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Optimization of The Portfolio of Financial Institution Pension Funds in Indonesia Using the Response Surface Methodology

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ABSTRACT

Investments in pension funds consist of government bonds, deposits, bonds, shares, mutual funds, and other investments. Pension funds consist of the Employer Pension Fund (EPF) and the Financial Institution Pension Fund (FIPF). The problem with FIPF is that participants choose investments at the beginning of membership and changes to investment and retirement, so there is a need for research regarding investment placement in FIPF because the average percentage growth in FIPF investments and the average percentage increase in FIPF net worth throughout the 2015–2021 period are the highest. Maximum portfolio placement for each investment, namely government bonds, deposits, bonds, shares, mutual funds, and other investments, which are a combination of independent variables, is the solution for the performance of investment managers at FIPF. In addition, the response variable maximizes the return value and minimizes the standard deviation or risk value to support maximum investment results and determines the maximum portfolio placement of each investment, namely government bonds, deposits, bonds, shares, mutual funds, and other investments, which are free combinations. In the experiment, it is hoped that it can provide alternative literature for investment managers. Apart from knowing the optimal composition of investment placements in FIPF, it is used as a reference for selecting investment packages and for FIPF participants at the start of selecting an investment package and when changing investment packages. The RSM (Response Surface Methodology) method can provide maximum portfolio placement results from each investment: government bonds, bank deposits, corporate bonds, shares, mutual funds, and other investments. Apart from that, the author chose the RSM method because its function is to find out the combination of independent variables to get optimal results, either maximum or minimum, and with an experimental design using several factorial designs that dominate the middle value and points with output in the form of independent variable values and optimal responses previously unknown. The result of this writing is that the maximum return value is 597.294, with the free variable value being the maximization of the return value that supports the maximum return value, such as government bonds = 22.45, deposits = 61.14, bonds = 14.18, shares = 12.76, mutual funds = 5.92, and other investments = 0.46. Based on placement investment and the value of maximization results obtained in the RSM method, which has almost the same results as real data, it proves that the RSM method can confirm the performance behavior of investment managers in FIPF. On the other hand, with the free variable value, the maximum return value is 570.83 and a minimum standard deviation value of 112.38, which is the maximization of the return value, which supports the

maximum return value, such as government bonds = 22.45, deposits = 61.14, bonds = 3.49, shares = 2.48, mutual funds = 2.91, and other investments = 0.18. Based on the order and value of the maximization results obtained in the RSM method, the results are almost the same as real data, but by minimizing the standard deviation (risk) value, the percentage of investment placement changes where the placement of bonds, shares, and mutual funds is transferred to deposits and government bonds. This proves that the influence of the minimal standard deviation of the RSM method produces confirmation that is slightly contradictory to the behavior of FIPF investment managers. By using the RSM method in optimizing pension fund investment placement by maximizing the independent variable, the return value reflects the behavior of FIPF pension fund investment managers in half the placement percentage, but in optimizing pension fund investment placement with response variables, maximizing the return value and minimizing the standard deviation (risk) value change the investment placement percentage. By minimizing standard deviation (risk), placements in bonds, shares, and mutual funds are shifted to safe or risk-free assets, namely government bonds and deposits, with the data used from 2015 to 2021 before and during the COVID-19 pandemic. 19, so this research can be used as literature during a crisis, but it is not appropriate to use it during normal conditions.

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1. INTRODUCTION

The pension fund portfolio in Indonesia was at 1.9% of Indonesia's GDP in 2020, even though it experienced an increase of 3.6% from 2019. This cannot be separated from the Indonesian government's policy of "not requiring" the population to have a pension fund account [1]. In 2045, the projected retirement population will reach 19% of the total population, and Indonesia is the country with the 4th largest population globally. This projection is a challenge for the government and private sector in providing a decent life in retirement with various existing pension programs [2].

To accelerate awareness of pension funds, the government of the Republic of Indonesia has established a National Social Security System consisting of BPJS Kesehatan and BPJS Ketenagakerjaan. Through BPJS Ketenagakerjaan, a transformation of BP Jamsotek, the government has assigned BPJS Employment to manage pension insurance with coverage for all workers, including permanent workers, temporary workers, and independent workers or self-employed workers [3].

In addition to the mandatory National Social Security System, the government also allows the management of pension funds by employer companies, namely the Employer Pension Fund (EPF), as well as by banking and insurance companies, namely the Financial Institution Pension Fund (FIPF), with voluntary contributions. EPF is a pension program whose benefits are determined in the Pension Fund Regulations with a formula that considers the length of service and final salary. This program only applies to EPF where the contributions received by the Pension Fund are the result of estimating the costs required to realize pension benefits based on actuarial calculations and the value can fluctuate or is called Defined Benefits (DB). DB is paternalistic, or the employer assumes all or most of the risk, including investment risk. Meanwhile, Defined Contribution (DC) is a pension program whose contributions are determined in the Pension Fund Regulations, all contributions and development results are recorded in each participant's account as pension benefits. In DC, if there is an investment risk, the risk is completely borne by the participant, the company is only obliged to pay contributions and never promises to compensate for losses; DC can be managed by EPF or FIPF [3].

EPF membership is for all or part of employees who work for the company. EPF is formed by a person or entity, in this case, the company's owner, to manage its participants' pension funds with the DB or DC schemes. Due to the limited scope of DPPK participants, namely all or part of the

employees, the researcher decided to research FIPF. Financial institutions manage FIPF in the form of banks and insurance, so it has the task of collecting pension funds from the community. Please note that FIPF's portfolio in Indonesia is available in government bonds, bank deposits, corporate bonds, shares, mutual funds, and other investments.

Another objective to be achieved in this research is that apart from finding out the optimal composition of investment placement in FIPF, it is also used as a reference for selecting investment packages for FIPF participants when selecting an investment package and when changing investment packages. The author chose the RSM method because functionally the combination of independent variables can be identified to obtain optimal results, with maximum yield values and minimum standard deviation values, with an experimental design using several dominating factorial designs. mean values and points with output in the form of independent variables and optimal responses that are not previously known.

Table 1 shows that the average order of greatest growth in pension fund investment from 2015 to 2021 is EPFDB, FIPF, and EPF DC, respectively. Table 2 shows that the average FIPF investment growth is the largest. In addition, Table 3 shows that the distribution of FIPF net assets has a smaller value than EPF DB but greater than EPF DC, but the percentage increase in FIPF net assets has the highest average value of EPF DB and EPF DC [3,4].

Table 1. Pension fund investment growth in trillions of rupiah

Type Of Pension Fund	Year							Average
	2015	2016	2017	2018	2019	2020	2021	
EPF DB	130,89	140,24	150,26	147,5	153,8	162,5	165,94	150,16
EPF DC	22,02	25,95	30,51	32,06	34,96	37,09	39,9	31,78
FIPF	47,44	63,12	74,51	81,52	94,65	106,5	111,5	82,75
Total	200,35	229,31	255,28	261,08	283,41	306,1	317,34	264,7

Table 2. Percentage growth in investment returns

Type Of Pension Fund	Year						Average
	2016	2017	2018	2019	2020	2021	
EPF DB	7,14%	7,14%	-1,84%	4,27%	5,64%	2,14%	4,08%
EPF DC	17,85%	17,57%	5,08%	8,20%	6,92%	4,65%	10,05%
FIPF	33,05%	18,04%	9,40%	16,11%	12,56%	7,57%	16,12%

Table 3. Distribution of net assets of pension

Type Of Pension Fund	Years							Average
	2015	2016	2017	2018	2019	2020	2021	
EPF DB	136,33	144,38	154,66	153,03	159,32	167,44	171,74	155,27
EPF DC	22,18	26,19	30,81	32,42	35,06	37,78	40,44	32,13
FIPF	47,98	63,9	75,36	82,58	95,89	108,04	113,42	83,88
Total	206,49	234,47	260,83	268,03	290,27	313,26	325,6	271,28

Related work from previous research includes more complete market information positively correlated with investment returns. This means less money is invested in risky assets in financial markets with incomplete information than with complete information [5]. This study's statistical performance from 2015 to 2021 was before the COVID-19 pandemic and when COVID-19 showed unusual market conditions. In addition, in line with previous research, the standard deviation is the limit of investment. Pension fund managers generally underperform compared to benchmarks targeted by pension funds because the implementation of investment regulations aimed at protecting retirees from financial losses makes it difficult for managers to earn returns that match or are higher than those benchmarks [6].

FIPF has the best investment performance and is a research priority to determine the optimal value of each investment placement. From the background above, the author is interested in examining the optimization of FIPF investment placement with independent variables maximizing return value and minimizing standard deviation or risk value as a reference for FIPF participants in choosing alternative investments and literacy for investment managers in FIPF.

2. Related Works

The large number of elderly and prospective retirees and the lack of awareness about pension funds have resulted in the state paying three times the pension insurance premium to get its citizens' pension benefits when they retire at the age of 60 [7]. Basic knowledge about investments, loans, and risk management based on age is the initial basis for introducing pension funds to the public [8]. There is a need for financial literacy, supported by a good level of education and income, as well as a job that already has a good pension system, which will be positively correlated with ownership of pension funds, either top-ups to EPF DC or voluntary deposits to FIPF [2]. In government or private companies that have pension funds, the strategy of adding contributions to DB, postponing payments to DB, and returning capital to DB members who die as a strategy to maintain DB continuity is usually applied proportionally by the general public, who understand the pension fund system and will be aware of these financial needs in retirement [9]. Pension fund benefits are tax-free investment results when you become a pension fund participant, so adding voluntary contributions is very important to enjoy more pension funds [10]. In the end, EPF DB or EPF DC who have difficulty running their business will liquidate themselves and be transferred to FIPF, where FIPF provides a one-time payment upon disbursement and does not provide monthly pension payments, also known as DC. This is a solution for managing existing pension funds [11].

One way to maximize the performance of pension funds is by following the program of partial fund annuities (e.g., 25%) put back on annuities to be disbursed when the customer is 85 years old (longevity annuity), where the placement of funds occurs when the participant is 66 years old or at the start of retirement age [12]. On the other hand, pension fund managers generally perform badly against benchmarks because of the application of investment regulations, which aim to protect retirees from financial loss, this makes work difficult for the manager to obtain returns that are in line with (or more than) the benchmark [13]. When inflation is high, the investment manager chooses shares or bonds that have investment returns that are at least equal to the inflation value to maintain the value of money in the pension fund and the event of death. For FIPF, if the participant dies, the funds are passed on to the heirs [14]. The mean-variance method can be used by FIPF or DC scheme investment managers to select the desired target investment results, an intuitive approach that is flexible to the needs of FIPF or DC participants, and an optimal portfolio [15], so the novelty of this research is using RSM. For pension fund optimization for investment managers in pension funds long-life expectancies may require more annuities, and short-life expectancies may encourage riskier investments [16].

Fossil fuel divestment from FIPF public funds is more likely to occur than from EPF company funds, as well as being an effective means of marketing pension funds and having a greater chance of getting new, larger funds in the form of new members or additional funds from existing participants [17]. By choosing ESG funds as underlying assets, green pension funds have better long-term performance in terms of risk management [18]. Additionally, pension fund investments in green energy can mean that governments, policymakers, and regulators must continue to work to ensure the green energy sector is conducive to mainstream investment [19]. In addition to investing in green energy, it is also necessary to develop international asset allocation criteria for DC pension programs when there is a depreciation of foreign currency, bonds, and shares and shorting of cash assets in foreign and domestic economies in the initial accumulation phase; long positions are then reduced (and vice versa for cash assets); foreign cash is generally chosen as the main short-sale asset; and such foreign cash can be replaced with domestic cash if the foreign exchange market is volatile [20]. Ultimately, institutional investors and the pension fund industry act simultaneously in the market, but sometimes with different behaviors during difficult times, when market volatility is excessive, the optimization of investment placement in pension funds can be researched continuously [21].

3. METHODS

Research data consists of the data used is the statistical data percentage of the FIPF investment portfolio in Table 4 and the percentage of investment income FIPF from 2015 to 2021 in Table 5 presenting the data performance before and during the Covid-19 pandemic [3,4]. The researcher did not examine the placement in each FIPF, namely in government bonds, bank deposits, corporate bonds, shares, mutual funds, and other investments; in this case, what series of government bonds or what series of sukuk; the name of the bank deposits placement bank; the name of the corporate bonds issuing company; the name of the company issuing shares; the name of the securities company selling mutual funds; and the names of

parties involved in other investments. Bank deposits consist of savings, time deposits, deposits on call, and certificates of deposit. Corporate Bonds consist of corporate bonds, corporate sukuk, and regional bonds, or regional sukuk. Other investments consist of Bank Indonesia securities, Medium Term Notes, Asset Backed Securities Collective Investment Contracts, Real Estate Investment Funds, Infrastructure Investment Funds, Repurchase Agreements, stock option contracts, direct investments, land, buildings, and land and buildings. Furthermore, categories that do not exist in bank deposits, corporate bonds, and other investments are included in the categories of government bonds, shares, and mutual funds.

Table 4. Percentage of FIPF Investment Portfolio for 2015 to 2021

investment placement	Year							Average
	2015	2016	2017	2018	2019	2020	2021	
Government bonds	18,55%	21,09%	17,24%	17,03%	18,31%	18,53%	22,45%	19,03%
Deposits	60,98%	56,78%	60,47%	61,14%	60,55%	58,84%	57,67%	59,49%
Bonds	12,92%	13,51%	14,18%	13,44%	13,52%	3,49%	11,90%	11,85%
Shares	4,43%	4,71%	4,34%	4,41%	3,87%	12,76%	2,48%	5,29%
Mutual funds	2,91%	3,67%	3,54%	3,79%	3,49%	5,92%	5,29%	4,09%
Other investments	0,21%	0,23%	0,24%	0,18%	0,27%	0,46%	0,21%	0,26%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 5. Percentage of Yield or Return Rate on DPLK Investment in 2016 until 2021

Types of Pension Funds	Years							Average
	2015	2016	2017	2018	2019	2020	2021	
FIPF Investment Results	8,45%	8,35%	7,64%	6,72%	7,70%	9,58%	4,65%	7,58%

The analysis method uses Response Surface Methodology (RSM), which is a mathematical and statistical technique that has the aim of developing, improving, and improving products and processes, where several independent variables are known that can obtain a minimum or maximum value from the response. [22] Specifically, the function of the Response Surface Methodology is the optimal combination can be determined from the factors that produce the desired response, which can be found or visualized close to the optimal response (maximum or minimum). Furthermore, the determination of the response is influenced by changes in factor levels. Finally, in observing the results, complex mathematical models can be replaced by simpler second-order regression models within a limited range. In other words, RSM is a collection of mathematical and statistical methods used in modeling and analysis to see the influence of several independent quantitative variables on a response variable, with the ultimate goal of optimizing (maximizing or minimizing) the response variable [23].

The flow carried out in this research are:

1. One-way ANOVA test to find out whether all independent variables do not affect each other.
2. Find the maximum value and minimum placement of the investment portfolio.
3. Tested using the Minitab Menu applications Statistic, Design of Experiment (DOE), Response Surface, and Create Response Surface Design. Determination of the number of trial combinations by selecting Box-Behnken Due to the minimum and maximum value of each portfolio known, the results were obtained in the form of 54 (fifty-four) experiments.
4. Using variables results in the form of the investment return value:
   - Find the DOE yield value to be used as an RSM calculation by multiplying the constant of each investment placement by the DOE.
   - DOE yield value as a yield variable and maximized using analyzing response surface design operation.
   - Obtained the value of P-value, Lack of Fit, and Polynomial Equation, then the Response Optimizer operation is carried out so that the value of the maximum result response variable and the maximum value of each variable are free of investment portfolio placement.
5. Using variables results in the form of investment returns and the standard deviation (risk):
   - From Tables 4 and 5, the standard deviation of investment portfolio placement and investment

returns is calculated.

- the standard deviation of investment placement divided by the standard deviation of investment returns to obtain a constant value.
- Look for the DOE result value used in the RSM calculation by multiplying the constant value by 54 trials on DOE.
- Two response variable values were obtained, namely the result value and standard deviation value as the DOE response variable, and then the analysis of the response surface operation was carried out so that the P-value, lack of fit, and polynomial equation values were obtained.
- The Response Optimizer operation is carried out, where the response variable's yield value is maximized and the standard deviation value is minimized so that the response variable value is obtained. The maximum yield value, the minimum standard deviation (risk) value, and the maximum value of each variable are free of investment portfolio placement.

4. RESULTS AND DISCUSSION

4.1. Early Stage

One-way ANOVA test (independent variables are not categorical) to find out whether all the independent variables in Table 4 government bonds, deposits, bonds, shares, mutual funds, and other investments have a mutual influence on each other has results his research stage is at the same time the stage of operation of the equipment.

Table 6. One-Way Anova Results

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1,693	5	0,339	602,47	1,25E-33	2,4772
Within Groups	0,02	36	6,00E-04			
Total	1,713	41				

From Table 6, Given that $H0 : \mu1 = \mu2 = \mu3$ and $H1$: there are at least 2 population means that are different. From Table 7 it is known that P-Value < α has a value of 1.2469E − 33 < 0.05 and $F > F\ Critical$ which is 602.4728 > 2.477169, then reject $H0$ and accept $H1$, this means that each independent variable is not related to each other and the RSM method can be continued.

From Table 4 it is known that the maximum and minimum values for each investment placement:

Table 7. Maximum and Minimum Value of Investment Portfolio

Investment Portfolio	Minimum Value	Maximum Value
Government bonds	17,03	22,45
Deposits	56,78	61,14
Bonds	3,49	14,18
Shares	2,48	12,76
Mutual funds	2,91	5,92
Other investments	0,18	0,46

The next step was to test the data in Table 7 using the Minitab Menu applications Statistic, Design of Experiment (DOE), Response Surface, and Create Response Surface Design. Determination of the number of trial combinations by selecting Box-Behnken Due to the minimum and maximum value of each portfolio known, the results were obtained in the form of 54 (fifty-four) experiments.

4.2. Using Variables Results in The Form of The Investment Return Value

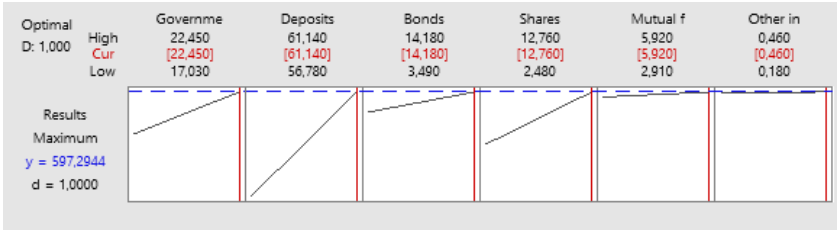
From Tables 4 and 5, a mathematical operation is carried out, dividing the investment placement per year by the investment return per year and averaging it to obtain a constant value. Find the DOE yield value to be used as an RSM calculation by multiplying the constant value of each investment placement by the DOE and then DOE yield value as a yield variable and maximized using analyzing response surface design operation obtained P-Value=* or 0 < α = 0,05, Lack of Fit=* or 0 < α = 0,05 this means the

independent variable is directly proportional to the response variable (the more placements invested, the greater the return on investment). R-square is 100%. This means that the model fits the data and that the independent variables are positively correlated with the response variables. The polynomial equation is as follows:

$$Results = 0{,}000 + 2{,}660\ Goverment\ bonds + 8{,}210\ Deposits + 1{,}670\ Bonds + 0{,}6700\ Shares + 0{,}5700\ Mutual\ funds + 0{,}03000\ Other\ investment \quad (1)$$

"Equation (1) is the polynomial equation" can be explained that if there is an increase in the yield Result of 1 point, it will increase government bonds by 2,660 points, deposits by 8,210 points, bonds by 1,670, shares by 0,6700 points, mutual funds by 0,5700, and other investments by 0,03000 points; the value of 0,000 is a value that is not directly related or outside the independent variable.

Next is the Response Optimizer operation, where the response variable result value is maximized, so the following results are obtained:



Parameters

Response	Goal	Lower	Target	Upper	Weight	Importance
Results	Maximum	530,406	587,506		1	1

Solution

Solution	Government bonds	Deposits	Bonds	Shares	Mutual funds	Other investments	Results Fit
1	22,45	61,14	14,18	12,76	5,92	0,46	597,294

Solution	Composite Desirability
1	1

Output by: Minitab Statistical Software

Fig. 1. Response optimization maximizes the result value

Fig. 1 shows that to obtain a maximum response variable value of 597,294, the independent variables are government bonds = 22,45, deposits = 61,14, bonds = 14,18, shares = 12,76, mutual funds = 5,92, and other investments = 0,46. In this experiment, it can be concluded that the maximum value can be determined from the result value of the maximum response variable, ranging from 530,406 to 587,506, using the RSM method, it can be maximized again (most optimally) at a maximum result response variable value of 597,3.

Based on the RSM results and real conditions, the following data was obtained:

Table 8. Comparison of the results of the RSM method with real data

Investment Placement	RSM	actual data	placement order
Government bonds	22,45	19,03	2
Deposits	61,14	59,49	1
Bonds	14,18	11,85	3
Shares	12,76	5,29	4
Mutual funds	5,92	4,09	5
Other investments	0,46	0,26	6

Based on Table 8, placement orders and the value of maximization results obtained in the RSM method, which has almost the same results as real data, prove that the RSM method can confirm the performance behavior of investment managers in FIPF. This is almost the same as the Indonesian PLN (State Electricity Company) EPFDB strategy, which places funds in government bonds of 15% but is different in bonds of 44% [24] and is in sharp contrast to researchers who recommend emptying placements in deposits

and maximizing placements in shares [25].

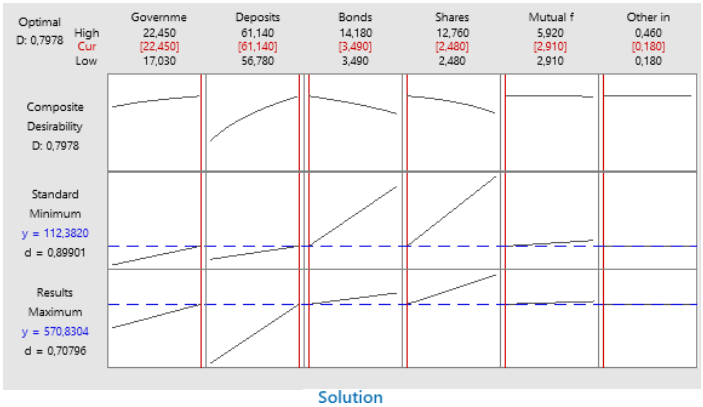
4.3. Using Variables Results in The Form of Investment Returns and The Standard Deviation (Risk)

From Tables 4 and 5, the standard deviation of investment portfolio placement and investment returns is calculated. The standard deviation of investment placement is divided by the standard deviation of investment returns to obtain a constant value. The DOE result value used in the RSM calculation is obtained by multiplying the constant value by 54 trials on the DOE to obtain two response variable values, namely the result value and the standard deviation value as the DOE response variable. Next, an analysis of the surface operation response is carried out to obtain P-Value=* or 0 < α = 0,05, Lack of Fit=* or 0 < α 0,05. This means the independent variable is directly proportional to the response variable (the more placements invested, the greater the return on investment). R-square is 100%. This means that the model fits the data and that the independent variables positively correlate with the response variables. The polynomial equation is as follows:

$$Standart\ Deviation = 0{,}000 + 1{,}280\ Goverment\ bonds + 1{,}110\ Deposits + 2{,}400\ Bonds + 2{,}160\ Shares + 0{,}7000\ Mutual\ funds + 0{,}06000\ Other\ investment \quad (2)$$

"Equation (2) is the polynomial equation" can be explained that if there is an increase in the yield Standard deviation of 1 point, it will increase government bonds by 1,280 points, deposits by 1,110 points, bonds by 2,400, shares by 2,160 points, mutual funds by 0,7000, and other investments by 0,06000 points; the value of 0,000 is a value that is not directly related or outside the independent variable.

Next is the Response Optimizer operation, where the response variable result value is maximized and the variable standard deviation is minimized, so the following results are obtained:



Parameters

Response	Goal	Lower	Target	Upper	Weight	Importance
Standard	Minimum		107,547	155,424	1	1
Results	Maximum	530,406	587,506		1	1

Solution

Solution	Government bonds	Deposits	Bonds	Shares	Mutual funds	Other investments	Standard Fit	Results Fit
1	22,45	61,14	3,49	2,48	2,91	0,18	112,382	570,830

Solution	Composite Desirability
1	0,797785

Output by: Minitab Statistical Software

Fig. 2. Response optimization maximizes the result value and minimizes the standard deviation value.

Fig. 2 shows that To obtain a maximum response variable value of 570,830 and a minimum standard deviation value of 112,382, the independent variable values are government bonds = 22,45, deposits = 61,14, bonds = 3,49, shares = 2,48, mutual funds = 2,91, and other investments = 0,18. In this experiment, it can be concluded that the maximum value can be determined from the maximum value of the response variable, which ranges from 530,406 to 587,506, and the response variable standard deviation value from the minimum is 107,547 to 155,424. By using the RSM method, it can be maximized again (most optimal) with a maximum

result response variable value of 570,8 and a minimum standard deviation of 112,4.

Based on the RSM results and real conditions, the following data was obtained:

Table 9. Comparison of the results of the RSM method with real data

Investment Placement	RSM	placement order	actual data	placement order
Government bonds	22,45	2	19,03	2
Deposits	61,14	1	59,49	1
Bonds	3,49	3	11,85	3
Shares	2,48	5	5,29	4
Mutual funds	2,91	4	4,09	5
Other investments	0,18	6	0,26	6

Based on Table 9, Based on the order and value of the maximization results obtained in the RSM method, the results are almost the same as real data, but by minimizing the standard deviation (risk) value, the percentage of investment placement changes where the placement of bonds, shares, and mutual funds is transferred to deposits and government bonds. This proves that the influence of the minimal standard deviation of the RSM method produces confirmation that is slightly contradictory to the behavior of FIPF investment managers. This is similar to There is no benefit from diversification of shares and real estate assets (non-liquid and market prices are difficult to determine) in the portfolio, both of which are speculative and investment returns are not significantly positive [26]. In other words, shares are best used if portfolio monitoring is carried out strictly and does not exceed the investment placement percentage limits determined by the regulator [27].

5. CONCLUSION

Using the RSM method in optimizing pension fund investment placement by maximizing the outcome variable, the return value reflects the behavior of the FIPF pension fund investment manager in terms of placement percentage, but in optimizing pension fund investment placement with a response variable, maximizing the return value and minimizing the standard deviation (risk) value change the percentage. investment placement. By minimizing the standard deviation (risk), placements in bonds, shares, and mutual funds are transferred to safe or risk-free assets, namely government bonds and deposits.

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