Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 7, July : 2023

COMPARING TRADITIONAL AND MODERN APPROACHES TO OPTIMIZING PORTFOLIO MANAGEMENT STRATEGIES

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ABSTRACT:

Portfolio management strategies that equitably divide risk and reward can boost returns for investors. Traditional and cutting-edge approaches to portfolio management have developed over time. Methods rooted in classical finance theory provide an emphasis on diversification and asset allocation that is informed by historical data and statistical models. The latter is predicated on the idea that markets function optimally and is supported by mean-variance optimization procedures such as Markowitz's portfolio theory. In order to adapt to the rapidly shifting business environment and meet these challenges, novel strategies have emerged in recent years. Factor-based investing, risk parity, and machine learning algorithms are just a few examples of the cutting-edge quantitative methodologies utilized by today's portfolio management systems. These strategies incorporate many factors, not only past returns, to boost a portfolio's efficiency. This study evaluates the strengths and weaknesses of both established and novel approaches to achieving optimal results in portfolio management. The underlying concepts, procedures, and assumptions of each strategy are examined and contrasted. In this research, the author looks into the prospective uses of newly developed approaches in the investment business.

1. INTRODUCTION

A beginning investing portfolio requires a certain sum of money. Taking on debt and obtaining capital from external investors is a common practice for banks and other financial institutions (and businesses) that lack the equity to fund portfolio expansion. Every business partner plans to maximize their individual profits, yet they all work together to make the endeavor successful. Since the bank and the outside investors both expected a return on their investment, they provided funding for the endeavor.

Investors and portfolio managers can use the findings here to develop a more fair strategy for investing. The following are the main themes that will be discussed in this article: Constructing a portfolio according to the Markowitz theory; formulating a problem for the optimal management of financial assets according to the Pontryagin maximum principle; elucidating the motivations of all involved parties; developing an objective function according to a utility function; locating an OCF; obtaining numerical experiment results.

It is expected that the investment portfolio will be updated. How much time the portfolio spends on each contributor. To create a portfolio of assets with the highest probability of success, one can utilize the Markowitz model (1952). Markowitz bases his method of portfolio construction on the idea of using standard deviation as a risk measure. In this research, we advocate for considering value-at-risk (VaR) as a risk indicator when putting together a portfolio of investments. For the given time frame, the total monetary value of losses is displayed.

The corporation can begin expanding its finances once a portfolio is built that maximizes efficiency with respect to constraints on potential financial losses. The amount invested and the monetary interests of all parties should guide the design of the tactics taken to attract financial resources. This

is why we're working on a prototype; the Pontryagin maximum notion (Pontryagin et al., 1962) can help us get the most out of our money. This is a viable method for handling investor monies. Success is the common objective of the financial institution (company) and the external investors in a differential game (Germeier, 1976).

2. LITERATURE REVIEW

Numerous writers have analyzed the optimal methods for constructing portfolios that include both high- and low-risk investments. The portfolio's risk score is quite important. Mean-Gini (MG) is a straightforward approach to building optimization models and doing risk analysis that was developed by Shalit and Yitzhaki (1984).

Kalayci et al. (2019) provide a summary of the research on the best procedures for constructing diversified portfolios of assets. Improved computer algorithms and techniques are the result of extensive study. We reviewed studies that updated the traditional paradigm of deterministic portfolios. Finally, we point the way forward for further studies.

Bender et al. (2019) suggest that when building factor portfolios, starting with variance means is the best place to start. They focus mostly on analyzing portfolios constructed with various weighting strategies. It is demonstrated that the quality of data description is enhanced when input factors are included in factor portfolios. Danko and oltés (2018) describe a portfolio approach that merges concepts from graph theory and the theory of portfolio selection developed by Harry Markowitz. In order to test the robustness of the created portfolios, they were placed through a battery of simulations. The information can be used to construct a portfolio with the goal of maximizing profits.

Zhou et al. (2019) found that the ideal investment portfolio can experience substantial growth in value. Consider the initial ferocity, dynamics, and stability of a jump as you work to optimize a portfolio. Compared to a supposedly large sample size, the created investment portfolio has performed better.

You can't build your portfolio on your past achievements alone, as Calvo et al. (2018) point out. The concept of value information that we propose will help us get there. Investor confidence in his use of non-historical data is measured by this metric. It is advised that for time horizons beyond the data coverage period, diversification limitations be used to fine-tune the level of risk. Lester (2019) covers the groundwork of factor investing theory and how it can be used in portfolio building. The author compares and contrasts a diverse portfolio with a more concentrated one. Analytical forecasts of future revenues and hazards have been demonstrated to be more reliable when using the integrated portfolio.

Oliynyk (2015) delves more into the insurance industry's use of portfolio theory. Our study presents an algorithm that can help insurance companies optimize their investing strategies. We used real-world data to build a portfolio of insurance investments with a low potential for loss. We used only the most important metrics to determine the insurance firm's stability.

Uhl and Rohner (2018) propose a particular asset allocation and risk profile for a compensation portfolio. The proposed strategy for optimizing portfolio parameters was influenced by both contemporary portfolio theory and behavioral portfolio theory. Portfolio optimization and empirical likelihood estimation by Post et al. (2018) using stochastic dominance as the selection criterion. To construct an optimization portfolio, we employ linear programming, whereas convex programming is used to determine the necessary probability. In terms of performance, the produced portfolio does remarkably well for an out-of-sample, sentiment-based investment strategy. Grinblatt and Saxena (2018) suggest merging all core holdings into a single portfolio to increase accuracy in the cost estimation of fake parts. Even

the most unstable portfolios can benefit from this method's stabilizing effects.

Since the mid-1990s, researchers have relied heavily on the Value-at-Risk (VaR) indicator to assess market risk. The VaR indicator and its trading applications are discussed in detail in Holton's (2003) book. He has written extensively on how this real-time indicator came to be and how it is used.

Using a dynamic optimization framework, Basak and Shapiro (2001) analyzed how managers use VaR criteria during portfolio creation. VaR risk management was seen to have taken a potentially financially ruinous route. They presented a novel method of risk management based on disaster prediction in an effort to reduce the frequency and severity of such events. According to Zhang et al. (2019), the double-VaR indicator is useful for maximum loss analysis. For simplicity and clarity, VaR values are shown along a single axis in graphical form. Two models' income-risk confidence intervals are analyzed and contrasted. Francq and Zakoan (2018) take into account a dynamic model of rebalancing portfolio holdings when thinking about market and appraisal risks jointly. When dealing with elliptical distributions, value at risk (VaR) is employed as a risk metric. We also look into filtered historical modeling, a technique that opens the door to other distributions for study. We examine whether or whether low-volatility investment strategies are preferable and to what extent. We weigh the benefits and drawbacks of any approach we might take.

In their 2018 paper, Burdorf and Van Vuuren investigate VaR's relationship to ES. These indicators for a stock portfolio can be found with more precision using the Monte Carlo method and the dispersion-covariance technique than by utilizing simply historical data. Conditional value-at-risk (CVaR) is a proposed risk metric by Rockafellar and Uryasev (2002). This criterion allows for risk assessments that aren't 100% compliant with the VaR metric. This signal requires the use of complex mathematical techniques and computational experimentation.

The utility function can be used to model the actions of an investor. This feature, which indicates the risk aversion of the decision maker, must meet certain criteria. The possibility of a decrease is factored into a novel utility function provided by Blanchett and Ratner (2015). This quality is ideal for retirees and investors seeking a reliable source of income.

Maheshwari and Sarantsev (2018) comprehensively compare several risk management approaches. The availability of low-interest loans from the government's central bank encouraged charitable contributions from businesses and organizations. Everyone engaging in an investment project is said to desire to maximize their own personal happiness, therefore private investors seek to maximize their expected logarithmic wealth, while central banks seek to maximize their expected logarithmic utility. We have mastered the art of complete command. Mathematical technique based on specialized programming is provided by Bilbao-Terol et al. (2016) to incorporate concepts like mental accounting and ethical investing into investment portfolio theory. It is suggested that an expert method employing fuzzy criteria be used to establish the extent to which each investor will be involved in the company's share capital. Mei and Nogales (2018) investigate the decision-making of a long-term investor. Value at risk, expense, and return predictability all have an impact on the optimality criterion of maximizing intermediate consumption utility. An inefficient design is described alongside an algorithm that aims to maximize power usage. The health of a financial institution is directly tied to how well its investment portfolio is managed.

Using the framework of factor investing theory, Van Gelderen et al. (2019) examine the strategies employed by several mutual fund managers. It has been demonstrated that a buy-and-hold strategy implemented by a multifactor manager

outperforms active fund management strategies. Del Guercioa et al. (2018) focus primarily on the efficiency of various portfolio management strategies, such as hedge funds, mutual funds, and separate accounts. Their research lends credence to the idea that there are more openings for bias when portfolios are managed collaboratively.

In their 2018 paper, Li et al. discuss the use of non-parametric programming to quantify asset profitability. The Fama-French three-factor model is advocated; it considers market, size, and pricing. The generated transformations for each factor are evaluated for necessity using a generalized criterion of the greatest probability hypothesis. The proposed strategy is tested using both real-world data and smaller sample sizes. The research on replication hedge funds conducted by Simonian and Wu (2019) provides valuable insights for investors. When it comes to reliably replicating results, nothing beats the ridge regression method. By combining the standard factorial models used to replicate hedge funds with OLS regression, we may arrive at a more comprehensive generalized model for gauging risk.

Garca-Melón et al. look into SR expenditures in their 2016 study. An essential component of SR is determining the weight to be given to each criterion in light of the asset in question. These benchmarks might be derived from an individual's personal financial priorities and values. In this piece, we advocate for the Analytic Hierarchy Process as the best method for assessing relative values.

The Pontryagin maximal principle is one way to increase a system's usefulness while dealing with dynamics. Several prominent scientists have used this concept in their research. Several economic growth models are based on Pontryagin's maximum principle, and Koopmans (1967) compared how well they function. In addition, he proposed avenues for future study and outlined possible approaches to resolving these issues. Shell (1969) investigated the Pontryagin maximum notion and its potential economic implications.

Kamien and Schwartz (1971) were the first economists to use the Pontryagin method. For a subset of economic problems, they have developed a theory about the features of system state variables that permits finding the best control solution.

Oliinyk (2017) analyzes the problem of optimal control of gross production distribution within the framework of a unified productive economic system. The proportion of GDP that is made up by consumers' discretionary spending acts as a lever. Finds the areas with the highest potential for investment growth. In the end, Pontryagin's maximum approach provides the answer to this conundrum.

For optimum management issues with constraints on state variables, Hartl et al. (1995) investigated numerous variations of the Pontryagin maximum principle. It was demonstrated how these optimal forms could be used by applying them to certain common managerial challenges.

Aseev et al. (2005) analyzed an endogenous growth model for two countries using the Pontryagin maximum principle. It appears that both countries gain when one adopts the creative techniques of another. By situating the Pontryagin maximal principle for addressing optimal management problems within the context of economic growth processes, Aseev and Kryazhimskii (2007) examine its theoretical underpinnings. Aseev (2014) investigated the applicability of the Pontryagin maximal principle to a class of optimal management problems by evaluating economic growth processes over an infinite time horizon.

Krasovskii and Tarasyev studied the optimal management problem in 2008, but they made a critical error by relying on an inappropriate integral functional. Several theories of economic expansion will need to inform this process. The authors propose a Pontryagin maximum principle-based algorithm for optimizing real-world

macroeconomic data.

One option that Artstein (2011) proposes is to apply the Pontryagin maximum principle to the calculus of variations more generally.

The Pontryagin maximal principle and its applications to economics and portfolio theory are central themes in the literature reviewed here. As a result, you should give some serious thought to building and supervising your financial portfolio.

3. APPROACHES TO PORTFOLIO MANAGEMENT:

When overseeing a portfolio, two common strategies are employed:

- Traditional approach
- Modern approach (Markowitz efficient frontier approach)

The two methods are as follows:

Traditional Approach:

One of the first things to think about while building a portfolio is what you hope to achieve. The only motivations for a rational investor are gain and growth in value. The amount that needs to be chosen to accommodate investors is laid out in detail by the conventional method. Standard procedure entails the following actions:

- Analysis of constraints
- Determination of objectives
- Selection of portfolio
- Assessment of risk and return
- Diversification

An explanation of these preliminaries follows:

Analysis of constraints:

Before putting money into a portfolio, you need to carefully consider the risks you're willing to take. Many factors, such as investors' returns, concerns about liquidity and stability, tax benefits, and so on, could act as restraints.

Determination of objectives:

Before making any additions to a portfolio, the investor should establish their goals. Gaining independence economically, growing their wealth and the security of their families are all possible aim

Risk and return analysis:

A portfolio's holdings are determined by the goals of the investors who created it. Depending on their tolerance for risk, investors might choose portfolios that are more conservative or risky.

Diversification:

According to the conventional view of portfolio management, investors will place a higher value on higher returns than they will on lower ones. Investors will need to take on more risk to reach these targets. His income is proportional to his risk-taking prowess and his willingness to take calculated chances. Risks in these areas include fluctuating interest rates, volatile stock prices, and uncertain economic growth.

Modern approach (Markowitz efficient frontier approach):

The final step in portfolio management is diversification, which follows the determination of the asset mix and the analysis of risk and return. An investor should diversify their holdings rather than putting all of their money into a single security. Therefore, the level of danger associated with every given circumstance varies. If an investor is well-diversified, they stand a better chance of coming out ahead even if some of their investments suffer losses. Markowitz's efficient frontier method is the current standard; Harry Markowitz is widely regarded as the method's creator. Investors with a low risk tolerance might use this concept to create portfolios with the highest possible predicted return.

4. CONCLUSION

Investment portfolio management is the topic of this study. In 1952, Harry Markowitz proposed what have become standard rules for portfolio creation. The inclusion of all risky assets is recommended. It is possible to construct a portfolio that is highly efficient and highly risk-averse. The difficulties of creating and combining the required financial assets into the portfolio are outside the scope of this work and

are the subject of subsequent investigations.

Having formed a portfolio of investments, the next concern is how to grow that portfolio while still satisfying the investors that funded it. Every backer has skin in the game and wants to see the initiative succeed. A bank's primary goal is to maximize the discounted net present value of all of its financial assets. An external investor's NPV is calculated by adding together the deferred value of their dividend payments and their cash investments. The utility function can be used as a global standard against which the strategy of the participants is evaluated.

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