# A Study with AI Quantization on the Performance Evaluation of Chinese Securities Investment Funds ——Based on the Pharmaceutical Sector

Xinyi Rao

zoey_rao@163.com

Business School, The University of Aberdeen Aberdeen, United Kingdom

**Abstract**—The healthcare sector is getting a lot of attention under the impact of COVID-19 in 2019. The medical and pharmaceutical industry has a very high investment value as an investment that can maintain stable demand and growth certainty over the long term. Since funds occupy such an important position in national investment, it is essential to assess the performance of funds. The research question in this paper is to find indicators that provide a comprehensive, realistic and unbiased picture of the performance of pharmaceutical equity funds. This paper measures the comprehensive performance of the pharmaceutical fund from two aspects. On the one hand, it evaluates the actual performance and earning capacity of the pharmaceutical fund relative to the market benchmark, mainly through the analysis of the fund income index, risk-adjusted earnings index; On the other hand, it evaluates the fund management and returns from the fund manager's ability, focusing on the fund manager's stock selection ability and timing ability. The final conclusions of the study are, most medical funds outperformed the market portfolio and obtained excess returns, In both the T-M and H-M models, a considerable number of pharmaceutical fund managers have this ability in terms of stock selection ability, but only a small number of pharmaceutical fund managers have this ability in terms of timing ability.

**Keywords:** pharmaceutical funds; performance evaluation indicators; stock selection and timing ability

## 1 INTRODUCTION

Most investors in the market today are reluctant to take high risks, so most choose to invest in pharmaceutical securities investment funds to minimise and diversify the risks they have to take through pooled investments. Pharmaceutical funds are now seen to be a pivotal part of asset allocation and investment. Investors who are unaware of the funds and the market can be attracted by misleading information in fund advertisements or follow popular trends to invest blindly. This paper therefore selects funds in medicine and healthcare and conducts an in-depth study of their performance. The above information has identified three dimensions and eight indicators for evaluating the performance of funds related to the pharmaceutical sector: (1) traditional fund evaluation indicators: fund compounded net return, standard deviation, beta coefficient [1]; (2) risk-adjusted indicators: Treynor Index, Sharpe Index, Jensen Index [2]; (3) fund manager's stock selection and timing ability: T-M model, H-M model [3]. This paper hopes to evaluate the performance of relevant funds from a more scientific and impartial perspective with the help of fund performance evaluation indicators and methods, and to provide a theoretical basis for

investors to invest in pharmaceutical funds in the future. To establish a scientific and reasonable fund performance evaluation system, which is of great practical significance to the regulator's supervision and governance of the fund, the fund manager's management and operation of the fund, and the investor's choice and investment of funds.

The healthcare industry has received a lot of attention due to the impact of COVID-19 2019. As far as investment projects are concerned, the medical and pharmaceutical sector is of high quality and can maintain long-term stable demand and certainty of growth. In general, the investment value of the medical and pharmaceutical industries is very high. But at present, most investors in the market are unwilling to take high risks, so most investors choose to invest in medical securities investment funds, which have become an essential part of asset allocation and investment. In the theoretical sense, this paper hopes to evaluate the performance of pharmaceutical funds with the help of fund performance evaluation indicators and methods, improve the market order of funds to improve the efficiency of fund management and the financing ability of the securities market to a certain extent.

## 2 TRADITIONAL FUND PERFORMANCE EVALUATION INDICATORS

### 2.1 Compounded NAV per unit growth rate

This paper adopts a more scientific and reasonable index to measure the performance of medical funds - compounded net unit growth rate, specifically. It refers to adding dividends back to the net unit value, and then reinvesting and compounding interest again. Compared with the previous method, this method can solve the problems existing in the previous method, compare the historical performance of the fund fairly and justly, and better calculate and evaluate the fund's NAV return. The specific formula is as follows:

$$R_i = \frac{d_e - d_f}{d_f} \tag{1}$$

The analysis of the compounded NAV per unit growth indicators for the 60 pharmaceutical funds can first be presented as follows.
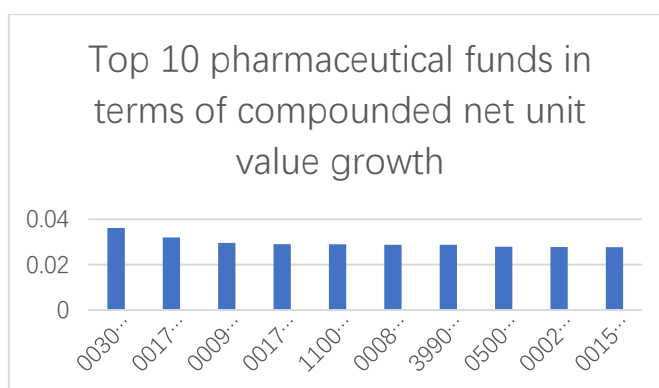


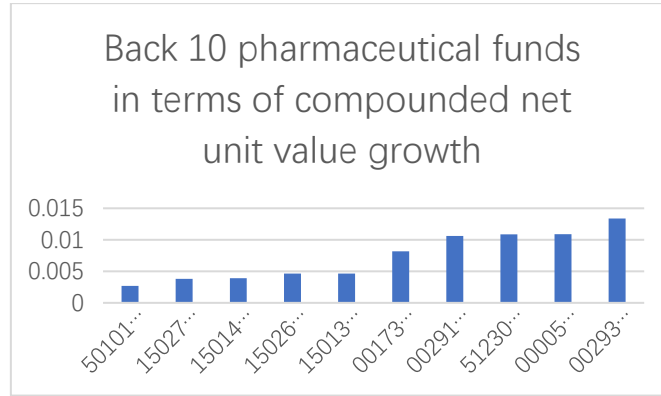**Figure 1.** Top 10 Pharmaceutical Funds Net Return

**Figure 2.** Back 10 Pharmaceutical Funds Net Return

Analysis of the results obtained from Excel shows that the average compound return growth rate of the 60 pharmaceutical funds over the 2017-2020 period was 0.021, and 35 pharmaceutical funds exceeded this average. In the above graph, three of the pharmaceutical funds, 003095.OF, 001717.OF and 000960.OF, have the highest compounded return growth rates of 0.036, 0.032 and 0.030, respectively, while three pharmaceutical funds, 150148.OF, 150271.OF and 501011.OF, have the lowest average returns of 0.004, 0.004 and 0.003, respectively.

## 2.2 The standard deviation of return

The higher the value, the more severe the volatility of the NAV growth rate and the greater the overall risk of the fund. The standard deviation has been explained in detail in modern investment theory. It is an indicator to measure the risk degree of a portfolio. The formula is as follows:

$$\sigma = \sqrt{\sum_{i-1}^{n}[R_i - E(R_i)]^2} \tag{2}$$

## 2.3 The β coefficient

The sensitivity of an asset's return to market changes is measured by β, which indicates to some extent the volatility and systemic risk of a fund relative to the market as a whole. The specific formula is as follows:

$$\beta_i = \frac{COV(R_i, R_m)}{VAR(R_m)} \tag{3}$$

## 2.4 CAPM model

60 funds in the pharmaceutical industry were selected as samples for modelling analysis. CAPM model was used to measure the performance level and systemic risk β of 60 pharmaceutical funds. OLS method was used to estimate the CAPM model, and the following results were obtained [4].

Table 1 Regression results of the CAPM model

| Fund Code | α | β | R2 | F | Sig(α) | Sig(β) |
|-----------|------|-------|-------|--------|--------|--------|
| 000059.OF | 0.002 | 1.179 | 0.592 | 66.690 | 0.712 | 0.000 |
| 000220.OF | 0.018 | 0.973 | 0.296 | 19.348 | 0.042 | 0.000 |
| 000339.OF | 0.017 | 1.124 | 0.519 | 49.699 | 0.008 | 0.000 |

| | | | | | |
|---|---|---|---|---|---|
| 000452.OF | 0.017 | 0.859 | 0.302 | 19.860 | 0.035 | 0.000 |
| 000523.OF | 0.008 | 1.082 | 0.499 | 45.846 | 0.211 | 0.000 |
| 000711.OF | 0.014 | 1.181 | 0.483 | 42.903 | 0.064 | 0.000 |
| 000727.OF | 0.014 | 1.215 | 0.457 | 38.753 | 0.067 | 0.000 |
| 000780.OF | 0.013 | 1.109 | 0.395 | 29.984 | 0.124 | 0.000 |
| 000831.OF | 0.017 | 1.065 | 0.381 | 28.345 | 0.040 | 0.000 |
| 000878.OF | 0.019 | 1.123 | 0.473 | 41.355 | 0.008 | 0.000 |
| 000913.OF | 0.017 | 1.254 | 0.422 | 33.531 | 0.058 | 0.000 |
| 000945.OF | 0.010 | 1.149 | 0.490 | 44.211 | 0.157 | 0.000 |
| 000960.OF | 0.020 | 1.197 | 0.415 | 32.640 | 0.021 | 0.000 |
| 001171.OF | 0.018 | 1.076 | 0.419 | 33.180 | 0.020 | 0.000 |
| 001230.OF | 0.015 | 1.160 | 0.441 | 36.350 | 0.050 | 0.000 |
| 001417.OF | 0.016 | 1.017 | 0.400 | 30.666 | 0.033 | 0.000 |
| 001558.OF | 0.016 | 1.397 | 0.511 | 48.122 | 0.045 | 0.000 |
| 001645.OF | 0.016 | 1.348 | 0.555 | 57.417 | 0.026 | 0.000 |
| 001717.OF | 0.022 | 1.140 | 0.382 | 28.432 | 0.011 | 0.000 |
| 001730.OF | 0.002 | 0.741 | 0.425 | 33.956 | 0.750 | 0.000 |
| 001766.OF | 0.021 | 0.881 | 0.323 | 21.898 | 0.008 | 0.000 |
| 001915.OF | 0.015 | 1.139 | 0.356 | 25.411 | 0.096 | 0.000 |
| 002300.OF | 0.015 | 1.072 | 0.377 | 27.856 | 0.065 | 0.000 |
| 002408.OF | 0.017 | 0.873 | 0.251 | 15.391 | 0.067 | 0.000 |
| 002708.OF | 0.018 | 0.975 | 0.357 | 25.527 | 0.020 | 0.000 |
| 002919.OF | 0.003 | 1.045 | 0.545 | 55.003 | 0.630 | 0.000 |
| 002938.OF | 0.006 | 1.135 | 0.550 | 56.135 | 0.351 | 0.000 |
| 003095.OF | 0.026 | 1.145 | 0.336 | 23.258 | 0.009 | 0.000 |
| 003230.OF | 0.018 | 0.916 | 0.322 | 21.854 | 0.025 | 0.000 |
| 003284.OF | 0.013 | 0.865 | 0.394 | 29.964 | 0.043 | 0.000 |
| 003581.OF | 0.012 | 1.029 | 0.441 | 36.349 | 0.075 | 0.000 |
| 050026.OF | 0.019 | 1.149 | 0.370 | 26.989 | 0.036 | 0.000 |
| 090020.OF | 0.010 | 1.285 | 0.578 | 62.989 | 0.114 | 0.000 |
| 110023.OF | 0.019 | 1.113 | 0.439 | 35.938 | 0.011 | 0.000 |
| 150130.OF | 0.003 | 0.000 | 0.002 | 0.089 | 0.000 | 0.767 |
| 150148.OF | 0.003 | 0.001 | 0.008 | 0.374 | 0.000 | 0.544 |
| 150261.OF | 0.003 | 0.000 | 0.000 | 0.002 | 0.000 | 0.968 |
| 150271.OF | 0.002 | 0.000 | 0.001 | 0.056 | 0.000 | 0.814 |
| 159929.OF | 0.007 | 1.325 | 0.583 | 64.442 | 0.323 | 0.000 |
| 159938.OF | 0.006 | 1.324 | 0.604 | 70.15 | 0.358 | 0.000 |
| 160219.OF | 0.010 | 1.252 | 0.531 | 52.063 | 0.143 | 0.000 |
| 160635.OF | 0.005 | 1.277 | 0.586 | 65.061 | 0.418 | 0.000 |
| 161035.OF | 0.013 | 1.158 | 0.463 | 39.733 | 0.083 | 0.000 |
| 161616.OF | 0.015 | 1.216 | 0.364 | 26.333 | 0.123 | 0.000 |
| 161726.OF | 0.013 | 1.48 | 0.478 | 42.163 | 0.152 | 0.000 |
| 162412.OF | 0.012 | 1.262 | 0.480 | 42.519 | 0.132 | 0.000 |
| 163001.OF | 0.011 | 1.107 | 0.410 | 32.008 | 0.146 | 0.000 |
| 163118.OF | 0.010 | 1.330 | 0.584 | 64.520 | 0.149 | 0.000 |
| 165519.OF | 0.009 | 1.310 | 0.590 | 66.176 | 0.142 | 0.000 |
| 240020.OF | 0.017 | 1.170 | 0.482 | 42.819 | 0.017 | 0.000 |
| 399011.OF | 0.019 | 1.107 | 0.454 | 38.31 | 0.009 | 0.000 |
| 470006.OF | 0.015 | 1.151 | 0.386 | 28.876 | 0.083 | 0.000 |
| 501005.OF | 0.007 | 1.462 | 0.516 | 49.101 | 0.390 | 0.000 |
| 501011.OF | -0.006 | 1.199 | 0.647 | 84.299 | 0.263 | 0.000 |
| 510660.OF | 0.012 | 1.328 | 0.572 | 61.431 | 0.088 | 0.000 |
| 512010.OF | 0.013 | 1.304 | 0.48 | 42.527 | 0.102 | 0.000 |

| | | | | | |
|---|---|---|---|---|---|
| 512120.OF | 0.008 | 1.358 | 0.565 | 59.812 | 0.276 | 0.000 |
| 512300.OF | 0.001 | 1.281 | 0.582 | 64.048 | 0.829 | 0.000 |
| 512610.OF | 0.005 | 1.348 | 0.585 | 64.759 | 0.460 | 0.000 |
| 519171.OF | 0.014 | 1.175 | 0.428 | 34.402 | 0.080 | 0.000 |

As can be seen from the table above, in the test of systemic risk $\beta$, only four pharmaceutical funds have no significant $\beta$ coefficient, and most of them are significant. From this data, it can be seen that the pharmaceutical index fund has a generally significant explanatory effect on pharmaceutical funds; While 24 medical funds failed to pass the significance test of $\alpha$, and the $\alpha$ values of the rest of medical funds were significantly greater than 0, indicating that 36 medical funds had advantages in performance. In the fit effect test, 56 pharmaceutical funds have R-squared above 0.2, which shows that the CAPM model fits relatively well for most pharmaceutical funds. In addition, in the overall significance test of the equation, only four pharmaceutical funds failed to pass the significance test of the F-statistic. So the linear relationship of the CAPM is not significant, the linear relationship between the variables of the CAPM model for the remaining pharmaceutical funds was also significant.

# 3    RISK-ADJUSTED RETURN ANALYSIS

## 3.1    Treynor Index

The Treynor Index is an important indicator to evaluate fund performance [5]. Precisely, it measures the fund's return on investment per unit of systemic risk to determine how well the fund is performing. Investors use this index to judge whether the risks and returns of the fund are reasonable. The higher the Traynor index, the higher the fund's return on investment per unit of systemic risk. If the value of the Traynor index is smaller, it means that the investment value of the fund is lower and the performance is worse, which is calculated according to the formula:

$$T_i = \frac{\overline{R_i} - R_f}{\beta_i} \tag{4}$$

## 3.2    Sharpe Index

The Sharpe ratio means that investors are generally rational, choosing the most efficient portfolio to hold for the long term. The Sharpe ratio shows that investors are rewarded for each additional point of risk they take, with a higher return per unit of total risk [6].

$$S_i = \frac{\overline{R_i} - R_f}{\sigma_i} \tag{5}$$

## 3.3    Jensen Index

The Jensen index refers to the difference between the actual and expected returns of the fund and is directly related to the fund manager's performance [7]. The Jensen Index represents the excess return by outperforming its market benchmark portfolio. If the Jensen Index is greater than 0, the fund has an advantage over the market benchmark portfolio. The Jensen index is an excellent way to measure whether a fund is earning excess returns above its exposure and can reasonably rank different funds' performance. A Jensen Index $\alpha_i$ greater than 0 indicates that the fund is in a good situation, and the fund's ability to obtain excess returns increases with the increase of the

Jensen index. The Jensen index is more intuitive and effective, telling us exactly how much each fund has outperformed its benchmark portfolio.

$$\bar{R}_i - R_f = \alpha_i + \beta_i(R_m - R_f) + \varepsilon_i \tag{6}$$

Below we will rate the performance of 60 pharmaceutical funds in the pharmaceutical industry according to three classic indexes: Treynor index, Sharpe Index and Jensen Index. The following table shows the results of the calculations.

Table 2 Pharmaceutical fund performance results based on the three indices

| Fund Code | Treynor | Rank | Sharp | Rank | Jensen | Rank |
|---|---|---|---|---|---|---|
| 000059.OF | 0.006 | 54 | 0.117 | 53 | 0.002 | 57 |
| 000220.OF | 0.023 | 7 | 0.368 | 9 | 0.018 | 10 |
| 000339.OF | 0.020 | 17 | 0.365 | 12 | 0.017 | 14 |
| 000452.OF | 0.023 | 5 | 0.331 | 21 | 0.017 | 17 |
| 000523.OF | 0.012 | 42 | 0.207 | 44 | 0.008 | 44 |
| 000711.OF | 0.016 | 31 | 0.304 | 28 | 0.014 | 29 |
| 000727.OF | 0.016 | 29 | 0.322 | 25 | 0.014 | 27 |
| 000780.OF | 0.016 | 32 | 0.283 | 30 | 0.013 | 34 |
| 000831.OF | 0.020 | 15 | 0.349 | 16 | 0.017 | 15 |
| 000878.OF | 0.021 | 11 | 0.392 | 6 | 0.019 | 7 |
| 000913.OF | 0.018 | 22 | 0.361 | 13 | 0.017 | 16 |
| 000945.OF | 0.013 | 39 | 0.241 | 42 | 0.010 | 41 |
| 000960.OF | 0.021 | 13 | 0.407 | 3 | 0.020 | 4 |
| 001171.OF | 0.021 | 12 | 0.367 | 11 | 0.018 | 12 |
| 001230.OF | 0.017 | 23 | 0.332 | 20 | 0.015 | 22 |
| 001417.OF | 0.020 | 16 | 0.333 | 18 | 0.016 | 21 |
| 001558.OF | 0.016 | 30 | 0.367 | 10 | 0.016 | 19 |
| 001645.OF | 0.016 | 27 | 0.360 | 14 | 0.016 | 20 |
| 001717.OF | 0.024 | 4 | 0.445 | 2 | 0.022 | 2 |
| 001730.OF | 0.006 | 53 | 0.078 | 55 | 0.002 | 58 |
| 001766.OF | 0.028 | 1 | 0.402 | 4 | 0.021 | 3 |
| 001915.OF | 0.018 | 21 | 0.328 | 22 | 0.015 | 23 |
| 002300.OF | 0.018 | 20 | 0.324 | 24 | 0.015 | 24 |
| 002408.OF | 0.023 | 6 | 0.332 | 19 | 0.017 | 18 |
| 002708.OF | 0.023 | 8 | 0.369 | 8 | 0.018 | 9 |
| 002919.OF | 0.007 | 52 | 0.117 | 52 | 0.003 | 54 |
| 002938.OF | 0.009 | 46 | 0.171 | 50 | 0.006 | 49 |
| 003095.OF | 0.027 | 2 | 0.502 | 1 | 0.026 | 1 |
| 003230.OF | 0.024 | 3 | 0.358 | 15 | 0.018 | 11 |
| 003284.OF | 0.019 | 18 | 0.273 | 34 | 0.013 | 32 |
| 003581.OF | 0.016 | 28 | 0.273 | 33 | 0.012 | 35 |
| 050026.OF | 0.021 | 14 | 0.389 | 7 | 0.019 | 8 |
| 090020.OF | 0.012 | 41 | 0.259 | 38 | 0.010 | 39 |
| 110023.OF | 0.022 | 10 | 0.395 | 5 | 0.019 | 5 |
| 150130.OF | - | - | 0.053 | 56 | 0.003 | 52 |
| 150148.OF | - | - | 0.043 | 58 | 0.003 | 55 |
| 150261.OF | - | - | 0.053 | 57 | 0.003 | 53 |
| 150271.OF | - | - | 0.040 | 59 | 0.002 | 56 |
| 159929.OF | 0.009 | 47 | 0.199 | 45 | 0.007 | 47 |
| 159938.OF | 0.009 | 49 | 0.187 | 48 | 0.006 | 48 |
| 160219.OF | 0.012 | 40 | 0.255 | 39 | 0.010 | 40 |
| 160635.OF | 0.008 | 50 | 0.173 | 49 | 0.005 | 50 |

| | | | | | |
|---|---|---|---|---|---|
| 161035.OF | 0.015 | 33 | 0.292 | 29 | 0.013 | 33 |
| 161616.OF | 0.016 | 25 | 0.326 | 23 | 0.015 | 26 |
| 161726.OF | 0.013 | 37 | 0.318 | 26 | 0.013 | 31 |
| 162412.OF | 0.014 | 36 | 0.281 | 31 | 0.012 | 36 |
| 163001.OF | 0.015 | 34 | 0.265 | 36 | 0.011 | 38 |
| 163118.OF | 0.011 | 44 | 0.250 | 40 | 0.010 | 42 |
| 165519.OF | 0.011 | 43 | 0.212 | 43 | 0.009 | 43 |
| 240020.OF | 0.019 | 19 | 0.316 | 27 | 0.017 | 13 |
| 399011.OF | 0.022 | 9 | 0.338 | 17 | 0.019 | 6 |
| 470006.OF | 0.017 | 24 | 0.280 | 32 | 0.015 | 25 |
| 501005.OF | 0.009 | 48 | 0.188 | 47 | 0.007 | 46 |
| 501011.OF | -0.001 | 56 | -0.011 | 60 | -0.006 | 60 |
| 510660.OF | 0.013 | 38 | 0.243 | 41 | 0.012 | 37 |
| 512010.OF | 0.014 | 35 | 0.264 | 37 | 0.013 | 30 |
| 512120.OF | 0.010 | 45 | 0.189 | 46 | 0.008 | 45 |
| 512300.OF | 0.005 | 55 | 0.096 | 54 | 0.001 | 59 |
| 512610.OF | 0.008 | 51 | 0.150 | 51 | 0.005 | 51 |
| 519171.OF | 0.016 | 26 | 0.270 | 35 | 0.014 | 28 |

Note: The CAPM models of the four pharmaceutical funds 150130.OF, 150148.OF, 150261.OF and 150271.OF are not significant, so their Treynor indices cannot be measured.

The table above shows that the top five pharmaceutical fund performance rankings based on the Treynor Index are: 001766.OF, 003095.OF, 003230.OF, 001717.OF, 000452.OF; the top five pharmaceutical fund performance rankings based on the Sharp Index are: 003095.OF, 001717.OF, 000960.OF, 001766.OF, 110023.OF in that order; then the pharmaceutical fund performance evaluation levels based on the Jensen Index, the top five are 001766.OF, 000960.OF, 001766.OF, 110023.OF in that order. OF, 001717.OF, 000960.OF, 001766.OF, 110023.OF; finally, the performance evaluation level of pharmaceutical funds based on the Jensen Index, the top five in order are: 003095.OF, 001717.OF, 001766.OF, 000960.OF, 110023.OF. By comparing the top-five performance of pharmaceutical funds, it can be seen that the top five are: 003095.OF, 001717.OF, 001766.OF, 000960.OF, 110023.OF. The Treynor Index deviates from both the Sharp and Jensen Indices.

The following is a comparison of the underperforming pharmaceutical funds based on the results of the three indices: the five worst-performing pharmaceutical funds according to the Treynor Index are: 501011.OF, 512300.OF, 000059.OF, 001730.OF, 002919.OF; the five worst performing pharmaceutical funds are 501011. 150271.OF, 150148.OF, 150261.OF, 150130.OF; Jensen Index shows the five worst pharmaceutical funds are: 501011.OF, 512300.OF, 001730.OF, 000059.OF, 150271.OF.

# 4    RESULTS OF THE EVALUATION OF THE FUND'S TIMING AND STOCK SELECTION ABILITY

## 4.1    T-M model

Treynor and Mazuy (1966) first proposed the T-M model to measure a fund manager's stock picking and timing ability [8]. Treynor and Mazuy argued that as a qualified fund manager, he should adjust his portfolio in response to changes in market conditions. Specifically, he should observe the β value in the portfolio. When the stock market sector is doing well, the fund manager

should increase the β value and when the stock market is depressed, the fund manager should reduce the beta value. In this model, α measures the fund manager's stock selection ability. If α is significantly greater than 0, it indicates that the fund manager's stock selection ability is strong, and vice versa. γ measures its timing ability. If γ is significantly greater than 0, then regardless of whether the market is long $((R_m - R_f) > 0)$ or short $((R_m - R_f) < 0)$, the fund's risk premium $(R_m - R_f)^2 > 0$ shows that the fund's risk premium $(R_i - R_f)$ is greater than the market's risk premium $(R_m - R_f)$ and the fund manager's timing ability is better, and vice versa.

$$R_i - R_f = \alpha + \beta_1(R_m - R_f) + \gamma(R_m - R_f)^2 + \varepsilon_i \qquad (7)$$

## 4.2 H-M model

Henriksson and Merton (1981) added dummy variables to the Jensen index to allow β to take on different values in different phases of bullish and bearish markets. They proposed the H-M model [9].

The dummy variable D can be assigned different values under different market conditions. For example, 0 or 1 can be selected, and the $\beta_1$ coefficient of the fund manager's investment strategy can be changed by changing the assignment. Similar to the TM model, $\alpha$ in the model represents the difference between the fund risk premium and the market risk premium, which measures the fund manager's stock selection ability. If $\alpha$ is significantly greater than 0, the fund manager is a strong stock picker and vice versa. $\beta_2$ represents the manager's adjustment of the fund's $\beta_1$ coefficient in response to market conditions and measures the fund manager's timing ability.

If $\beta_2$ is significantly greater than 0, regardless of whether the market is long $((R_m - R_f) > 0, \ D = 1)$ or short $((R_m - R_f) > 0, \ D = 0)$, the fund's risk premium $(R_i - R_f)$ is always greater than or equal to the market's risk premium $(R_m - R_f)$, and the fund manager's timing ability is better, and vice versa.

$$R_i - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2 D(R_m - R_f) + \varepsilon_i \qquad (8)$$

## 4.3 Analysis based on the T-M model

Table 3 T-M model results

| Fund Code | α | $\beta_1$ | γ | $R^2$ | F | Sig (α) | Sig (β) | Sig (r) |
|---|---|---|---|---|---|---|---|---|
| 000059 .OF | 0.025 | 9.158 | -397.784 | 0.277 | 8.602 | 0.002 | 0.044 | 0.021 |
| 000220 .OF | 0.019 | 0.761 | 2.023 | 0.723 | 58.840 | 0.012 | 0.003 | 0.325 |
| 000339 .OF | 0.054 | 0.710 | 2.721 | 0.311 | 10.135 | 0.000 | 0.000 | 0.528 |
| 000452 .OF | -0.027 | -0.179 | 47.808 | 0.694 | 51.011 | 0.010 | 0.473 | 0.000 |
| 000523 .OF | 0.076 | 5.134 | 55.942 | 0.595 | 33.076 | 0.000 | 0.000 | 0.007 |
| 000711 .OF | -0.031 | 1.824 | 21.812 | 0.901 | 204.734 | 0.001 | 0.000 | 0.000 |
| 000727 .OF | -0.029 | -0.032 | 16.737 | 0.739 | 63.629 | 0.000 | 0.982 | 0.255 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 000780 .OF | 0.059 | -1.806 | -73.930 | 0.589 | 32.302 | 0.000 | 0.000 | 0.000 |
| 000831 .OF | 0.040 | -2.829 | -108.674 | 0.869 | 149.795 | 0.000 | 0.001 | 0.000 |
| 000878 .OF | -0.010 | 4.708 | 46.298 | 0.829 | 109.361 | 0.761 | 0.086 | 0.281 |
| 000913 .OF | 0.023 | 0.451 | -112.983 | 0.676 | 46.915 | 0.002 | 0.059 | 0.000 |
| 000945 .OF | 0.063 | 2.731 | -49.550 | 0.760 | 71.107 | 0.000 | 0.000 | 0.000 |
| 000960 .OF | 0.028 | 11.777 | -489.042 | 0.315 | 10.364 | 0.000 | 0.005 | 0.002 |
| 001171 .OF | 0.019 | 0.814 | 1.641 | 0.777 | 78.571 | 0.005 | 0.000 | 0.360 |
| 001230 .OF | 0.061 | 0.882 | -2.990 | 0.368 | 13.109 | 0.000 | 0.000 | 0.497 |
| 001417 .OF | -0.006 | 0.167 | 32.090 | 0.552 | 27.776 | 0.637 | 0.584 | 0.007 |
| 001558 .OF | 0.073 | 4.749 | 48.768 | 0.660 | 43.704 | 0.000 | 0.000 | 0.007 |
| 001645 .OF | -0.022 | 1.619 | 18.716 | 0.813 | 97.933 | 0.048 | 0.000 | 0.000 |
| 001717 .OF | -0.028 | 0.272 | 13.929 | 0.736 | 62.579 | 0.000 | 0.851 | 0.356 |
| 001730 .OF | 0.055 | -1.540 | -65.662 | 0.584 | 31.633 | 0.000 | 0.001 | 0.000 |
| 001766 .OF | 0.023 | -1.227 | -66.989 | 0.794 | 86.878 | 0.016 | 0.210 | 0.008 |
| 001915 .OF | -0.011 | 4.899 | 50.631 | 0.821 | 102.892 | 0.732 | 0.070 | 0.231 |
| 002300 .OF | 0.019 | 0.374 | -92.855 | 0.571 | 29.915 | 0.012 | 0.125 | 0.000 |
| 002408 .OF | 0.050 | 2.531 | -44.608 | 0.686 | 49.144 | 0.000 | 0.000 | 0.000 |
| 002708 .OF | 0.027 | 5.059 | -238.815 | 0.258 | 7.820 | 0.000 | 0.195 | 0.106 |
| 002919 .OF | 0.019 | 0.844 | 1.082 | 0.777 | 78.346 | 0.004 | 0.000 | 0.532 |
| 002938 .OF | 0.061 | 0.597 | -3.532 | 0.230 | 6.732 | 0.000 | 0.001 | 0.394 |
| 003095 .OF | -0.023 | 0.101 | 38.794 | 0.653 | 42.354 | 0.047 | 0.713 | 0.000 |
| 003230 .OF | 0.068 | 3.958 | 36.591 | 0.636 | 39.308 | 0.000 | 0.000 | 0.034 |
| 003284 .OF | -0.022 | 1.715 | 18.092 | 0.836 | 114.459 | 0.044 | 0.000 | 0.000 |
| 003581 .OF | -0.028 | 0.287 | 12.771 | 0.741 | 64.297 | 0.000 | 0.831 | 0.361 |
| 050026 .OF | 0.056 | -1.603 | -64.665 | 0.540 | 26.403 | 0.000 | 0.001 | 0.000 |
| 090020 .OF | 0.028 | -1.434 | -74.228 | 0.803 | 91.851 | 0.005 | 0.156 | 0.005 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 110023<br>.OF | 0.017 | 2.275 | 10.678 | 0.804 | 92.073 | 0.599 | 0.388 | 0.797 |
| 150130<br>.OF | 0.013 | 0.233 | -96.622 | 0.647 | 41.318 | 0.052 | 0.290 | 0.000 |
| 150148<br>.OF | 0.061 | 2.228 | -42.824 | 0.633 | 38.807 | 0.000 | 0.000 | 0.000 |
| 150261<br>.OF | 0.017 | 10.339 | -420.574 | 0.275 | 8.555 | 0.006 | 0.004 | 0.002 |
| 150271<br>.OF | 0.016 | 0.866 | 0.638 | 0.687 | 49.370 | 0.042 | 0.001 | 0.762 |
| 159929<br>.OF | 0.056 | 0.821 | -4.561 | 0.312 | 10.223 | 0.000 | 0.000 | 0.325 |
| 159938<br>.OF | -0.032 | -0.165 | 47.836 | 0.687 | 49.459 | 0.003 | 0.520 | 0.000 |
| 160219<br>.OF | 0.071 | 6.022 | 74.795 | 0.706 | 54.082 | 0.000 | 0.000 | 0.000 |
| 160635<br>.OF | -0.022 | 1.657 | 16.186 | 0.835 | 113.579 | 0.040 | 0.000 | 0.000 |
| 161035<br>.OF | -0.025 | 0.727 | 7.615 | 0.706 | 53.926 | 0.001 | 0.606 | 0.603 |
| 161616<br>.OF | 0.047 | -1.133 | -58.336 | 0.655 | 42.670 | 0.000 | 0.005 | 0.000 |
| 161726<br>.OF | 0.040 | -2.707 | -99.974 | 0.758 | 70.447 | 0.000 | 0.008 | 0.000 |
| 162412<br>.OF | -0.014 | 4.546 | 45.019 | 0.874 | 156.162 | 0.600 | 0.039 | 0.191 |
| 163001<br>.OF | 0.017 | 0.473 | -95.882 | 0.605 | 34.444 | 0.013 | 0.043 | 0.000 |
| 163118<br>.OF | 0.055 | 2.790 | -48.836 | 0.791 | 85.384 | 0.000 | 0.000 | 0.000 |
| 165519<br>.OF | 0.019 | 6.810 | -287.029 | 0.154 | 4.093 | 0.008 | 0.097 | 0.064 |
| 240020<br>.OF | 0.019 | 0.938 | 0.853 | 0.844 | 121.558 | 0.001 | 0.000 | 0.566 |
| 399011<br>.OF | 0.047 | 0.800 | -0.140 | 0.367 | 13.066 | 0.000 | 0.000 | 0.973 |
| 470006<br>.OF | -0.042 | -0.387 | 56.443 | 0.693 | 50.851 | 0.000 | 0.145 | 0.000 |
| 501005<br>.OF | 0.059 | 4.533 | 47.490 | 0.653 | 42.414 | 0.000 | 0.000 | 0.005 |
| 501011<br>.OF | -0.018 | 1.654 | 15.162 | 0.803 | 91.588 | 0.120 | 0.000 | 0.000 |
| 510660<br>.OF | -0.030 | 2.460 | -8.127 | 0.712 | 55.508 | 0.000 | 0.130 | 0.626 |
| 512010<br>.OF | 0.064 | -1.770 | -72.006 | 0.555 | 28.024 | 0.000 | 0.001 | 0.000 |
| 512120<br>.OF | 0.036 | -2.666 | -100.161 | 0.737 | 63.066 | 0.001 | 0.017 | 0.001 |
| 512300<br>.OF | 0.059 | -1.496 | -51.257 | 0.812 | 97.089 | 0.093 | 0.592 | 0.248 |
| 512610<br>.OF | 0.014 | 0.629 | -81.875 | 0.459 | 19.057 | 0.066 | 0.017 | 0.000 |

| Fund Code | α | β₁ | β₂ | R² | F | Sig (α) | Sig (β) | Sig (γ) |
|---|---|---|---|---|---|---|---|---|
| 519171.OF | 0.049 | 2.364 | -43.518 | 0.675 | 46.774 | 0.000 | 0.000 | 0.000 |

In the T-M model, from the perspective of α value, 54 medical funds have passed the significance test at the level of 10%, among which 41 medical funds have coefficients significantly greater than 0, indicating that the medical industry funds have a strong stock selection standard. The five pharmaceutical funds with the best stock selection are: 000523.OF, 001558.OF, 160219.OF, 003230.OF, 512010.OF. OF, 003230.OF, 512010.OF. From the point of view of γ value, 39 medical funds have passed the significance test of 10% level, among which 17 medical funds' γ coefficient is significantly greater than 0, which shows that these 17 medical funds also have very good timing ability. Combining the alpha and gamma indices, five pharmaceutical funds - 000523.OF, 001558.OF, 003230.OF, 160219.OF and 501005.OF - have stable stock selection standards and good timing ability.

## 4.4 Analysis based on the H-M model

Table 4 H-M regression results

| Fund Code | α | β₁ | β₂ | R² | F | Sig (α) | Sig (β) | Sig (γ) |
|---|---|---|---|---|---|---|---|---|
| 000059.OF | 0.013 | 1.355 | -0.020 | 0.605 | 34.502 | 0.223 | 0.000 | 0.222 |
| 000220.OF | 0.028 | 1.141 | -0.019 | 0.305 | 9.883 | 0.078 | 0.001 | 0.447 |
| 000339.OF | 0.023 | 1.216 | -0.010 | 0.523 | 24.663 | 0.049 | 0.000 | 0.563 |
| 000452.OF | 0.026 | 1.022 | -0.018 | 0.313 | 10.235 | 0.061 | 0.000 | 0.398 |
| 000523.OF | 0.017 | 1.229 | -0.017 | 0.509 | 23.291 | 0.146 | 0.000 | 0.356 |
| 000711.OF | 0.028 | 1.428 | -0.028 | 0.504 | 22.884 | 0.030 | 0.000 | 0.168 |
| 000727.OF | 0.019 | 1.294 | -0.009 | 0.459 | 19.107 | 0.175 | 0.000 | 0.686 |
| 000780.OF | 0.020 | 1.238 | -0.015 | 0.400 | 15.007 | 0.167 | 0.000 | 0.524 |
| 000831.OF | 0.024 | 1.195 | -0.015 | 0.387 | 14.209 | 0.092 | 0.000 | 0.517 |
| 000878.OF | 0.031 | 1.328 | -0.023 | 0.490 | 21.587 | 0.014 | 0.000 | 0.238 |
| 000913.OF | 0.025 | 1.390 | -0.015 | 0.427 | 16.743 | 0.116 | 0.000 | 0.532 |
| 000945.OF | 0.017 | 1.268 | -0.013 | 0.495 | 22.097 | 0.176 | 0.000 | 0.491 |
| 000960.OF | 0.036 | 1.478 | -0.032 | 0.438 | 17.565 | 0.017 | 0.000 | 0.178 |
| 001171.OF | 0.021 | 1.128 | -0.006 | 0.420 | 16.298 | 0.124 | 0.000 | 0.779 |
| 001230.OF | 0.024 | 1.303 | -0.016 | 0.448 | 18.277 | 0.089 | 0.000 | 0.460 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 001417 .OF | 0.021 | 1.103 | -0.010 | 0.403 | 15.182 | 0.115 | 0.000 | 0.642 |
| 001558 .OF | 0.024 | 1.530 | -0.015 | 0.516 | 23.990 | 0.096 | 0.000 | 0.510 |
| 001645 .OF | 0.028 | 1.546 | -0.022 | 0.568 | 29.529 | 0.031 | 0.000 | 0.263 |
| 001717 .OF | 0.028 | 1.237 | -0.011 | 0.385 | 14.074 | 0.072 | 0.000 | 0.652 |
| 001730 .OF | -0.005 | 0.626 | 0.013 | 0.435 | 17.333 | 0.567 | 0.001 | 0.366 |
| 001766 .OF | 0.022 | 0.906 | -0.003 | 0.323 | 10.724 | 0.105 | 0.001 | 0.895 |
| 001915 .OF | 0.017 | 1.174 | -0.004 | 0.356 | 12.448 | 0.290 | 0.001 | 0.877 |
| 002300 .OF | 0.020 | 1.156 | -0.009 | 0.380 | 13.765 | 0.170 | 0.000 | 0.679 |
| 002408 .OF | 0.018 | 0.905 | -0.004 | 0.251 | 7.542 | 0.252 | 0.006 | 0.886 |
| 002708 .OF | 0.031 | 1.193 | -0.025 | 0.375 | 13.511 | 0.026 | 0.000 | 0.257 |
| 002919 .OF | 0.000 | 0.997 | 0.005 | 0.546 | 27.031 | 0.989 | 0.000 | 0.735 |
| 002938 .OF | 0.011 | 1.222 | -0.010 | 0.553 | 27.833 | 0.320 | 0.000 | 0.564 |
| 003095 .OF | 0.032 | 1.257 | -0.013 | 0.339 | 11.545 | 0.062 | 0.001 | 0.638 |
| 003230 .OF | 0.022 | 0.991 | -0.008 | 0.324 | 10.798 | 0.116 | 0.001 | 0.703 |
| 003284 .OF | 0.011 | 0.826 | 0.004 | 0.395 | 14.708 | 0.350 | 0.001 | 0.804 |
| 003581 .OF | 0.017 | 1.114 | -0.010 | 0.445 | 18.005 | 0.160 | 0.000 | 0.619 |
| 050026 .OF | 0.040 | 1.502 | -0.040 | 0.406 | 15.356 | 0.013 | 0.000 | 0.106 |
| 090020 .OF | 0.006 | 1.211 | 0.008 | 0.580 | 31.061 | 0.610 | 0.000 | 0.648 |
| 110023 .OF | 0.031 | 1.315 | -0.023 | 0.453 | 18.664 | 0.021 | 0.000 | 0.276 |
| 150130 .OF | 0.003 | -0.001 | 0.000 | 0.009 | 0.194 | 0.000 | 0.554 | 0.586 |
| 150148 .OF | 0.003 | 0.002 | 0.000 | 0.010 | 0.231 | 0.000 | 0.520 | 0.758 |
| 150261 .OF | 0.003 | -0.001 | 0.000 | 0.007 | 0.167 | 0.000 | 0.708 | 0.567 |
| 150271 .OF | 0.002 | 0.001 | 0.000 | 0.005 | 0.120 | 0.000 | 0.642 | 0.669 |
| 159929 .OF | 0.020 | 1.549 | -0.025 | 0.601 | 33.843 | 0.093 | 0.000 | 0.171 |
| 159938 .OF | 0.019 | 1.540 | -0.024 | 0.620 | 36.788 | 0.099 | 0.000 | 0.168 |
| 160219 .OF | 0.023 | 1.467 | -0.024 | 0.547 | 27.174 | 0.065 | 0.000 | 0.212 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 160635 .OF | 0.019 | 1.508 | -0.026 | 0.605 | 34.521 | 0.096 | 0.000 | 0.142 |
| 161035 .OF | 0.021 | 1.295 | -0.015 | 0.470 | 19.957 | 0.115 | 0.000 | 0.458 |
| 161616 .OF | 0.025 | 1.385 | -0.019 | 0.371 | 13.287 | 0.148 | 0.000 | 0.476 |
| 161726 .OF | 0.029 | 1.744 | -0.030 | 0.494 | 21.949 | 0.080 | 0.000 | 0.246 |
| 162412 .OF | 0.014 | 1.300 | -0.004 | 0.481 | 20.837 | 0.314 | 0.000 | 0.841 |
| 163001 .OF | 0.012 | 1.125 | -0.002 | 0.410 | 15.663 | 0.375 | 0.000 | 0.927 |
| 163118 .OF | 0.022 | 1.540 | -0.024 | 0.599 | 33.550 | 0.065 | 0.000 | 0.205 |
| 165519 .OF | 0.025 | 1.572 | -0.030 | 0.614 | 35.806 | 0.030 | 0.000 | 0.100 |
| 240020 .OF | 0.031 | 1.394 | -0.025 | 0.500 | 22.523 | 0.018 | 0.000 | 0.208 |
| 399011 .OF | 0.030 | 1.291 | -0.021 | 0.467 | 19.739 | 0.021 | 0.000 | 0.302 |
| 470006 .OF | 0.023 | 1.294 | -0.016 | 0.392 | 14.489 | 0.130 | 0.000 | 0.506 |
| 501005 .OF | 0.019 | 1.656 | -0.022 | 0.526 | 24.932 | 0.212 | 0.000 | 0.352 |
| 501011 .OF | 0.013 | 1.525 | -0.037 | 0.696 | 51.537 | 0.126 | 0.000 | 0.010 |
| 510660 .OF | 0.028 | 1.604 | -0.031 | 0.597 | 33.361 | 0.021 | 0.000 | 0.099 |
| 512010 .OF | 0.033 | 1.645 | -0.038 | 0.514 | 23.812 | 0.020 | 0.000 | 0.084 |
| 512120 .OF | 0.025 | 1.655 | -0.033 | 0.593 | 32.777 | 0.043 | 0.000 | 0.087 |
| 512300 .OF | 0.007 | 1.383 | -0.011 | 0.586 | 31.819 | 0.518 | 0.000 | 0.525 |
| 512610 .OF | 0.019 | 1.582 | -0.026 | 0.603 | 34.156 | 0.114 | 0.000 | 0.158 |
| 519171 .OF | 0.021 | 1.292 | -0.013 | 0.432 | 17.130 | 0.145 | 0.000 | 0.559 |

In the H-M model, 31 medical funds have passed the significance test of 10% level from the $\alpha$ index, and the coefficients of $\alpha$ index are significantly greater than 0, indicating that the average stock selection level of medical funds is relatively stable. From the $\beta 2$ value, only 4 medical funds passed the significance test of 10% level, indicating that the overall timing ability of medical funds is relatively weak.

# 5  CONCLUSION

(1) In the sample period from January 2017 to December 2020, pharmaceutical industry-related funds returned well, with the average return of the sample funds reaching a peak of 3.2%. Among

the 60 pharmaceutical industry-related funds, the R2 of 56 funds reached or exceeded 0.2, indicating a high degree of fitting with THE CAPM model.

(2) The Treynor Sharpe and Jensen indices show that most funds have achieved excess returns compared to market portfolios.

(3) Regarding stock selection and timing ability, 54 pharmaceutical funds in the T-M model passed the significance test for this index, with coefficients all significant at the 10% level. Among them, the alpha index coefficient of 41 medical funds is greater than 0, which has a strong stock selection standard. However, from the gamma value, only 13 funds have a gamma coefficient significantly greater than 0, which indicates that the fund manager's timing ability is very poor. In the H-M model, 31 funds passed the significance test of the 10% index level, and the alpha index coefficients were significantly greater than 0, indicating that the average stock selection level of pharmaceutical funds was relatively stable and did not have timing ability.

This paper summarises the dimensions and index selection of the comprehensive evaluation of fund performance by previous scholars, and adds new perspectives to the original research results to enrich the comprehensive evaluation system and make its evaluation more comprehensive. Moreover, by establishing a complete set of comprehensive fund performance evaluation system, investors can be better guided to make reasonable, scientific and rational investments, as well as to integrate various factors to select fund allocation, thereby enhancing people's financial awareness and promoting a scientific and rational investment culture.

As society progresses and the industry evolves, the theoretical, policy and technical contexts in which some academic fields are situated are constantly changing. Over the past 60 years, academics have evaluated the causes of research fund performance from the perspective of economic theory and financial modelling. While the importance of these theoretical studies for understanding economic systems and in the functioning of human society cannot be denied. But from a practical point of view, the evaluation of fund performance can be viewed from a more enlightened perspective. It would therefore be a better option to redirect future research towards the prediction of the future performance of funds.

## REFERENCES

[1]     A. Marhfor, "Portfolio Performance Measurement: Review of Literature and Avenues of Future Research", American Journal of Industrial and Business Management, vol. 06, no. 04, pp. 432-438, 2016.

[2]     Md. Bokhtiar Hasan, A. F. M. Mainul Ahsan. Can Mutual Funds Outguess the Market: Evidence from Bangladesh?. *Journal of Finance and Accounting*. Vol. 4, No. 1, pp 11-19, 2016.

[3]     J. Gao, N. O'Sullivan and M. Sherman, "An evaluation of Chinese securities investment fund performance", The Quarterly Review of Economics and Finance, vol. 76, pp. 249-259, 2020.

[4]     H. Markowitz, "Portfolio Selection", The Journal of Finance, vol. 7, no. 1, p. 77, 1952.

[5]     J. Treynor, "How to rate management of investment funds", Harvard Business Review, vol.43, pp. 63-75, 1965.

[6]     W. Sharpe, "Mutual Fund Performance", The Journal of Business, vol. 39, no. 1, p. 119-138, 1966.

[7]     M. Jensen, "THE PERFORMANCE OF MUTUAL FUNDS IN THE PERIOD 1945-1964", The Journal of Finance, vol. 23, no. 2, pp. 389-416, 1968.

[8]     J. Treynor, K. Mazuy. "Can mutual funds outguess the market", Harvard Business Review, vol.44, pp. 131-136, 1966.

[9]     R. Henriksson and R. Merton, "On Market Timing and Investment Performance. II. Statistical Procedures for Evaluating Forecasting Skills", *The Journal of Business*, vol. 54, no. 4, p. 513, 1981.