



Stock Selection Strategy and Application of Portfolio Theory

Yaqi Wang

School of Social Sciences, University of Manchester, Manchester, M13 9PT, United Kingdom
yaqi.wang-5@student.manchester.ac.uk

Abstract. There are various stock selection methods nowadays, so choosing a process most suitable for investors is essential. This paper explores three main methods of stock selection: PE Ratio, ESG criteria, and the portfolio theory. Investors can adjust their methods by investment objectives, risk tolerance, social obligations, and other indicators. By analysing the data and performances of Ping An Bank (000001. SZ), Kweichow Moutai (600519. SH), and PetroChina Company Limited (601857. SH) in the stock market, the paper mainly introduces the application of portfolio theory. Through a series of calculations of expected return, standard deviation, correlation, and applying 'Solver-Add in', the researcher illustrated the graph of the Efficient Frontier of the portfolio that is comprised of stocks mentioned above and obtained the optimal combination of weights of the number of stocks purchased. Overall, the research concluded that the Sharpe Ratio increases as the risk-adjusted return of an investment improves.

Keywords: investment method, stock selection, portfolio theory, Sharpe Ratio

1 Introduction

In today's interconnected financial markets, effective stock selection methods are increasingly important as investors strive to balance risks and returns as well as other investment indicators. Based on the existing research, this paper studies three stocks: Ping An Bank (000001. SZ), Kweichow Moutai (600519. SH), and PetroChina Company Limited (601857. SH). Furthermore, the researcher mainly unfolds the application of the portfolio theory through a series of calculations. Eventually, the researcher derived the purchasing weights of the three stocks and the conclusion of the analysis.

2 Methods for picking stocks for investment

What will companies consider when picking a stock? There are various indicators that companies can use to achieve operation objectives. This paper will introduce three methods of selecting stock for a portfolio.

The company seeking to assess whether a stock is overvalued or undervalued often relies on the PE Ratio (market price per share/earning per share), which is vital for comparing companies within the same industry and assessing the growth prospects

relative to their current earnings. Specifically, A higher PE ratio might reveal that investors expect higher growth rates in the future, as they are willing to pay more for per unit of earnings today [1]. Conversely, a lower PE ratio indicates that companies are undervalued or its growth prospects are not as strong. However, a main limitation of applying the PE ratio is that it is sophisticated to compare companies in different industry sectors since the valuation and growth rates of companies often differ significantly between industries due to the timing and methods by which firms generate their revenue. Moreover, it might be difficult for investors to calculate some companies' PE ratios if they are non-profitable and have no or negative earnings per share.

If the company prioritises sustainability and long-term growth, it should consider ESG (Environmental, Social, and Governance) criteria. These factors are increasingly important for assessing how a company manages environmental, social, and governance issues, which can affect its resilience and potential for sustainable growth. ESG investing is commonly viewed as a method of "sustainable" investing, where investments are linked to the environment, human well-being, and the economy [2]. This approach is grounded in the increasing belief that the financial performance of organizations is increasingly influenced by environmental and social factors.

Investors concerned about risk management could mainly refer to the portfolio theory—a fundamental investment management concept developed by Harry Markowitz in 1952. It offers a mathematical framework for constructing a portfolio of assets that maximizes expected return for a specified level of risk, or alternatively, minimizes risk for a given level of expected return [3]. The key of the portfolio theory is diversification, which refers to a portfolio strategy that aims to minimise unsystematic risk (the variability in a security's returns that is due to factors specific to that individual security or to the particular industry in which it operates) by holding assets that are not perfectly positive correlated. This is because a loss in assets in related industries is likely offset by a gain in those unrelated industries. In portfolio theory, the collection of optimal portfolios that provide the highest expected return for a specified level of risk can be represented by the Efficient Frontier in the form of a curve. Portfolios on the Efficient Frontier are considered optimal, while those below the curve are suboptimal because they deliver lower returns for the same level of risk [4].

3 Sharpe ratio

The Sharpe ratio can be employed to assess the return and risk of an investment, serving as a mathematical illustration of the concept that higher returns over time might reflect increased volatility and risk rather than superior investment expertise. It is calculated by subtracting the risk-free rate from the portfolio's expected return and then dividing this difference by the standard deviation of the portfolio's excess return. The risk-free rate represents the return on an investment with no risk, usually associated with government securities such as treasury bills. In addition, if the risk-free rate is given, each portfolio consists of risk-free and risky assets. Without risk-free assets, investors are limited to portfolios on the efficient frontier of risky assets. However, when including the risk-free rate, they can expand investment opportunities by achieving points on the

Capital Market Line (CML). This theoretical notion includes all portfolios that ideally blend the risk-free rate of return with the market portfolio of risky assets [5]. In theory, portfolios positioned along CML achieve the best risk/return balance, thereby optimizing performance.

4 Portfolio theory in real-life case

In this paper, the research applies portfolio theory by constructing a portfolio using three prominent A-shares: 000001 (Ping An Bank Co., Ltd.), 600519 (Kweichow Moutai Co., Ltd.), and 601857 (PetroChina Company Limited). A-shares are stocks of companies incorporated in mainland China that are traded in Chinese yuan (RMB) on the mainland stock exchanges. By analysing their annualised expected return on daily returns of individual stocks, taking into account the cash dividends reinvested basis for four years, returns converted to each business day, the standard deviation of the annualised expected return of each selected stock, correlation of every two stocks, and then calculating the Sharpe Ratio of the portfolio, the investors can demonstrate how portfolio theory can guide the selection and allocation of assets to achieve an optimal balance of risk and return. These companies are selected based on their significant positions within different sectors of the Chinese economy and their diverse risk and return profiles.

4.1 Company Introduction

The stocks selected in this paper are from different sectors. Ping An Bank (000001. SZ) represents the financial sector, known for its stability and consistent returns. It is one of China's leading banks, providing various financial services. Kweichow Moutai (600519. SH) is a leader in the consumer goods sector, specifically in the alcoholic beverage industry. As it is known for its luxury liquor products, it is a strong performer with a history of high profitability and relatively low volatility. PetroChina (601857. SH) is a significant player in the energy sector, particularly in oil and gas. Global oil prices often influence this company's performance, adding a different risk factor than the other two companies. By selecting stocks from different sectors, the portfolio can potentially reduce sector-specific risks, as these companies are likely to respond differently to various economic factors [6].

Ping An Bank Co., Ltd. (000001. SZ), Ping An Bank Co., Ltd. is a commercial bank providing financial services to both corporate and individual clients across China. It provides local and foreign currency services, including deposits, loans, settlements, securities trading, and gold transactions [7]. By 15:00 on August 16, 2024, the company's Market Cap (intraday) was 196.582 billion [7].

Kweichow Moutai Co., Ltd. (600519. SH), established in 1999 and headquartered in Maotai, Guizhou Province, is the world's most valuable liquor company. It is famous for producing Moutai, a high-end Chinese liquor with a long history and a strong brand presence. The company has consistently delivered strong financial performance, driven by the high demand for its premium products [8]. Therefore, it distributes its products

within the domestic market and overseas markets. By 15:00 on August 16, 2024, the company’s Market Cap (intraday) was 1.798 trillion [8].

PetroChina Company Limited (601857. SH), founded in 1999, is a subsidiary of the state-owned China National Petroleum Corporation and one of China’s largest oil and gas producers. The company operates in exploration, refining, and natural gas, playing a key role in both Chinese and global energy markets [9]. By 15:00 on August 16, 2024, the company’s Market Cap (intraday) was 1.592 billion [9].

4.2 Performance of the Candidate Companies

Calculation of expected return, and standard deviation and correlation. After selecting three stocks and extracting data from CSMAR [10] on daily stock returns taking into account reinvested cash dividends from June 15, 2020, to June 15, 2024, the annualised expected returns(r) on daily returns of individual stocks taking into account the cash dividends reinvested basis for four years of Ping An Bank (000001. SZ), Kweichow Moutai Co., Ltd. (600519. SH), and PetroChina Company Limited (601857. SH) are 7.02144, 0.00044, and 0.00122 respectively. Then, the annual returns converted to each business day could be derived from the formula in Equation (1).

$$\text{Annual return} = (1 + r)^{250} - 1 \tag{1}$$

Thus, the annual returns are 1.77%, 8.71%, and 37.77%. (Table 1) Furthermore, their standard deviations of the annualised expected return of the selected stock are 502.32%, 454.76%, and 461.93%. With the calculated data, correlations of each portfolio are obtained: 0.37196 (000001. SZ and 600519. SH), 0.04104 (600519. SH and 601857. SH), and 0.24650 (000001. SZ and 601857. SH). (Table 2)

Table 1. Annual return and standard deviation of the stocks selected

	Ping An Bank	Kweichow Moutai Co., Ltd	PetroChina Company Limited
Annual return	1.77%	8.71%	37.77%
Standard deviation	502.32%	454.76%	461.93%

Table 2. Correlation of the stocks selected

Stocks	Correlations
00001.SZ & 600519.SH	0.37196
600519.SH & 601857.SH	0.04104
00001.SZ & 601857.SH	0.2465

Draw the efficient frontier by adjusting weights. Then, the research makes assumptions of the weight of the number of stocks purchased, and the sum of their weight equals 1. Next, the portfolio’s expected return of 000001.SZ, 600519.SH, and 601857.SH are calculated. By adding their respective weight, SH multiplies the returns converted to each business day. (Fig. 1)

Moreover, with the weights of the assets, the standard deviation of the annualised expected return of each selected stock, and correlations between the assets, the standard deviation of the portfolio is achieved via the Portfolio Variance Formula. Additionally, the 10-year Chinese treasury bill yield on August 16, 2024, is 2.15%, regarded as the risk-free rate. The (expected return - risk-free rate)/standard deviation calculates the Sharpe ratio.

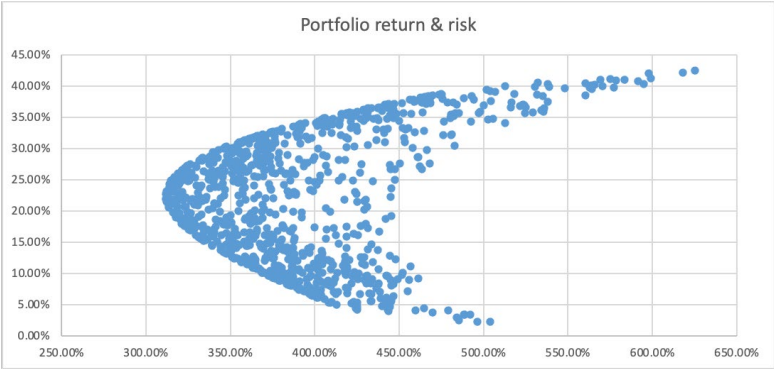


Fig. 1. Risk and return of the portfolio

Obtain the optimal solution by applying ‘Solver-Add in’. By adjusting the weights of the number of stocks purchased and applying ‘Solver-Add in’, the graph of the Efficient Frontier and the best possible expected return of the portfolio comprised of the three stocks for the risk level at 2.15%. As a result, the answer report of ‘Solver-Add in’ illustrates that the weights of the number of stocks purchased are 0, 0.21507, and 0.78493 for 000001.SZ, 600519.SH, and 601857.SH accordingly. (Table 3) The standard deviation is 350.65%, and the expected return of the portfolio is 29.95%. Thus, the Sharpe ratio is 7.93%. (Table 4)

Table 3. Weight of the optimal portfolio

	Ping An Bank	Kweichow Moutai Co., Ltd	PetroChina Company Limited
Weight	0	21.51%	78.49%

Table 4. Information of the optimal portfolio

	Optimal portfolio
Expected return	29.95%
Standard deviation	650.65%
Risk-free rate	2.15%
Sharpe ratio	7.93%

Explain the meaning of the optimal solution. Any weight combination different from the weight combination of 0, 0.21507, and 0.78492 will decrease the expected return and increase in standard deviation, which further causes Sharpe ratio lowering. This leads to the conclusion that a higher Sharpe Ratio signifies a stronger risk-adjusted return on an investment.

5 Conclusion

In conclusion, this paper outlines three essential methods of stock selection: PE Ratio, ESG criteria, and portfolio theory, and analyses the application of the portfolio theory in depth. Each method provides a distinct approach, allowing investors to tailor their choices based on specific investment goals, risk tolerance, ethical and social considerations, and personal values. Whether prioritising financial metrics with the PE Ratio, aligning investments with social and environmental responsibilities through ESG, or optimising risk and returns using portfolio theory, investors can select the strategy that most closely matches overall objectives and personal characteristics, ensuring a well-informed and purposeful investment journey.

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