

# THE INFLUENCE OF UNCERTAIN FACTORS IN DECISION ECONOMETRIC OF ADMINISTRATOR OF ENTERPRISE FINANCIAL MANAGEMENT

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**Abstract:** *in a competitive market economy, business executives often face situations uncertain business conditions. Decision econometric models in problems generally ignore this under uncertainly elements or have not determined its impact in a specific and reliable manner. Therefore, applying the supporting tools of statistical probability theory, economic theory, econometrics ...to perfect the decision-making in a specific way, the impact of uncertain factors in decision-making models is necessary to improve the efficiency of corporate financial management.*

**Keywords:** *decision econometric models, uncertain factors.*

## ВЛИЯНИЕ НЕОПРЕДЕЛЕННЫХ ФАКТОРОВ НА ЭКОНОМЕТРИЧЕСКИЕ РЕШЕНИЯ АДМИНИСТРАТОРА ФИНАНСОВОГО УПРАВЛЕНИЯ ПРЕДПРИЯТИЯМИ

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**Аннотация:** *в условиях конкурентной рыночной экономики руководители предприятий часто сталкиваются с ситуациями, в которых не определены условия ведения бизнеса. Эконометрические модели принятия решений в задачах обычно игнорируют это из-за элементов неопределенности или не определяют его влияние конкретным и надежным образом. Поэтому, применяя вспомогательные инструменты статистической теории вероятностей, экономической теории, эконометрики... для совершенствования принятия решений определенным образом, влияние неопределенных факторов в моделях принятия решений необходимо для повышения эффективности корпоративного финансового управления.*

**Ключевые слова:** *эконометрические модели принятия решений, неопределенные факторы.*

### 1. Introduction

In directing and making business decisions, corporate managers frequently face uncertain business conditions and situations. For a manager's decisions to be highly effective, they need to consider these risk factors. From a managerial perspective, this involves establishing the impact of uncertainties within decision-making models.

Traditional decision-making models have failed to meet the reality of the information and data explosion. From a practical standpoint, with the current development of technology and information, we have sufficient data and computational tools to reliably and specifically determine the influence of uncertain factors in business decision-making models. This aids in timely decision-making and enhances the effectiveness of corporate financial management.

### 2. Basic Theoretical Foundations

#### a. Managerial Decision-Making

Managerial decision-making is a creative act performed by managers to establish the program and nature of an organization's activities in order to address a well-developed issue. This process is based on an understanding of the objective laws governing the management system and the analysis of information regarding the phenomena within the system.

#### b. Decision-Making Based on the Level of Impact of Uncertainty Factors

Decision-making is a conscious process of selecting between two or more options to choose the one that will yield the desired outcome under known constraints. If there is only one solution to a problem, it does not constitute a decision-making problem. It is also important to note that "doing nothing" is also an option and, at times, may be the chosen course of action.

Depending on the level of detail in the approach, establishing the impact of uncertainty in decision-making models can be executed in one of two ways:

#### **- Determining the probabilities of events and incorporating them into the decision-making model:**

This involves identifying situations and uncertainties, calculating the probabilities of these situations occurring, and then integrating these probabilities into the business decision-making model.

#### **- Utilizing statistical, econometric, and other economic models to specifically forecast uncertain factors:**

Currently, quantitative techniques that account for the impact of uncertainties in decision-making include decision tables, decision trees, expected monetary value models, expected regret value models, Monte Carlo simulations, among others. Within the scope of this study, the author employs the Monte Carlo simulation method to facilitate decision-making.

*The Monte Carlo Simulation Method*

The principle of the Monte Carlo method involves continuously repeating the calculation of a model's outcome with input values sampled randomly from their respective probability distributions. The input factors may include input data, model parameters, and errors in the model structure. The repeated results of the model form a random sample of the probability distribution of the output results. Statistical analysis describes this sample by calculating the mean and standard deviation, providing representative values for the uncertainty level of the model's output, given a sufficiently large sample size.

**c. Steps to Building a Decision-Making Model**

According to the author, the decision-making process typically involves the following steps:

- **Step 1:** *Identify the Problem*

- **Step 2:** *Analyze the Problem*

Recognize Situations and States: Identify the different scenarios or states that could occur and list all possible alternatives.

Estimate Benefits and Costs: Assess all the benefits and costs associated with each alternative for each scenario.

- **Step 3:** *Apply the Model to Find Solutions*

Use a suitable decision-making model to analyze the alternatives and their associated outcomes.

- **Step 4:** *Make the Decision*

**3. Specific Illustration**

**3.1. Decision-Making Method Based on the Probability of Situations**

To demonstrate the decision-making method based on the probability of situations, let's consider the business performance report of a company for March 2024.

*Table 1. Business Performance Report for March 2024.*

1. Units Sold	550.000 units	4. Revenue ( $4 = 1 \times 2$ )	11.902.000.000 VND
2. Unit Selling Price	21.640 VND/unit	5. Total Variable Costs ( $5 = 1 \times 3$ )	9.014.500.000 VND
3. Variable Cost per Unit	16.390 VND/unit	6. Contribution Margin ( $6 = 4 - 5$ )	2.887.500.000 VND
		7. Total Fixed Costs	1.683.285.300 VND
		<b>8. Net Profit (<math>8 = 6 - 7</math>)</b>	<b>1.204.214.700 VND</b>

In order to accelerate towards achieving the profit targets for 2024, the business department has proposed a cohesive strategy based on customer satisfaction, market demand, financial management acumen, and employee motivation. The detailed business strategy plan for April 2024 is as follows:

*Table 2. Business Strategy Plan for April 2024.*

1. Increase in Sales Bonus:	300 VND/unit
2. Increase in Broker Commission:	100 VND/unit
⇒ Variable cost per unit	$16.390 \text{ VND/unit} + 300 \text{ VND/unit} + 100 \text{ VND/unit} = 16.790 \text{ VND/unit}$
3. Reduction in Selling Price	750 VND/unit
⇒ Unit selling price	$21.640 \text{ VND/unit} - 750 \text{ VND/unit} = 20.890 \text{ VND/unit}$
4. Increase in Advertising Expenditure:	280.000.000 VND
⇒ Total fixed costs	$1.683.285.300 \text{ VND} + 280.000.000 \text{ VND} = 1.963.285.300 \text{ VND}$

Given the expected increase in customer demand, the business must make decisions to accommodate this growth effectively. The sales department anticipates a potential increase in sales volume ranging from 30% to 45%. Based on market research data provided by the market research department, the probabilities associated with each level of increase are as follows:

- Probability of a 30% increase in sales volume: 70%

- Probability of a 45% increase in sales volume: 30%

**Calculation and Recommendation:**

*Scenario 1: Probability of a 30% Increase in Sales Volume (70%)*

➔ Expected Sales Volume:  $130\% \times 550,000 = 715,000$  units.

1. Units Sold	715.000 units	4. Revenue ( $4 = 1 \times 2$ )	14.936.350.000 VND
2. Unit Selling Price	20.890 VND/unit	5. Total Variable Costs ( $5 = 1 \times 3$ )	12.004.850.000 VND
3. Variable Cost	16.790 VND/unit	6. Contribution Margin ( $6 = 4 - 5$ )	2.931.500.000 VND

per Unit			
		7. Total Fixed Costs	1.963.285.300 VND
		<b>8. Net Profit (8 = 6 - 7)</b>	<b>968.214.700 VND</b>

Scenario 2: Probability of a 45% Increase in Sales Volume (30%)

→ Expected Sales Volume:  $145\% \times 550,000 = 797,500$  units.

1. Units Sold	797.500 units	4. Revenue (4 = 1 × 2)	16.659.775.000 VND
2. Unit Selling Price	20.890 VND/unit	5. Total Variable Costs (5 = 1 × 3)	13.390.025.000 VND
3. Variable Cost per Unit	16.790 VND/unit	6. Contribution Margin (6 = 4 - 5)	3.269.750.000 VND
		7. Total Fixed Costs	1.963.285.300 VND
		<b>8. Net Profit (8 = 6 - 7)</b>	<b>1.306.464.700 VND</b>

The increase in profit when accounting for the influence of uncertain factors:

$$968.214.700 \times 70\% + 1.306.464.700 \times 30\% = 1.069.689.700 \text{ VND}$$

Therefore, despite the sales department's proposal to increase sales volume by 30 - 45%, considering the uncertain probabilities of various factors, the business manager disagrees with implementing the sales department's business strategy. This decision is based on the projected decrease in profit by 134,525,000 VND.

### 3.2. Decision-Making Method Using the Monte Carlo Model

The director of XYZ Company wants to make a decision regarding the choice of which type of rice to produce and at what selling price. The decision-making process involves the following steps:

#### Step 1: Problem Identification

During a company meeting, the director of XYZ Company states that the factory will produce one of two types of products: regular rice or specialty rice, with the pricing set at 460 USD and 580 USD, respectively.

#### Step 2: Problem Analysis

- Identifying potential scenarios and states and listing all possible options

Table 3. Forecasted Probabilities of Market Survey Results.

Result of Market Survey	Market State	Probability of Market State ( $P_{Ai}$ )	$P(B A_i)$	$P(B \cap A_i)$ $P_{Ai} * P(B A_i)$	$P(A_i/B)$ $P(B \cap A_i) / P_B$
Normal rice	Good	0.3	0.6	0.18	<b>29.51%</b>
	Moderate	0.5	0.8	0.40	<b>65.57%</b>
	Poor	0.2	0.15	0.03	<b>4.92%</b>
Probability of normal rice market state: ( $P_B$ ) = $\sum P(B \cap A_i)$				<b>0.610</b>	
Specialty rice	Good	0.3	0.4	0.12	<b>30.77%</b>
	Moderate	0.5	0.2	0.10	<b>25.64%</b>
	Poor	0.2	0.85	0.17	<b>43.59%</b>
Probability of specialty rice market state: ( $P_B$ ) = $\sum P(B \cap A_i)$				<b>0.390</b>	

Definitions:

$P(A_i/B)$ : Probability of the market state (good, moderate, poor) given the result of the market survey for either regular or specialty rice.

$P(B|A_i)$ : Probability of the result of the market survey for regular or specialty rice given the market state (good, moderate, poor).

$P(A_i)$ : Probability of the market state (good, moderate, poor).

$P(B)$ : Probability of the result of the market survey for regular or specialty rice.

- Estimated Profit for Each Option Corresponding to Each Market State.

Table 4. Expected Profit.

Unit: USD

Company's Choice	Market State		
	Good	Moderate	Poor
Normal rice	14.500	7.510	3.650
Specialty rice	18.500	5.080	2.000

#### Step 3: Applying the Model to find a solution

- Determine the relationship between the input variables and the forecasted variables

No.	Function and Variable	Symbol	Risk Variable
1	Rice price	P	X
2	Profit	$EMV_i = \sum_{j=1}^m p(s_j) \times P_{ij}$	

**Explanation:**

EMVi: Expected profit for the chosen option.

p(s<sub>j</sub>): Profit level in the market state (good, moderate, poor).

P<sub>ij</sub>: Probability of the market state (good, moderate, poor).

- Determining the Value Range of Forecasted Variables in Various Situations

Table 5. Value Range of Forecasted Variables for Profit.

Unit: USD

Company's Choice	Profit Value Range			Making decisions based on the goal of maximizing				Making decisions based on the goal of minimizing				Profit Expectation
	Minimum Value	Maximum Value	Average Value	Good	Moderate	Poor	Objective	Good	Moderate	Poor	Objective	
Normal rice	3.650	14.500	8.553	4.000	0	0	4.000	0	2.430	1.650	2.430	8.835
Specialty rice	2.000	18.500	8.527	0	2.430	1.650	2.430	4.000	0	0	4.000	8.490

- Identifying the probability distribution of the input variable

The input variable is the price fluctuation of rice in two production scenarios: normal rice and specialty rice. The probability distribution function applied to simulate the probability is the standard normal distribution function.

Table 6. Probability of rice price input variables.

Unit: USD

Average Rice Price	530	Standard Deviation	45	
Rice Price	Increase/Decrease	Adjusted Rice Price	Probability	Cumulative Probability
460	-70%	512	0.75%	33.33%
480	-50%	521	0.82%	41.18%
500	-30%	530	0.87%	47.06%
520	-10%	543	0.89%	53.33%
530	0%	548	0.89%	58.82%
540	10%	552	0.87%	60.00%
560	30%	561	0.82%	66.67%
580	50%	530	0.75%	73.33%
600	70%	530	0.65%	82.35%

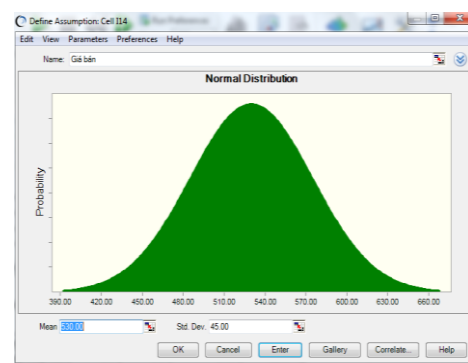
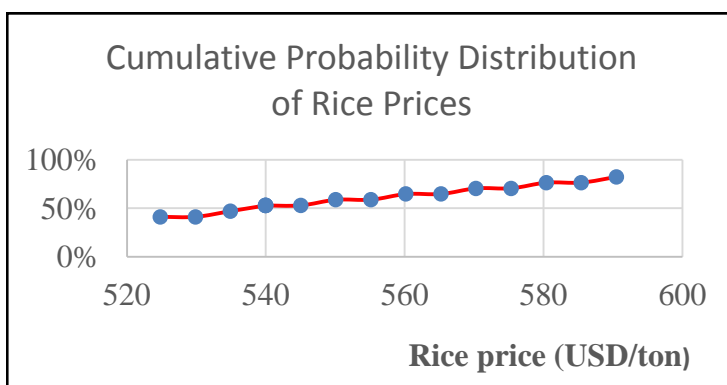


Fig. 1. Probability Distribution of the Input Variable - Rice Price.

➤ **The expected profit values**

After 1,000 simulations with different random values of the input variable - rice price, obtained through Monte Carlo simulation for the forecasted profit variable are as follows:

Table 7: Calculated Results in Percentage Form

%	Profit
0%	8.490
10%	9.032

Table 8: Calculated Results in Statistical Graph Form

Statistical Indicators	Profit
<input type="checkbox"/> Number of simulation runs	1.000
<input type="checkbox"/> Expected value	8.835

20%	9.426
30%	9.672
40%	9.944
50%	10.152
60%	10.379
70%	10.606
80%	10.845
90%	11.210
<b>100%</b>	<b>12.990</b>

□ Mean	10.154
□ Median	10.152
□ Mode	8.490
□ Standard deviation	830
□ Variance	688.440
□ Skewness	0,1967
□ Kurtosis	2,79
□ Correlation coefficient	0,0817
□ Minimum value	<b>8.490</b>
□ Maximum value	<b>12.990</b>
□ Range	4.500
□ Adjusted standard deviation	26

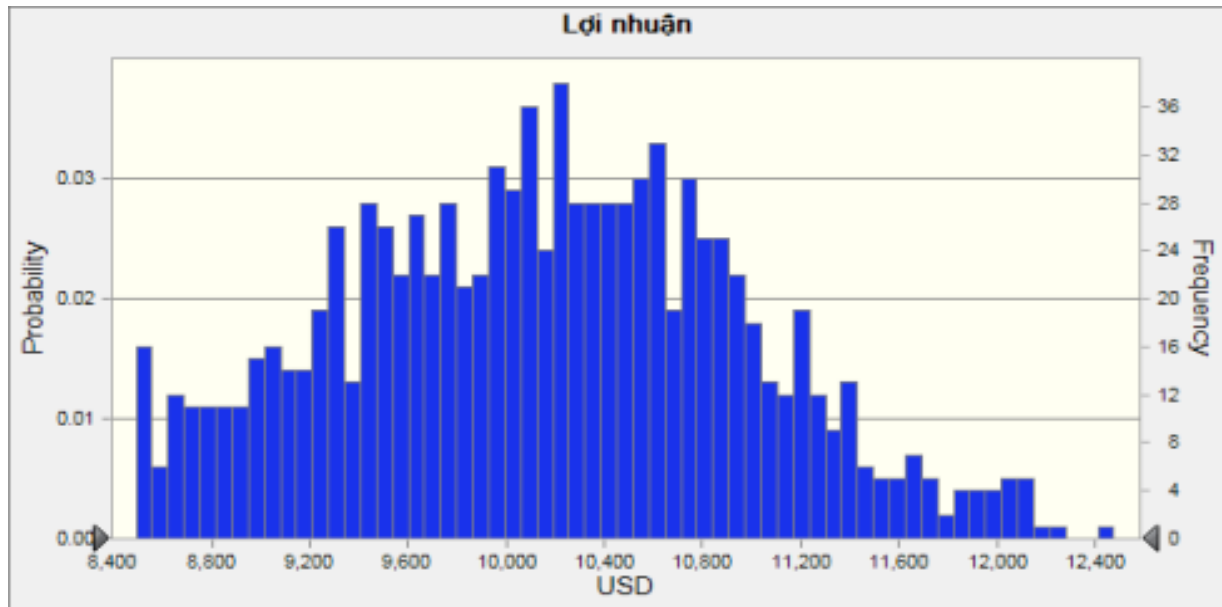


Fig. 2. Profit Value Range.

#### Step 4: Decision Making under Uncertainty

Decision-making based on expected profit value is a common criterion used in selecting suitable business options. From the simulation results, the profit range fluctuates between 8,490 USD and 12,990 USD. This means that the potential profit ranges from 8,490 USD in the worst-case scenario to 12,990 USD in the most favorable scenario. Combining this with the expected value and standard deviation of the forecasted profit variable, the manager can assess the probability of negative profit in the case of producing regular rice as 0%, while the expected profit if the company produces regular rice is also greater than producing specialty rice (8,835 USD > 8,490 USD). Therefore, the level of risk due to the fluctuation of regular rice prices leading to losses is very low, so the managerial decision in this case is to choose the option of producing regular rice.

Through Monte Carlo simulation, the manager gains a more comprehensive view in decision-making. Without considering the changes in risk factors and forecasting potential scenarios, the manager may make decisions that are not optimal.

#### 4. Conclusion

Decision-making is the selection of the most reasonable solution for the identified problem. Managers always make decisions, and decision-making is one of the key skills of a manager. The quality and outcome of decisions can have positive or negative effects on employees and the business organization. The main thing is that managers must maximize their decision-making ability if they want to become truly effective managers.

In directing and making business decisions, business managers often face uncertain business conditions and situations. It is the ability to realize the actual value of factors such as selling prices, consumption levels, interest costs... that will significantly deviate from estimates. To make effective managerial decisions, managers need to consider the influence of uncertain factors, and the application of quantitative models that incorporate the impact of uncertain factors will enhance the quality of managerial decisions.

#### References / Список литературы

1. Cao Hao Thi. Statistics probability textbook. Ho Chi Minh city: Asian Institute of Technology Center in Vietnam, 2008.
2. Do Thanh Nghi. Data mining curriculum. Can Tho city: Can Tho University, 2008.

3. *Dinh Manh Tuong*. Artificial intelligence textbook, Hanoi: Hanoi National University Publishing House, 2007.
4. *Doan Thi Thu Ha - Nguyen Thi Ngoc Huyen*. Management science I. Volume 1, Science and Technology Publishing House, 2004.
5. *Hull John C*. Options futures and other derivatives, Prentice Hall, 2000. ISBN 0-13-015822-4.
6. *John Wiley & Sons*. Monte Carlo methods in finance, 2002. ISBN 0-47-149741-X.