STATISTICAL MODEL FOR OPTIMIZING A SHARE WITH A RISK COEFFICIENT

MICULA LIA[1], DINCU ANA-MARIANA*[1], POPESCU SOFIA[2], BRAD IOAN[1], ALANCUTI NICOLETA[1],

[1]***Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Management and Rural Tourism, Romania***
[2]***Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Faculty of Food Engineering, Romania***
*Corresponding author's e-mail: maridincu2004@yahoo.com

Abstract: *In the paper we propose to evaluate the efficiency of an action that depends on the global market output, using a linear regression model. In the case of practical proof, we carried out economic applications in which we achieved the marginal rate of substitution, the slope of a straight line and the slope of a budget line.*

Key words*: partial derivatives, optimization, Lagrange multipliers, SUMMING-UP*

INTRODUCTION

The global regression method allows for a significant reduction in the operations required to calculate returns and total risk.

I reasonably chose two baskets with chocolate or jam. I have graphically represented some indifferent cubes, that is, the total of combinations of two A and B products that give me the same satisfaction. [1, 2, 3, 11, 14]

MATERIALS AND METHODS

We start from the hypothesis that the yield of an action is linearly dependent on the overall yield.

$$R_{ij} = \sigma_i + \beta_i RP_j + \varepsilon_{ij} \ , \qquad j = \overline{1,n}$$

The average operator is marked with:

$$E(R_i) = \sigma_i + \beta_i RP_J E(RP)$$

The variation of shares is decomposed into two components due to the systematic risk and due to the random factors.

$$\text{Var } (R_i) = E[R_{ij} - R_i]^2 = \beta_i^2 \sigma_p^2 + \sigma_{\varepsilon 1}^2 = \sigma_i^2$$

Where: σ_i^2 =total risk

The average yield of the analyzed portfolio is characterized by the structure vector.

$$E(RT) = \sigma_T + E(RP)$$

Where: $\sigma_T = \sum_i x_i \sigma_i \quad , \qquad \beta_T = \sum_i x_i p_i$

The total risk of the portfolio is measured by the yield variation within a time horizon is determined by the systematic risk and the unsystematic risk that occurs at the level of the financial market. [12, 13]

$$\sigma_T^2 = \beta_T^2 \sigma_T^2 + \sum_i x_i^2 \sigma \sum_{\varepsilon i}^2$$

The optimization model built for a given yield level is:

$$\begin{cases} [\min]_{x_1 \ldots x_m} \sigma_T^2 \\ E[RT] = \sum_i x_i E(R_i) \\ \beta p = \Sigma x_i p_i \\ \sum_i x_i = 1 \end{cases}$$

We measure the proportions in which the two shares enter the portfolio optimizing portfolio risk minimization.

We build the minimal problem corresponding to the mathematical model.

$$\begin{cases} \min x_A x_B \sigma_p^2 \\ x_A + x_B = 1 \end{cases} \Rightarrow \begin{cases} \min_{x_A x_B} \left(0{,}0196 x_A^2 + 0{,}0201 x_B^2 + 0{,}0007 x_A x_B\right) \\ x_A + x_B = 1 \end{cases}$$

We use the Lagrange multipliers method: [4,6, 8]

$$L = 0{,}0196 x_A^2 + 0{,}0201 x_B^2 + 0{,}0008 x_A x_B + \lambda(1 - x_A - x_B)$$

With the following optimal conditions

$$\begin{cases} \frac{\delta L}{\delta x_A} = 0 \\ \frac{\delta L}{\delta x_B} = 0 \Rightarrow \begin{cases} 0{,}0394 x_A + 0{,}0008 x_B - \lambda = 0 \\ 0{,}0402 x_B + 0{,}0008 x_A - \lambda = 0 \end{cases} \\ \frac{\delta L}{\delta x} = 0 \end{cases}$$

$$x_A + x_B = 1 \Rightarrow x_B = 0{,}47 = 47\% \qquad x_A = 0{,}53 = 53\%$$

Portfolio risk and portfolio profitability as a weighted average of return rates for A and B shares.

$$ER_p = x_A ER_A + x_B ER_B = 0{,}53 \cdot ? + 0{,}47 \cdot ? =$$

We consider two actions A and B with probability distributions of profitability rates.

Probability	RA (%)	RB (%)
0,2	-10	-20
0,6	15	15
0,4	35	30

We determine the mathematical expectation of the profitability of the two actions.

$$ER_A = \sum_{i=1}^{3} p_i R_{A_i} = 0{,}2 \cdot (0{,}1) + 0{,}6 \cdot (0{,}15) + 0{,}4 \cdot (0{,}35) = ?\%$$

$$ER_B = 0{,}2 \cdot (-0{,}2) + 0{,}6 \cdot (0{,}15) + 0{,}4 \cdot (0{,}3) = ?\%$$

The risk associated with each action is determined by the average square deviation.

$$\sigma_A^2 = \sum_{i=1}^{3} p_i (R_{Ai} - ER_A)^2 = 0{,}0196$$

$$\sigma_B^2 = \sum p_i (R_{Bi} - ER_B)^2 = 0{,}0201$$

So $\sigma_A = 13{,}7\%$ and $\sigma_B = 15{,}18\%$

RESEARCH RESULTS

The marginal substitution rate of the three product baskets is shown in tables 1. and 2.

Table 1.

The marginal substitution rate for basket A and B

A	Chocolate	jam	Δq Goods beded	Δq Goods obtained	Replacement rate
	400	150	200	50	4
B	200	200			

Defining the substitution rate between chocolate and jam as a ratio between the amount of good yielded (chocolate) and the amount of good obtained (jam). Thus we obtain the substitution rate equal to 4. [5, 7, 9,10, 15]

Table 2.

The marginal substitution rate for basket B and C

B	Chocolate	jam	Δq Goods beded	Δq Goods obtained	Replacement rate
	200	200	20	100	0,2
C	180	300			

Defining the substitution rate between chocolate and jam as a ratio between the amount of good yielded (chocolate) and the amount of good obtained (jam). Thus, we obtain a substitution rate equal to 0.2.

We have introduced an instant replacent rate called the marginal rate of siblings (RMS)

$$\text{RMS} = \lim_{\Delta q\ bun\ obținut \to 0} -\frac{\Delta q\ goods\ beded}{\Delta q\ goods\ obtained}$$

$$\text{RMS} = \lim_{\Delta q\ bun\ obținut \to 0} -\frac{20}{100}$$

Thus, an interference curve at a given point will also be derived the function $q_{bun\ cedat} = f(q_{bun\ obținut})$ taken with the minus sign.

$$\text{RMS} = \frac{\Delta q \text{Goods beded}}{\Delta q \text{Goods obtained}}$$

$$RMS = -\frac{20}{100}$$

However, for products A and B in quantities x, y the marginal substitution rate will be: RMS = - $\frac{dy}{dx}$

CONCLUSIONS

Questionnaires were then disseminated statistically, clonking that the majority of consumers were very satisfied with the product, we considered a different approach by analyzing, by comparison with another product, the jam using mathematical analysis an infinitesimal model of the isocratic line and by the calculation of the marginal rate of substitution.

Mathematically analyzed limits were interpreted as the minimum and maximum level of satisfaction with a possible substituted probum.

We recommend that as a result of this analysis, any two competitive and high-quality food products should be promoted together in the same campaign, so that mammals can be successful.

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