermediate layer contains a combination of stocks and bonds, the second mental arithmetic is distinguished by a moderate capacity for risk tolerance. Because the dominating assets in the upper layer are represented by shares of a limited number of businesses, or perhaps a single company, the investor's readiness to assume greater risk is the final characteristic of the third mental arithmetic. At

one level of the pyramid, investors may be "short" in a certain asset, but at another level, they may be "long" in the same security (Lekovic, 2019, p. 260). Investors also allocate a separate mental account to each individual security, with a reference point typically set at the purchase price (Thaler, 1985). According to prospect theory, they are risk-averse in the domain of gains (selling winners to "realize" a gain) and risk-seeking in the domain of losses (holding losers to avoid "realizing" a loss). This leads to the empirically documented tendency to sell winning investments too early and hold losing investments too long (Odean, 1998), a tax-inefficient and performance-damaging strategy. This effect has been robustly confirmed in markets worldwide, including among professional fund managers (Rau, 2015).

Therefore, while ordinary (irrational) investors select shares and other financial assets based not only on utility but moreover on moral and sentimental advantages, rational investors construct their portfolios based on overall benefits (the highest predicted return and the lowest potential risk). The ordinary (irrational) investor aims to optimize each of the three benefit dimensions, but the rational investor strives to maximize overall utility as reflected in wealth growth, that is, maximizing returns for a given degree of risk. The average (irrational) investor gains emotional benefits from a sense of pride and fulfillment, expressive benefits from the appearance of being a socially conscious individual, and total benefits from increased wealth when he buys shares of a company that cares about the environment. The rational investor, on the other hand, is driven solely by the desire to maximize money and is able to separate passion from reason. Even though one of his family members may be battling alcoholism, the rational investor is nevertheless prepared to purchase high-yielding stock in a company that manufactures alcoholic beverages.

Because investors are guided by distinct aims and sets of factors while developing desired portfolios, it is evident that the mean variance limitations of Markowitz's MPT do not coincide with the behavioral want limits of Behavioral Portfolio Theory. Consequently, as Figure 3 below illustrates, the efficient BPT portfolio is likewise different from the efficient MPT portfolio.

Figure (3): Default Values Function.



source : (Lekovic, 2019, p. 262)

In other words, while BPT investors have many efficient frontiers to take into account (one for each rational calculation), MPT investors just have one. Ordinary (irrational)

investors thus choose multiple effective sub-portfolios instead of just one, one for each layer of the portfolio pyramid, most optimal portfolio. As a result, the efficient sub-portfolios are combined to form the efficient portfolio. The optimal MPT portfolio is a combination of the market portfolio and risk-free securities, as per (Shefrin & Statman, Behavioral Portfolio Theory, 2000), Conversely, the optimal BPT portfolio is a combination of bonds and government tickets for the lottery, as it is a combination of these efficient sub portfolios.

As seen in Figure 3 above, portfolio F represents the efficient portfolio of a typical (irrational) an investor who takes into account all three dimensions of advantages, while portfolio E represents the rational investor's effective portfolio who disregards sentimental and sentimental rewards. Because the pursuit of sentimental and emotional gains typically lowers the anticipated return for the same degree of risk, portfolio F is lower than portfolio E. The efficient portfolio and the behavioral portfolio theory's efficient frontier are lower than Markowitz's modern portfolio theory's efficient mean-variance frontier because Investors are prepared to forgo a section of this expected return in exchange for sentimental and emotional benefits. Portfolio F is optimal because it offers investors the greatest total benefits when taking into account all three of the previously described benefit dimensions, even though it does not yield the highest utilitarian benefits.

According to the behavioral portfolio theory, a number of factors, such as requirements, wants, biases, habits, preferences, and emotions (such as pride, patriotism, and social obligation), affect an investor's efficient portfolio. This is similar to how investors' efficient portfolios differ according to their risk tolerance level, which is determined by Markowitz's modern portfolio theory.

In conclusion, mental accounting portfolio theory does not seek to replace mean-variance optimization but to contextualize it within the psychological reality of how investors think about money. A sophisticated portfolio management practice must recognize these mental account structures, use them to improve client communication and adherence, and design strategies and processes that mitigate their most detrimental effects on diversification, risk management, and after-tax returns. The synthesis lies in using the mathematics of Markowitz to build the optimal portfolios within the behavioral architecture defined by the client's mental accounts.

IV Conclusion.

A significant advancement in behavioral portfolio theory was made with the introduction of the idea of mental accounting. The investor was able to agree to a number of investment objectives and risk tolerance levels rather than just one thanks to mental accounting. In order to successfully satisfy the investor's goals, it also offered the chance to construct an ideal investment portfolio based on several ideal sub-portfolios. Because behavioral portfolio theory considers people's genuine nature as well as their many needs, wants, and preferences, it also reflects reality more accurately than Markowitz's modern portfolio theory.

The hypothesis of this article is tested through an examination of integrative models. Shefrin and Statman’s Behavioral Portfolio Theory (BPT) can be seen as an alternative hypothesis to MPT: that investors construct portfolios as layered pyramids addressing

specific goals, rather than as a single mean-variance efficient bundle. While BPT is more descriptive, it sets the stage for integration.

The evolution from Markowitz's normative hypotheses to the descriptive challenges of Kahneman and Tversky and the integrative efforts of Shefrin and Statman and Barberis and Huang; charts the path toward a more robust financial science. The hypothesis of this article—that an integrated framework is superior—finds strong theoretical support**.**

Future research must focus on the rigorous empirical testing of that an integrated framework is superior. This involves**:**

Developing standardized metrics for key behavioral traits (loss aversion coefficient, overconfidence index) for use in optimization models**.**

Designing controlled field experiments with investment advisors to test the performance of behaviorally-modified asset allocations against traditional models**.**

Expanding the integrated model to include collective behavior and market-wide sentiment, as hypothesized by the limits to arbitrage literature, to better inform tactical asset allocation**.**

In conclusion, the synthesis of Markowitz analysis and behavioral finance is not merely a theoretical compromise; it is a necessary evolution. By testing and refining the integration hypothesis, the field can advance towards portfolio management that is both scientifically rigorous and profoundly human, ultimately fulfilling the core objective of helping investors navigate uncertainty to achieve their financial goals.

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