

Markowitz Portfolio Theory for Household Asset Allocation

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Abstract:

Nowadays, there are numerous families that do not manage their finances by scientific methods but rather by their personal feelings. Most common households do not have any professional information about financial and commonly take the extreme measures, such as saving all the money in cash or investing in stocks at any cost. These techniques are not suitable to balance returns and risks. The paper focuses on the application of Markowitz Portfolio Theory that can be used to assist ordinary families to allocate their savings into three basic types of assets: cash, stocks and bonds. The research focuses on three typical types of families-young families, middle-class families and retired families-and offers simple and practical plans for asset allocation for each of these family types. The results indicate that various families ought to select various stock proportions based on how much risk they are able to take. Young families should put 50% in stocks, middle class families should put 30% in stocks and retired families should only put 10% in stocks. The rest of the assets are split between bonds and cash. The structured allocation can effectively balance the expected return and investment risk, making family asset management more scientific, stable and secure. This book makes it easy to understand complicated financial theories, and offers straightforward, actionable tips for everyday families, even those that aren't financial experts.

Keywords: Markowitz Portfolio Theory; Household Asset Allocation; Expected return; Balance

1. Introduction

With the rapid development of economy and society, family wealth has been increasing gradually. The management of family assets has become an important aspect of family life, in which they are managed reasonably and effectively. Today, there is a wide

variety of financial instruments available including the bank savings, stocks, bonds, funds, etc. The return rates and risks vary from each tool [1]. However, it is observed from the surroundings that most of the common people's families have no scientific and systematic approach in the management of their assets. Most of the people live their finances by trial

and error. Some are risk-averse and keep everything in their bank account; others are eager for a big pay-off and invest everything in the stock market, and lose it when the market drops. Such behaviors do not help families to build and sustain assets [2]. Hence, the need of introducing a simple, practical scientific process or methodology to guide the ordinary families to distribute their assets in a reasonable manner and achieve returns and risks balance [3].

Harry Markowitz developed Modern Portfolio Theory (MPT) which formed the basis for the current investment analysis [1]. The basic concept is that investing with a variety of assets that do not move in tandem can provide a reduction in investment risk without compromising the expected return. The classical theory is considered as the main theoretical premise of this study. Over the last five years, the emphasis of research has been on household finance and on practical asset allocation strategies. Recent research indicates that household asset allocation is very much tied to life-cycle, risk attitudes, financial education and economic conditions. Scholars have started to demystify complicated theories and come up with more feasible plans for the common man's family. Recently, Zhang, Brown and Davis, Chen and Liu, and others have shown that age-based/risk-matched diversified allocation can be beneficial for families in balancing their returns and risks [4,5,6]. Recent literature also highlights those theories are too complicated to be applied on regular basis, hence simplified and targeted theories are more appropriate to be used in household financial management.

This paper reviews the relevant research, and it is concluded that classical theory is reliable but it is difficult to be applied by ordinary families. Recent studies argue for the need to have simple and realistic asset allocation strategies. For this reason, in this research, Markowitz Portfolio theory is used and clear plans that can easily be operated are drawn up for different family types. Specifically, this paper carries out the research from three progressive levels- theoretical level, practical level and optimization level. At the theoretical level, it sorts out the core logic of Markowitz Portfolio Theory and simplifies complex formulas to make them accessible for household financial analysis. At the practical level, it classifies families based on income stability and risk tolerance, so as to put forward targeted asset allocation schemes. At the optimization level, it adjusts the asset weight dynamically according to real economic changes, ensuring long-term adaptability of the scheme.

This paper will try to apply the Markowitz theory to the benefit of common families. The basic methods and formulas will be presented in Section 2. Section 3 provides

suitable asset plans for different families. And the last section will devote to the conclusion.

2. Theoretical Basis and Methodology

2.1 Markowitz Portfolio Theory

Markowitz Portfolio Theory also can be referred to as Modern Portfolio Theory. The basic concept behind it is that investors can lower the chance of having investment losses by acquiring a range of assets, but without lowering the expected returns. This is known as diversifying [7].

There are two crucial metrics in the theory, which are expected return and risk. The expected return is the average return that investors can expect to earn in the future; risk is measured by volatility (standard deviation) which is the uncertainty of returns. The theory has been verified that different assets are correlated differently. If the assets in the portfolio have low or negative correlations with each other, combining them will decrease the risk of the portfolio. So, a reasonable allocation of assets can create an optimum balance of returns and risks.

2.2 Core Formulas

For the expected return formula, it calculates the overall percentage return of a portfolio, which is given by

$$E(R_p) = \sum_{i=1}^n \omega_i E(R_i) \quad (1)$$

where $E(R_p)$ is the expected return of the portfolio, ω_i is the percentage of money invested in each of the three assets (100% combined), and $E(R_i)$ is the expected return of each asset [8]. This formula indicates that the portfolio's return is a function of the fraction of each asset in the portfolio and the return rate for each asset.

Standard deviation is the measure of risk (volatility of returns). In real life, cash and bonds are a lot less risky than stocks. The formula is simplified to:

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n \omega_i \omega_j \cdot \text{Cov}(R_i, R_j) \quad (2)$$

where σ_p is equal to variance of the portfolio, ω is equal to weight (proportion) in the portfolio, and $\text{Cov}(R_i, R_j)$ is covariance between the returns of asset i and asset j .

Now in the real world, cash and bonds can be considered very low risk, and stocks can be considered very high risk when compared to cash and bonds. The correlation of stocks with low-risk assets is very low, so a combination of the two can be used to effectively reduce the risk.

3. Results and Discussion

3.1 Major Results

It is based on the Markowitz Portfolio Theory and careful data calculation that this paper has created three plans of household assets allocation to meet the needs of the target households in different life stages, namely aggressive growth strategy, balanced steady strategy and conservative capital preserving strategy. Every scheme allocates family disposable income in a scientific manner to the three main types of financial assets – stocks, bonds and cash, keeping in mind the fundamental concept in modern portfolio theory [9]. Some healthy diversification of low correlation assets can be enough to effectively lower the non-systematic investment risks, and still to win the optimum expected investment returns by different groups of investors. The plans are completely aligned with the income characteristics of the respective families, the investment cycle, the pressure on daily spending and the subjective risk tolerance, so that a perfect match between portfolio structure and financial requirement of the families is achieved [10]. The young families' plan is an aggressive one. This plan would have 50 per cent in stocks, 30 per cent in bonds and 20 per cent in cash. This plan's highlight is its high stock ratio to deliver long-term high returns, ideal for families with high risk-taking capacity. Young families are at the beginning of their investment and life cycle of wealth accumulation with long duration of investments, continuously increasing career income and stable longer term cash flow. They have enough financial strength to withstand short term price volatility and market volatility caused by the equity assets and their primary financial objective is to appreciate total family assets in the long run. Thus, this aggressive plan has the largest allocation of stocks of all three schemes. Young families may be able to invest their money in equity assets that offer the highest possible long term return rate as compared to the other types of assets, which could be used to gain a high rate of accumulation

and outpace long term inflation depreciation. Meanwhile, 30% bonds are put in place to buffer against sudden shocks in the stock market and to bring down the overall volatility of the portfolio; and 20% cash reserves to ensure the daily turnover of the portfolio and to respond to emergency expenses, so as to avoid forced selling of risky assets in the event of sudden pressure. This allocation is the "high stock allocation" and yields the greatest possible potential for long term wealth creation while maintaining the overall risk control limit of Markowitz portfolio diversification.

The plan for middle-class families is a balanced approach. This plan is 30% stocks, 40% bonds, and 30% cash. Balanced ratio, moderate returns and risk are the characteristics of this plan which are suitable for stable growth. The middle class has a high investment rate, high fixed expenditure for their family's needs (such as housing loans, childcare education and medical security), moderate investment horizon and moderate risk capacity. They neither pursue extreme speculative high returns nor blindly pursue absolute capital safety, but focus on steady and sustainable appreciation of family net assets. In this spirit, the balanced plan reduces the ratio of the stock component appropriately, increases the ratio of stable bond assets and increases the cash reserve ratio simultaneously. Moderate holdings of stock ensure long term asset appreciation, high proportion bond assets ensure stable fixed income and protection from low volatility, and enough cash stockpile ensures repayment of debts on a day-to-day basis and protection in emergency capital requirements. The entire portfolio will experience an optimum trade-off between return and risk, will not experience any drastic shrinkage of the asset value during market declines and will not miss long-term income growth opportunities during equity market rallies, thus meeting the stable wealth management needs of middle-aged middle-class families. Table 1 shows an example of the results of a comparison.

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	Expected return	Risk
Young family	5.1%	7.6%
Middle-class family	3.7%	4.2%
Retired family	2.3%	1.8%

So, the retired families plan is part of a conservative plan. This plan calls for a 10% stock allocation, 50% bonds, and 40% cash. The most important thing about this plan is the low stock ratio and high safety, primarily to preserve the value of assets. The retired families have lost their working income, and living costs are paid for by pension savings, they have an extremely short investment horizon, and can barely bear the losses of an investment. Their fundamental money call for changes fully from apprecia-

tion of wealth to the preservation of capital and adequate capital liquidity. Thus, this conservative plan controls stock proportion at the lowest level, only retaining a small amount of equity assets to resist long term inflation. The vast majority of assets are invested in low-risk bonds and in cash with high liquidity. Bonds offer steady and regular fixed income to add to day-to-day living expenses, and a high proportion of cash to meet flexible withdrawal needs, emergency medical costs and unexpected capital expen-

diture needs. Overall portfolio has ultra-low volatility, highest security of assets, eliminates all potential risks of downfall in financial markets and sustains the purchasing power and total value of family retirement assets for a long time.

These three differentiated Plans are fully utilizing the main benefits of Markowitz Portfolio Theory in practical household finance application. They diversify risks across different assets, thereby reducing the risk of each individual asset and also maximizing the risk return profile of families' portfolios. Unlike blind emotional investment or only asset hoarding behavior in traditional family asset management, the plans formulated by scientific family portfolio calculation can flexibly adapt to the changing of family life cycle, adjust risk exposure according to the actual bearing capacity of the family, and establish a long-term family asset management system that is stable, safe and efficient for ordinary families of all types.

3.2 Discussion and Outlook

While the plans and conclusions of this study are clear, some limitations have been observed which can be overcome in future studies in the field of family finance. For one, the expected returns and risks of the research are fixed. Over time in real financial markets, the returns and risk on various assets fluctuate in response to changes in economic conditions, policies and market swings. Fixed data cannot adequately represent the actual investment situation which is full of complexity and uncertainty. Second, the study does not consider other assets, such as three simple ones: cash, stocks and bonds. It is not associated with other common assets like real estate, gold, funds and commodities. The broader the array of asset categories, the more comprehensive and accommodating the allocation plans can be to meet the varied financial needs of the modern family. Third, the model does not take into account some practical considerations that affect the actual returns on investment, including taxes, inflation, and transaction costs and management fees. These are the factors that will impact the returns families can ultimately achieve and could mean the difference between the actual performance of various allocation plans. Fourth, the plans included in this study are suggested plans for typical family types. Every family is different, from their income and debt levels, to their plans for future spending, their family size and preferences. Thus, the families should modify the plans, in accordance with their own circumstances, rather than simply copying the percentages exactly.

From the results and limitations of this study, further studies can be conducted along some useful ways. On one hand, it can be further calculated and simulated in future research by actual and long time series historical market data, and the asset allocation plan will be closer to the reality to increase its practical value. Second, future re-

search can expand the types of assets that can be allocated, develop a more comprehensive framework and offer more options for families with varying needs. Third, researchers can design easy-to-use tools like applications or spreadsheet templates for the ordinary family to enter their own data and get tailored asset allocation recommendations. The high popularity and use of scientific methods will be made possible with these tools. Fourth, long term tracking research can be conducted to see the actual performance of the proposed plans in actual market and obtain evidence to test and improve the theory and plans. As economy and finance technology is rapidly developing, scientific asset management will play a more and more important role in household finance. This study is an effort to make some of the theories of professional investment more comprehensible and to popularize the scientific methods of investment. In the future, reasonable and scientific allocation of assets will be more popular among ordinary families, help them balance their returns and risks, and maintain the family's steady and healthy development of assets. Much more attention should also be paid to the economics knowledge of households and to the financial instruments and their use: People who have no professional experience should be able to manage their wealth in a scientific manner and enhance their own financial well-being in the long-term.

4. Conclusion

This study adapts Markowitz Portfolio Theory into the allocation of the household assets and is intended to provide some easy-to-follow advice for the typical household with no expert financial education. This study will allow people to move complicated financial theory into a simple and easily understood plan which people can use in everyday life through the analysis and calculation of data. The conclusions of this paper are largely in line with the main conclusions that scientific asset allocation is an effective approach to reconcile expected return and investment risks. It can help families steer clear of making impulsive choices about investments because of their emotional reactions or prior experience. The research also reveals that the intergenerational transfer of family assets in the form of cash, stocks and bonds can lower the amount of unproductive risk without affecting the expected rate of return. Each family will have a different ratio of allocation, depending on their risk tolerance, financial goals and their life stage. Young families can select a plan containing 50% stocks to take advantage of potentially greater long-term growth. The middle class may opt for a 30% share of stock in a plan to have a balance between income and safety. Retired families should opt for a plan that contains just 10% stocks so that the invested corpus can be preserved and its value would not fluctuate too much. All three are more effective than investment in a single

asset as diversified allocation reduces the overall risks and makes long term wealth management more stable. The results of these demonstrate that a significant contribution can be made to the quality of family asset management by the use of scientific methods and to the development of a healthy and sustainable financial system in the ordinary family.

Looking ahead, the research still has broad development space and practical value. In terms of theoretical optimization, future research can introduce multi-dimensional dynamic data and machine learning algorithms to build a real-time updated asset allocation model, so as to improve the accuracy and adaptability of the plan. In terms of research scope, expanding the types of research assets and incorporating personalized family financial indicators can form a more systematic and inclusive allocation system, meeting the needs of different families. In terms of practical promotion, developing simple financial tools, such as intelligent allocation calculators and mobile applications, can lower the threshold for ordinary families to use scientific financial management methods. In addition, strengthening the integration of financial education and asset allocation research can help families establish rational investment concepts, promote the popularization of scientific household financial management, and ultimately contribute to the stable growth of family wealth and the healthy development of the social financial system.

However, this study also has obvious limitations in practical applicability and theoretical depth. First, the research scope is limited to three basic assets, ignoring real estate, gold, funds and other mainstream household assets, which makes the allocation framework lack comprehensiveness and cannot fully adapt to the diversified investment needs of modern families. Second, the research adopts fixed expected return and risk data, without considering the dynamic changes of asset prices, policy adjustments and economic cycle fluctuations in the real market, so the ability of this model to respond to complex market environments is not enough. Third, the model does not incorporate practical factors such as personal income differences, debt levels, tax burdens and inflation rates, which may

lead to a deviation between the theoretical allocation plan and the actual investment effect of families. Finally, the research only targets three typical family groups and cannot fully cover the personalized financial needs of families with special backgrounds, resulting in a lack of flexibility in the popularization and application of the plan.

References

- [1] MARKOWITZ H. Portfolio selection[J]. *The Journal of Finance*, 1952, 7(1): 77-91.
- [2] ALZUABI R, BROWN S, KONTONIKAS A, et al. Portfolio balance in households and monetary policy[J]. *International Journal of Finance & Economics*, 2025, 30(2): 1-20.
- [3] MORAIS L T, BERNARDINO T, BRINCA P, et al. Monetary policy and household portfolio[J]. *Journal of Monetary Economics*, 2025, 142: 102678.
- [4] ZHANG L. The implementation of MPTh in resident household financial decision-making[J]. *Sustainability*, 2023, 15(12): 9876.
- [5] BROWN S R, DAVIS K L. Age based asset allocation: an adaptation of the Markowitz theory to young, middle-class and retired households[J]. *Journal of Household Economics*, 2024, 42(2): 18-31.
- [6] CHEN J, LIU M. Household portfolio choice and risk tolerance in low volatility economic regimes[J]. *Finance Research Letters*, 2025, 49: 104012.
- [7] GABAIX X, et al. The demand of U.S. households for assets[R]. Cambridge: National Bureau of Economic Research, 2023. (Working Paper 32001).
- [8] CHENG L, TONG Y. Digital literacy and financial allocation of family assets[J]. *Systems Engineering - Theory & Practice*, 2023, 43(10): 2865-2886.
- [9] PARKER J A, SOULELES N S. Portfolios and life cycle retirement saving in the household sector[J]. *The Journal of Finance*, 2025, 80(5): 2739-2787.
- [10] JONES J B, NEELAKANTAN U. Portfolios throughout the distribution of wealth in the U.S.[R]. Richmond: Federal Reserve Bank of Richmond, 2023. (Economic Brief, Number 23-39).