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Performance Comparison on Four Selection Methods for Two-Factored Stock Strategies

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ABSTRACT
Finding factor(s) capable of capturing better stock return is popular research issue where how factors can be used together is also an important issue. Other than multi-variable regression, methods of other kinds also exist in literatures claiming reasonable results. In this study, we use two factors as example (called two-factored stock strategies in this study), and select four different methods (from literatures) for selecting stocks based on two factors combined. We proposed a systematic approach to first validate whether the target two-factored stock selection methods are better than single-factored method. Then the same procedure is used to find the better performing one among the four compared two-factored stock selection methods. The four chosen two-factored methods in this study are intersection selection method, filter selection method, weighted interpolation method, and weighted ranking method. By validated with stocks traded in Taiwan Stock Exchanges, two-factored methods perform better than single-factor method, the two weighted (interpolation and ranking) methods perform better than the other two two-factored methods, and weighted ranking method performs better than weighted interpolation method.
The research results provide investors with a more objective and structured evaluation approach for stock selection methods in hope to make more accurate investment decisions.

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I. INTRODUCTION

Quantitative trading is gaining popularity in recent years (Li and Zhou, 2021) . Factor selection is one of the important issues in quantitative trading. Fama and French (1993) developed a three-factor model and found that market size and company value are important factors affecting stock returns. This multi-factor model has higher effectiveness in identifying stock values and selecting stocks of higher return. Liyu Su (2023) discovered that selecting effective factors through multiple aspects such as valuation, profitability, debt-paying ability, growth potential, and operational capability can achieve a portfolio with higher payoff.

Different from the aforementioned researches focusing on building numerical regression models for the studied factors, Tortoriell (2009) proposed a procedural quantitative trading model aimed at analyzing the efficacy of fundamental and momentum factors in the U.S. stock market. Tortoriell introduces a two-factored (i.e., using two factors to select stocks) stock selection method, the Filter Selection Method, which selects a priority factor for primary ranking and establishes a second factor's ranking without violating the priority factor's order. In addition to the Filter Selection Method, the book also mentioned, the Intersection Selection Method, for two-factored stock selection. However, the book only introduces these two stock selection steps without providing their performance comparisons.

Yeh Yi-Cheng (2020) explored the performance of several stock factor models in the Taiwan stock market over the past 12 years, including single- and two-factored stock models with different selection methods of the models. Equal weighting method and weighted Interpolation method are used to merge different factors for comparing performance in the book, and found that two-factored models with unequal weights can produce better performance compared to equal weight models.

Nicoletti and Li (2011) explained excess returns in the Hong Kong stock market with a multi-factor stock selection model using the weighted Interpolation method and the weighted ranking method.

In this study, using two factors to select stocks is called as *two-factored stock selection*, and those with one factor as *single-factored stock selection*. This study explores the application of two-factored stock selection model with the aforementioned operational procedures in actual investment based on stocks traded in Taiwan Stock Exchange to help investors make wiser investment decisions.

This study compares different trading strategies by comparing three commonly used performance indicators: CAGR (Compound Annual Growth Rate), and MDD (Maximum Drawdown Down).

The research design of this study aims to answer the following two research questions:

Research Question 1: First, examine whether the above four different two-factored stock selection models perform better to single-factor models, thereby producing a synergistic effect.

Research Question 2: Secondly, compare the performance of the Weighted Interpolation Method, Weighted Ranking Method, Filter Selection Method, and Intersection Selection Method, and whether there is a specific method that can consistently outperform others.

II. LITERATURE SURVEY

The related researches are provided in this section for readers to better understand the background knowledge and how to view this study with others' work.

2.1 Quantitative Trading and Factor Analysis

Quantitative trading uses data analysis and trading model to formulate strategies, aiming to surpass traditional human judgment, improve trading efficiency and rationality, and reduce emotional impact (Liu et al., 2020). Quantitative trading strategies include momentum trading, statistical arbitrage, high-frequency trading, etc. Backtesting is usually used to verify performance.

Factor analysis selects stocks based on specific factors, including financial ratios, technical analysis indicators, fundamental analysis factors, etc. In practice, the factor stock selection process includes: factor ranking and scoring, candidate stock clustering, stock market backtesting, performance review (O'Shaughnessy, 2012). For example, value investors prefer stocks with low price-to-earnings (PE) ratios or high dividend yields, believing that these factors are related to the stock being undervalued and expect future price increases. Momentum investors, on the other hand, look for stocks that have performed strongly in the past as the pursued factor(s), expecting them to continue to perform well (Carhart, 1997).

2.2 The Synergistic Effect of Two Factors

Synergy refers to the total effect produced by a combination of multiple factors exceeding that of a single factor. It is widely used in fields such as education, healthcare, economics, and politics (Cortina-Borja et al., 2009). In stock selection strategies, Yeh Yi-Cheng (2020) studied the interaction of multi-factor models and found that the overall effect of these factor combinations exceeded the expected effect of a single factor. For example, ROE (Return on Equity) and P/B (Price to Book Ratio) are as the factors, and the results showed that the average return of the two-factored model presented a nonlinear curve.

These findings prompt us to consider that when using multiple factors for stock selection, adjusting factor weights is an important issue (Chou et al., 2021). Investors can set weights according to their preferences. For example, conservative investors may increase the weights of profitability and dividend factors to reduce volatility, while long-term investors may value valuation and profitability factors (Gaocheng Yuan, 2023).

III. Comparing the Four Selection Methods for Two-Factored Stock Strategies

The four selection method for the two-factored stock strategies are first explained, and then the experiment procedures designed to compare their performance for answering the proposed research questions in Section 1 are detailed. In this section, Factor A and Factor B as used as examples for illustration with graphics and tables. In each method, stocks are divided into four groups (Quantile = 4) for illustration where the actual number of groups can be adjusted as needed.

3.1 The Four Selection Methods for Two-Factored Stock Strategies

Intersection Selection Method

In this method, as shown in Figure 1, all candidate stocks are separately ranked and grouped according to Factor A and Factor B, and divided into four groups. The intersection of the first group based on Factor A and that based on Factor B are taken to form the first group of two factors. The red area represents the result of this intersection, which is the first investment portfolio. The remaining three groups are deduced in the same way, and finally, investment portfolios from the first group to the fourth group can be generated, as shown in Figure 2.

Filter Selection Method

In this method, as shown in Figure 3, all candidate stocks are first sorted and grouped according to Factor A, divided into four groups. Then, the first group is taken and sorted and further sub-grouped using Factor B, and the first sub-group is taken out as a two factor to form the first sub-group of two factors. The remaining three groups are deduced in the same way, and finally, investment portfolios from the first group to the fourth group can be generated, as shown in Figure 4.

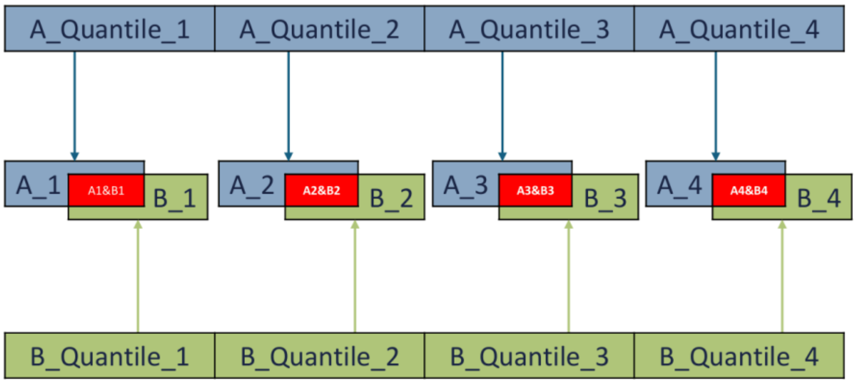

Figure 1: Procedure of the Intersection Selection Method

Figure 2: Result of the Intersection Selection Method

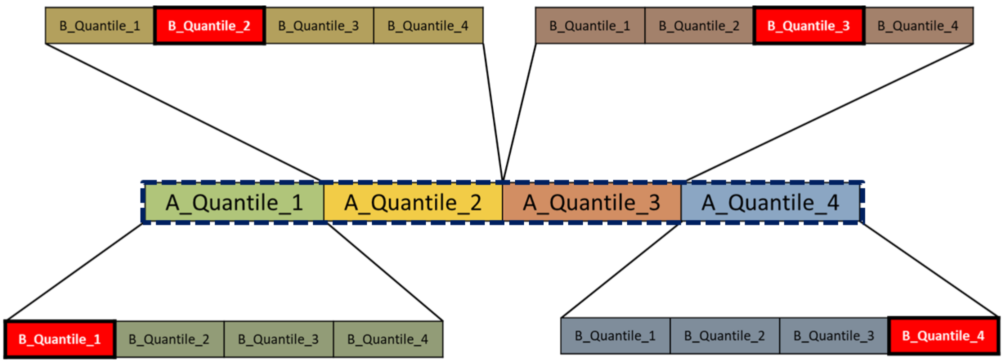

Figure 3: Procedure of the Filter Selection Method

Figure 4: Result of the Filter Selection Method

Weighted Interpolation Method

An example of this method is illustrated in Table 1. Original value of the single-factor, normalized single-factor value, weighted value for the single-factor, and the two-factor weighted value are all calculated. The higher the weighted total value, the better the stock, and vice versa. Finally, divide the weighted total score into four groups, these four groups are the investment portfolio. The weights of factors can be adjusted as needed, and these weights can also be considered during the performance comparison.

Weighted Ranking Method

An example of this method is illustrated in Table 2. single-factor original value, single-factor ranking values, single-factor weighted values, and the two-factored weighted values are all calculated. The higher the weighted total value, the better the stock, and vice versa. Finally, by dividing the weighted total values into four groups, these four groups are the investment portfolio. The weights of factors can be adjusted as needed. The key difference between weighted interpolation and weighted ranking methods are how the original factor values are pre-processed.

Table 1: Procedure and result of weighted interpolation method

Stock	Factor value		Normalized Factor value		Weights for factor		Weighted value for a factor		Weighted value for two factors
	Factor A	Factor B	Factor A	Factor B	Factor A	Factor B	Factor A	Factor B	
1101	0.8	1.5	0.43	0.57	0.6	0.4	0.26	0.23	0.49
1102	1.2	1.8	1.00	1.00	0.6	0.4	0.60	0.40	1.00
1103	0.5	1.1	0.00	0.00	0.6	0.4	0.00	0.00	0.00
1104	1.0	1.4	0.71	0.43	0.6	0.4	0.43	0.17	0.60
1105	0.7	1.2	0.29	0.14	0.6	0.4	0.17	0.06	0.23
1106	1.1	1.6	0.86	0.71	0.6	0.4	0.52	0.28	0.80
1107	0.6	1.3	0.14	0.29	0.6	0.4	0.08	0.12	0.20
1108	0.9	1.7	0.57	0.86	0.6	0.4	0.34	0.34	0.69

Table 2: Procedure and result of weighted ranking method

Stock	Factor original value		Factor ranking value		Weight for factor		Weighted value for the factor		Weighted ranking value for two factors
	Factor A	Factor B	Factor A	Factor B	Factor A	Factor B	Factor A	Factor B	
1101	0.8	1.5	4	5	0.6	0.4	2.4	2	4.4
1102	1.2	1.8	8	8	0.6	0.4	4.8	3.2	8.0
1103	0.5	1.1	1	1	0.6	0.4	0.3	0.4	1.0
1104	1.0	1.4	6	4	0.6	0.4	3.6	1.6	5.2
1105	0.7	1.2	3	2	0.6	0.4	1.8	0.8	2.6
1106	1.1	1.6	7	6	0.6	0.4	4.2	1.2	5.4
1107	0.6	1.3	2	3	0.6	0.4	1.2	1.2	2.4
1108	0.9	1.7	5	7	0.6	0.4	3.0	2.8	5.8

3.2 The Study Procedure

Tortoriell (2009) studied most factors appearing in literatures and the most effective ones include at least the following 14 factors to be used as example to study two factor effect in this paper: Earnings Per Share (EPS), Price to Earnings Ratio (P/E), Enterprise Value to Sales Ratio (EV/S), Free Cash Flow to Price Ratio (FCF/P), Cash Return on Invested Capital (CROIC), Free Cash Flow to Operating Income Ratio (FCF/OI), Return on Equity (ROE), Return on Invested Capital (ROIC), Price to Book Ratio (P/B), Price to Sales Ratio (P/S), Price to Invested Capital Ratio (P/IC), Operating Cash Flow to Equity Ratio (OCF/E), and Price Momentum (Momentum).

As shown in Table 3, by exhausting possible combination on arranging the two factors, the two factor methods studied in this paper include 25 different two-factor stock selection models: 1 intersection filtering method, 2 filter screening methods (as the order of the two factor matters in this method), 11 weighted interpolation methods (as 11 weighting are possible as shown the weight for factor column in Table 1), and 11 weighted ranking methods (as 11 weighting are possible as shown the weight for factor column in Table 1). Out of 14 factors, we have 91 ((14*13)/ (1*2)) sets of two-factor arrangement, totaling 2275 two-factor stock selection combinations. We will also compare the single-factor stock selection model for the14 single factors. The subsequent process will backtest these 2289 combinations (14 single-factor, 2275 two-factor) under the same stock backtesting procedures. Statistical methods are designed to answer the questions posed in Chapter 1: (1) Examine whether the above four different two-factored stock selection models are superior to the single-factor model, thereby generating synergy. (2) Compare the return performance of the weighted interpolation method, weighted ranking method, filter screening method, and intersection filtering method, and whether there is a specific method that can consistently win out.

Table 3: Detailing how the 2289 combinations are generated for two factor comparison

Type	Selection Method	Possibility of weight and factor arrangement	Number of possible Weight arrangements	Number of possible Factor arrangements
1	Single factor	N/A	1	14
2	Intersection Selection Method	No weight assignment needed. The order of the two factor are irrelevant	1	91
3	Filter Selection Method	No weight assignment needed. The order of the two factor are relevant	2	91
4	Weighted Interpolation Method	The weight arrangement to be testedare: （10:0）、（9:1）、（8:2）…（1:9）、（0:10） Thus the order of the two factor are irrelevant	11	91
5	Weighted Ranking Method	The weight arrangement to be testedare: （10:0）、（9:1）、（8:2）…（1:9）、（0:10） Thus the order of the two factor are irrelevant	11	91

Normal Distribution Test

In order to select the proper statistical method, this study uses the Shapiro-Wilk test to determine whether the sample follows a normal distribution. The whole process is shown in Figure 5. Before verifying all research questions, it is necessary to perform the Shapiro-Wilk test on the CAGR, MDD, and the number of selected stocks of all investment portfolios to see if their values follow a normal distribution. The experiment includes all the aforementioned 2289 combinations. In each combination, all the stocks cut into 10 groups according to the final factor score size, so a total of 22,890 different investment portfolios will be generated.

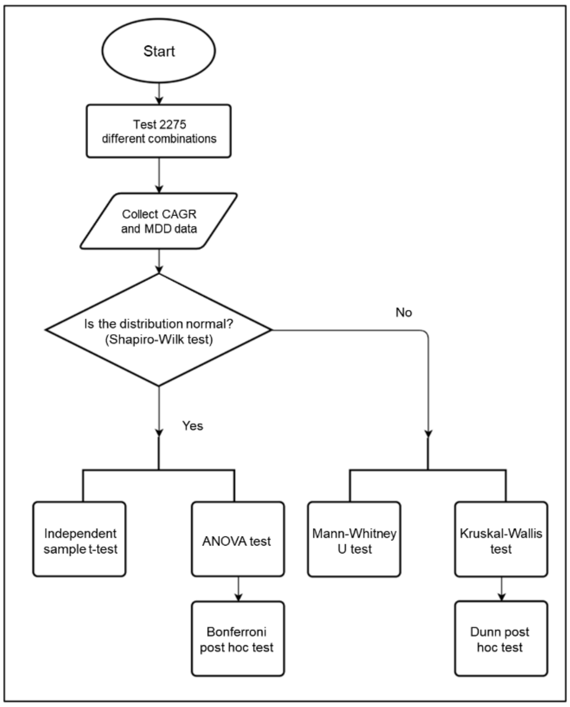

Figure 5: The procedure for determining statistical methods based on distribution

Verification of Research Question 1

In order to examine whether the above four different two-factored stock selection models can generate synergy, the best performing weights of the weighted interpolation method, weighted ranking method, and filter selection method in each two-factor combination are compared with the intersection selection method and the single-factor model. They are subjected to a test of three or more independent samples (Kruskal-Wallis /

ANOVA) and post-hoc test (Dunn / Bonferroni) to see if there are significant differences and to identify the winner(s). If a two-factor model is significantly better than a single-factor model, it can be said to have synergy.

Verification of Research Question 2

In order to verify whether there are significant differences in the CAGR and MDD of the backtest results when the best performing weight combinations of the above four different two-factored stock selection models are applied to the same two factors, the best performing weights of the weighted interpolation method, weighted ranking method, and filter selection method in each two-factor combination are compared with the intersection selection method. They are subjected to a test of three or more independent samples (Kruskal-Wallis / ANOVA) and post-hoc test (Dunn / Bonferroni) to see if there are significant differences and to identify combinations with differences. In order to examine whether there are significant differences in the performance of the weighted interpolation method and the weighted ranking method in terms of CAGR and MDD, these two methods are compared. Each method is paired with 91 two-factors and 11 weight combinations, and each of the two stock selection models has a total of 1001 backtest performances. Based on the results of the normal distribution test, an independent sample t-test or Mann-Whitney U test is performed to compare whether there are significant differences between the two stock selection models in the CAGR and MDD indicators.

IV. EXPERIMENTS ANALYSIS AND VALIDATION

In this study, the TEJ database was used as the primary data source to analyze 1,814 listed and OTC stocks in the Taiwan stock market (TEJ, 2024). The factors used in the study were single factors from all factor combinations according to Tortoriello (2009), totaling 14 single factors as shown in previous section. These 14 factors can have 91 different two-factor combinations. With the possible arrangement for values on weights and factors, we have total of 2275 actual two-factor combinations and 14 single factors to test as already illustrated in Table 3.

4.1 Experimental Results

The experiment results are shown in the following three parts.

Examining Whether Backtesting Performance is Normally Distributed

After conducting the Shapiro-Wilk test on the CAGR, MDD, and number of selected stocks for 22,890 investment portfolios, the results are shown in Table 4. The p-values of the three backtesting indicators are all less than 0.05, indicating non-normal distributions. Therefore, subsequent statistical analysis will use nonparametric tests, including the Mann-Whitney U test and the Kruskal-Wallis test.

Table 4: Result of the SW test on three indicators (CAGR, MDD, and # of selected stocks) for all the examined portfolios

Tested Indicators	# of samples	mean	Standard deviation	Statistical value	p value	Is normal distribution
CAGR	22890	0.10	0.03	0.95	0.0023*	Non-normal distribution
MDD	22890	0.61	0.45	0.96	0.0004*	Non-normal distribution
# of selected stocks	22890	133.27	43.62	0.54	0.0000*	Non-normal distribution

ps：*indicate significant at the 5% significance level.

Examining Whether Two-Factor is Superior to Single-Factor Stock Selection

To determine which method is superior to others, both CAGR and MDD should be statistically superior to conclude a method is better. Thus, we compare the CAGR and MDD of the two-factored and single-factored stock selection methods.

From Table 5, it can be seen that the p-value of the Kruskal-Wallis test is less than 0.05, indicating that there is a difference in CAGR among the five independent samples. By observing the combinations numbered 1 to 4 in Tables 6 and 7, it can be seen that the single-factor stock selection (X0) is significantly inferior when compared with the filter selection method (X2), weighted interpolation method (X3), and weighted ranking method (X4). When compared with the intersection selection method (X1), although the performance of X0 is also worse, the difference is not statistically significant. The results show that X0 is significantly inferior to other combinations in most comparisons, especially X2, X3, and X4. This indicates that the method of single-factor stock selection (X0) is relatively poor in terms of CAGR performance.

Table 5: Kruskal-Wallis test statistics for CAGR of all tested methods

	p value	H value
value	0.0000	23.12

Table 6: Kruskal-Wallis test result for CAGR of all tested methods

	Single factor （X0）	Intersection selection method （X1）	Filter selection method （X2）	Weighted interpolation method （X3）	Weighted ranking method（X4）
# of samples	14	91	91	91	91
medium	0.12	0.14	0.16	0.19	0.19
Sum of rankings	1744.5	14020	17311	18543.5	20012

Table 7: Dunn post-hoc test for CAGR of all tested methods

#	Comparing pair	Mean Rank difference	Z value	Standard error	threshold	P value
1	x0-x1	-29.46	0.94	31.37	88.05	0.3523
2	x0-x2	-65.62	2.09	31.37	88.05	0.0411*
3	x0-x3	-79.17	2.52	31.37	88.05	0.0198*
4	x0-x4	-95.30	3.04	31.37	88.05	0.0000*
5	x1-x2	-36.16	2.23	16.20	45.47	0.0306*
6	x1-x3	-49.71	3.07	16.20	45.47	0.0001*
7	x1-x4	-65.85	4.07	16.20	45.47	0.0000*
8	x2-x3	-13.54	0.84	16.20	45.47	0.4037
9	x2-x4	-29.68	1.83	16.20	45.47	0.0788

From Table 8, it can be seen that the p-value of the Kruskal-Wallis test is less than 0.05, indicating that there is a significant difference in MDD among the five independent samples. However, after further conducting the Dunn post-hoc test and observing the results of combinations numbered 1 to 4 in Table 10, we can see that the single-factor stock selection (X0) has an average ranking difference of -24.97, -36.32, and -52.02 respectively when compared with the filter screening method (X2), weighted interpolation method (X3), and weighted ranking method (X4), showing that X0 performs worse in these comparisons. However, the difference between X0 and other combinations is not statistically significant, mainly because the standard error is too large, making it difficult for the test results to reach a significant level. Despite this, from the perspective of the average ranking difference, we can conclude that the single-factor stock selection model performs relatively worse in terms of MDD.

Based on the above results, it can be concluded that after considering the performance of CAGR and MDD, the two-factored stock selection model is indeed superior to the single-factor stock selection model, confirming the existence of two-factor synergy. Therefore, the next step will be to continue comparing the differences among the four different selection methods of the two-factor models, and if the difference exists, which one method is better than others.

Table 8: Kruskal-Wallis test statistics for MDD of all tested methods

	p value	H value
value	0.0000	29.74

Table 9: Kruskal-Wallis test result for MDD of all tested methods

	Single factor （X0）	Intersection Selection Method （X1）	Filter Selection Method （X2）	Weighted Interpolation Method （X3）	Weighted Ranking Method （X4）
Size of sampling	14	91	91	91	91
Medium	-0.56	-0.6	-0.56	-0.52	-0.52
Rank sum	2373	12673	17697	18730	20158

Table 10: Dunn post-hoc test for MDD of all tested methods

	Comparing pair	Mean Rank difference	Zvalue	Standard error	Threshold	P value
1	x0-x1	30.24	0.96	31.37	61.48	0.3455
2	x0-x2	-24.97	0.8	31.37	61.48	0.4320
3	x0-x3	-36.32	1.16	31.37	61.48	0.2545
4	x0-x4	-52.02	1.66	31.37	61.48	0.1078
5	x1-x2	-55.21	3.41	16.2	31.75	0.0587
6	x1-x3	-66.56	4.11	16.2	31.75	0.0000*
7	x1-x4	-82.25	5.08	16.2	31.75	0.0007*
8	x2-x3	-11.35	0.7	16.2	31.75	0.4832
9	x2-x4	-27.04	1.67	16.2	31.75	0.1004
10	x3-x4	-15.69	0.97	16.2	31.75	0.3345

ps：*indicate significant at the 5% significance level.

Examining Whether Exist Difference Among the Four Two-Factored Stock Selection Models and Which one is better

Again, to determine which method is superior to others, both CAGR and MDD should be statistically superior to conclude a method is better. Thus, we continue to compare the CAGR and MDD among the four selection methods for two-factored stock strategies.

From Table 11, it can be seen that the p-value of the Kruskal-Wallis test is less than 0.05, indicating that there is a significant difference in CAGR among the four independent samples. However, after further conducting the Dunn post-hoc test and observing the results of combinations numbered 1 to 3 in Table 13, we can see that the intersection screening method (X1) has a negative average ranking difference compared to the filter screening method (X2), weighted interpolation method (X3), and weighted ranking method (X4), and the p-values of these three groups are all less than 0.05. This means statistically, the other three two-factored stock selection models perform significantly better than the intersection screening method in terms of CAGR.

Table 11: Kruskal-Wallis test statistics for CAGR of the studied four selection methods

	p value	H value
value	0.0005	17.45

Table 12: Kruskal-Wallis test results for CAGR of the studied four selection methods

	Intersection Selection Method （X1）	Filter Selection Method （X2）	Weighted Interpolation Method （X3）	Weighted Ranking Method（X4）
Size of sampling	91	91	91	91
Medium	13.62%	16.22%	19.1%	19.25%
Rank sum	13326	16486	17598	19020

Table 13: Dunn post-hoc test results for CAGR of the studied four selection methods

	Comparing pair	Mean Rank difference	Z value	Standard error	Threshold	P value
1	x_1-x_2	-34.73	2.23	15.60	41.15	0.0332*
2	x_1-x_3	-46.95	3.00	15.60	41.15	0.0000*
3	x_1-x_4	-62.57	4.01	15.60	41.15	0.0007*
4	x_2-x_3	-12.22	0.78	15.60	41.15	0.4314
5	x_2-x_4	-27.85	1.79	15.60	41.15	0.0754
6	x_3-x_4	-15.62	1.00	15.60	41.15	0.3220

ps：*indicate significant at the 5% significance level.

From Table 14, it can be seen that the p-value of the Kruskal-Wallis test is less than 0.05, indicating that there is a significant difference in MDD among the four independent samples. However, after further conducting the Dunn post-hoc test and observing the results of combinations numbered 1 to 5 in Table 16, we can see that the intersection screening method (X1) and the filter screening method (X2) have negative average ranking differences compared to the weighted interpolation method (X3) and the weighted ranking method (X4), and the p-values of these five groups are all less than 0.05. This means statistically, the weighted interpolation method and the weighted ranking method perform significantly better in terms of MDD than the other two methods.

Based on the above experimental results, it can be concluded that the two two-factored weighted stock selection models that apply multiple weight combinations are superior to the other two non-weighted models. Subsequently, the differences between these two types of two-factored weighted stock selection models will be compared in more dimensions.

Table 14: Kruskal-Wallis test statistics for MDD of the studied four selection methods

	p value	H value
value	0.0000	29.12

Table 15: Kruskal-Wallis test results for MDD of the studied four selection methods

	Intersection Selection Method （X1）	Filter Selection Method （X2）	Weighted Interpolation Method （X3）	Weighted Ranking Method（X4）
Size of sampling	91	91	91	91
Medium	-60.03%	-55.93%	-51.69%	-51.72%
Rank sum	12147	16983	17959	19341

Table 16: Dunn post-hoc test results for MDD of the studied four selection methods

	Comparing pair	Mean Rank difference	Z value	Standard error	Threshold	P value
1	x_1-x_2	-53.14	3.41	15.60	41.15	0.0000*
2	x_1-x_3	-63.87	4.09	15.60	41.15	0.0000*
3	x_1-x_4	-79.05	5.07	15.60	41.15	0.0050*
4	x_2-x_3	-18.73	0.69	15.60	41.15	0.0406*
5	x_2-x_4	-25.91	1.66	15.60	41.15	0.0470*
6	x_3-x_4	-15.19	0.97	15.60	41.15	0.3339

ps：*indicate significant at the 5% significance level.

Examining Whether Exist Difference Between the Two Weighted Two-Factored Stock Selection Models

Again, to determine which method is superior to others, both CAGR and MDD should be statistically superior to conclude a method is better. Thus, we continue to compare the CAGR and MDD among the two weighted two-factored stock strategies.

By observing Table 17, it can be seen that the p-value of the Mann-Whitney U test is greater than 0.05, indicating that there is no significant difference in the CAGR performance between the weighted interpolation method and the weighted ranking method.

Through observation of Table 19, it is known that the p-value of the Mann-Whitney U test is greater than 0.05, indicating that there is no significant difference in the performance of the weighted interpolation method and the weighted ranking method in terms of Maximum Drawdown (MDD).

Taking into account the results of several experiments, considering returns, risk resistance, and predictive ability, it can be concluded that the weighted ranking method performs the best among the four two-factored stock selection models.

Table 17: Mann-Whitney U test statistics for CAGR of the weighted (interpolation and ranking) methods

	p value	H value
value	0.3770	18.20

Table 18: Mann-Whitney U test statistics results for CAGR of the weighted (interpolation and ranking) methods

	Weighted Interpolation Method	Weighted Ranking Method
Size of sampling	10010	10010
Medium	10.88%	10.82%
Rank sum	100568881.5	99841328.5

Table 19: Mann-Whitney U test statistics for MDD of the weighted (interpolation and ranking) methods

	p value	H value
value	0.8309	18.20

Table 20: Mann-Whitney U test statistics results for MDD of the weighted (interpolation and ranking) methods

	Weighted Interpolation Method	Weighted Ranking Method
Size of sampling	10010	10010
Medium	-61.82%	-61.84%
Rank sum	100118772.5	100291437.5

V. CONCLUSION

This study examines the impact of a two-factored stock selection model on portfolio performance in the Taiwan stock market. The results indicate that the two-factored model overall outperforms the single-factor model, showing significant synergy in both CAGR and MDD aspects.

Among the four types of two-factored stock selection models, the weighted interpolation method and the weighted ranking method performed better than the other models. Upon comparison, the weighted ranking method proved to be superior in predicting returns and maximum drawdowns, particularly achieving an R-squared value of 0.51 in return prediction. Therefore, considering returns, risk resistance, and prediction accuracy, the weighted ranking method is the optimal two-factored stock selection model.

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