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Monte Carlo Simulation for Rattan Revenue: Production, Costs, and Demand Analysis

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ABSTRACT

The rattan industry in Cirebon, Indonesia, is a significant part of the country's creative economy, but it faces several major challenges, including unstable production, fluctuating prices for raw materials, and uncertain demand, which make it difficult to predict income. The goal of this research is to create a quantitative model that can accurately forecast business income and help entrepreneurs make better financial decisions. The study employs the Monte Carlo simulation method to examine the impact of production levels, raw material costs, and demand on the revenue of rattan businesses. The simulation was run 10,000 times using probability distributions based on historical data. The results indicate that market demand and selling prices have the most significant positive impact on profits, while raw material costs have the most substantial negative effect on profits. The model illustrates the uncertainty of business conditions, with profit varying between IDR 19.5 billion and IDR 76.1 billion, averaging IDR 50.2 billion. The findings underscore the need to strike a balance between meeting growing demand and managing costs to achieve long-term profitability. This Monte Carlo-based model can be a valuable tool for rattan business owners and policymakers to support informed planning and mitigate risks.

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1. INTRODUCTION

The rattan craft industry in Cirebon Regency is a leading sector that has made a significant contribution to the local economy, particularly since the development of Tegalwangi Village as a rattan industry centre in the 1970s [1], [2]. However, the industry continues to face serious challenges that threaten its sustainability, including unstable production levels, fluctuating raw material prices, and unpredictable market demand. These problems result in considerable uncertainty in business income and profitability [1]. The lack of an effective quantitative forecasting model makes it difficult for entrepreneurs and policymakers to anticipate risks and design adaptive strategies. Therefore, a systematic understanding of how internal and external factors affect business performance is urgently needed to maintain the sustainability of the rattan industry in Cirebon.

The dynamics of government policy on the trade of raw rattan have further exacerbated the instability of supply [1]. In addition, small and medium-sized enterprises (UMKM) in this sector face capital constraints and low technology adoption, which hinder production capacity expansion [3]. The decline in interest among the younger generation to engage in this industry has also led to a shortage of skilled labour, which is essential for business continuity. Previous studies have demonstrated that capital, labour, and technology have a substantial impact on the profitability of the rattan industry, whereas product variety and digital marketing strategies have yielded limited results [2]. Under these conditions, an analytical approach is needed that can simultaneously map the effects of production, raw material prices, and market demand on business income. The Monte Carlo algorithm approach is considered relevant because it can describe scenarios of uncertainty probabilistically [4]. Although this method has been widely used in the manufacturing and retail sectors, its application in the context of UMKM based on natural materials such as rattan is still very rare [3]. This rarity highlights the research gap between the growing complexity of the rattan market and the limited use of quantitative modelling in supporting decision-making among small-scale entrepreneurs. This indicates a gap between the complexity of the rattan industry market and the need for adaptive quantitative methods in strategic revenue planning [2].

To address these challenges, this research applies a Monte Carlo simulation approach to model revenue uncertainty in the rattan business. The author's main insight lies in the use of stochastic modelling to simulate thousands of possible financial outcomes under varying market conditions, providing a more accurate and data-driven understanding of business risk. By doing so, the study aims to bridge the gap between theoretical risk modelling and its practical application in small- and medium-sized industries. This approach has been proven effective in other industrial contexts, such as in reducing the bullwhip effect in the steel industry by Trenggonowati et al. [4] and inventory planning in the retail sector by Montororing and Widyantoro [5]. The objective of this study is to analyse how production quantity, raw material cost, and market demand influence business revenue and profitability using the Monte Carlo algorithm. The model aims to support decision-making processes by providing probabilistic projections rather than deterministic estimates, enabling stakeholders to better prepare for market volatility. In this way, the research not only provides an analytical framework but also delivers a practical tool that business actors can directly implement to anticipate financial risks.

Research shows that probabilistic simulation methods are effective for modelling uncertainty. The use of simulation can improve the accuracy of economic decision-making [6], [7] and also emphasises that Monte Carlo algorithms are widely used methods for modelling risk and financial projections, taking into account various possible scenarios [8]. On the other hand, Monte Carlo is effective in the manufacturing sector for estimating income uncertainty. However, the application of this method in the rattan business is still limited [3]. This limitation presents an opportunity to adapt the Monte Carlo method to the specific characteristics of creative industries that rely on natural materials, where price volatility and demand fluctuations are significantly higher than in conventional industries.

Monte Carlo algorithms have been widely used in various industrial contexts, such as to reduce the bullwhip effect in the steel industry supply chain [4] and in retail sector inventory planning [3]. This approach has proven effective in managing uncertainty and demand variability, but its application in the rattan craft sector—especially in Cirebon—is still very limited. In fact, the rattan industry has unique characteristics, such as high dependence on natural raw material supplies and fluctuations in export market demand, which make it vulnerable to uncertainty [9]. The main advantage of this study lies in the application of the Monte Carlo simulation method, which is specifically tailored to the context of rattan craft UMKM. Unlike previous studies that tended to focus on one or two variables, this study simultaneously integrates production, raw material prices, and demand variables into a single predictive model. This integration enables a more comprehensive analysis of revenue projections, while also providing an overview of the sensitivity to changes in each variable. This model was not only developed for academic purposes but also designed to be used directly by UMKM actors, ensuring the results are applicable and relevant to the reality of business in the field. As emphasised by Gunawan and Nugroho [10], UMKM needs an income model that is responsive to the dynamics of supply and demand. Thus, this study not only fills the literature gap in the application of Monte Carlo in the natural material-based creative economy sector but also makes a real contribution to improving the competitiveness and sustainability of the rattan industry in Cirebon. Consequently, this research positions itself as both a theoretical and practical contribution, offering empirical insights that align with current industrial challenges and policy directions.

The novelty of this study is in applying the Monte Carlo algorithm within the rattan industry, an area that has received little attention. Besides offering more precise revenue forecasts, this research also supports the development of data-driven decision models for creative industries that rely on natural resources. It is expected that the findings will not only provide a deeper understanding of the relationships among production, cost, and demand but also generate actionable insights for improving profitability and financial resilience. In the long term, this research could serve as a foundation for developing intelligent decision-support systems that integrate simulation with predictive analytics, thereby enhancing the competitiveness and sustainability of Indonesia's rattan industry [11]. Ultimately, the study contributes to the advancement of quantitative modelling in Indonesia's creative economy, reinforcing the importance of scientific approaches in achieving sustainable business growth.

2. METHOD

The author employed the descriptive-analytic method as the research approach in this study. This method involves systematically analysing and describing the characteristics, patterns, and relationships within the observed data. The descriptive analysis aims to characterise, explain, or describe the subject or object under study, such as an institution, society, or specific phenomenon, based on naturally or precisely obtained information [12]. In the context of this research, the descriptive-analytic approach is employed to capture the complexity of the rattan business ecosystem, combining both qualitative field observations and quantitative data analysis. This approach ensures that the model developed not only reflects theoretical constructs but also represents actual business conditions in Cirebon.

This study was systematically developed to address the challenge of forecasting revenue in the rattan business sector in Cirebon, utilising a Monte Carlo algorithm in conjunction with multivariate regression and sensitivity analysis. The methodology was structured into five interrelated stages that contributed to achieving the intended outcomes. Please observe the following image. Each stage was designed to build upon the previous one, forming a coherent research workflow that ensures both analytical depth and empirical reliability. The integration of Monte Carlo simulation with regression and sensitivity analysis enables the research to quantify uncertainty while maintaining contextual relevance for decision-making in UMKM.

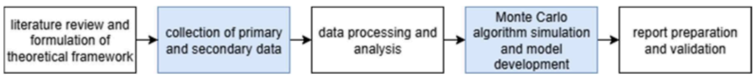

Figure 1. Research Method Flowchart

The first step is collecting empirical data on production, raw material prices, and demand for rattan products [13]. The data is obtained through field surveys of local businesses and supplemented with secondary data from government agencies and industry associations. The result is a comprehensive and valid dataset that can serve as the basis for a simulation model. This activity is conducted by a team of researchers in collaboration with industry partners to ensure the relevance and representativeness of the data. Data analysis is a method of processing data into information to help understand data characteristics and solve problems, especially those related to research [14]. In this phase, emphasis is placed on data validity, accuracy, and diversity of sources, since the robustness of the Monte Carlo model highly depends on the quality of empirical inputs. By combining primary and secondary data, the research achieves a balance between field realities and statistical requirements for simulation modelling.

The second stage involves developing a Monte Carlo algorithm model to map the uncertainty of the three main variables on business income. The probability distribution of each variable is calibrated using a multivariate regression approach as the initial estimation model. Validation is carried out through backtesting techniques using historical data from the past five years. This stage is handled by team members who are competent in statistical programming and data processing using R/Python [15]. This modelling phase ensures that each input variable follows a realistic probability distribution, allowing the simulation to capture a wide range of possible business outcomes. Furthermore, the use of regression analysis helps to identify interdependencies between variables before performing stochastic simulations, enhancing the overall predictive accuracy of the model.

The third stage involves conducting a sensitivity analysis to identify the variables that have the most significant impact on revenue. Validation is conducted through discussions with industry players to ensure the model's applicability in practice [16]. The outputs from this stage include a sensitivity report and simulation-based revenue risk mitigation strategies. The sensitivity analysis serves as an interpretive bridge between statistical results and managerial insights, allowing researchers to translate numerical outputs into practical recommendations. The interactive validation with business practitioners strengthens external validity and ensures that the simulation model is not only statistically sound but also operationally beneficial.

The fourth stage involves implementing Focus Group Discussions (FGDs) with rattan business actors and academics. FGDs are used to test the feasibility of the model and develop adaptive and applicable risk management strategies. This method adapts an approach that has proven successful in various sectors. Trenggonowati et al. [4] employed a Monte Carlo simulation to mitigate the bullwhip effect in the steel industry. Montororing and Widyantoro [5] used it in retail inventory planning. Applied it to project the income of furniture Micro, Small, and Medium Enterprises (UMKM) [17], [18]. Through FGDs, the research obtains qualitative validation that complements quantitative testing, ensuring the proposed model reflects the operational realities faced by local UMKM. This participatory step not only refines the simulation results but also promotes knowledge transfer among stakeholders, fostering collaborative problem-solving for industry improvement.

The methodology employed in this study utilises a Monte Carlo Simulation stage for production, cost, and demand analysis [18]. The stages involved in data processing within the Monte Carlo method are illustrated in the research framework presented in Figure 2.

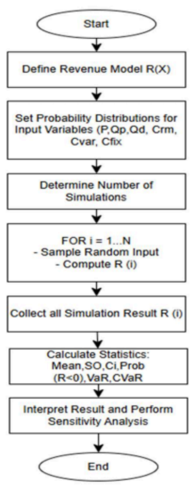

Figure 2. Monte Carlo Simulation

Before analysing the Monte Carlo model, it is essential to understand the concept of income. In the context of the rattan business, revenue is influenced by product selling prices, production capacity, market demand, and the prices of raw materials. The net income function can be written as:

$R = P.\min(Q_p, Q_d) - (C_{rm}.Q_p + C_{var}.Q_p + C_{fix})$ (1)

With:

P = selling price per unit (IDR/unit)
Q_p = production capacity (units),
Q_d = market demand (units),
C_{rm} = raw material price per unit of production (IDR/unit),
C_{var} = variable cost per unit,
C_{fix} = fixed cost.

Similar models have been widely used in simulation-based revenue analysis in the manufacturing industry [19].

The Monte Carlo Algorithm Steps:

The Monte Carlo algorithm for rattan income projections is carried out using the following steps [20], [21]:

Determine the mathematical model R(X) from the input variables
Determine the probabilistic distribution for each input variable
Determine the number of simulations N (for example, 10,000)
Perform random sampling of input variables according to the specified distribution
Calculate the output $R^{(i)}$ for each iteration
Estimate the mean, standard deviation, quantiles, probability of loss, and Value-at-Risk (VaR)

Simulation Statistics Formula

Estimated average output:

$$\hat{\mu}_R = \frac{1}{N}\sum_{i=1}^{N} R^{(i)} \tag{2}$$

Output variance estimation:

$$\hat{\sigma}_R^2 = \frac{1}{N-1}\sum_{i=1}^{N} \left(R^{(i)} - \hat{\mu}_R\right)^2 \tag{3}$$

Probability of loss:

$$\widehat{P}(R < 0) = \frac{1}{N}\sum_{i=1}^{N} \mathbf{1}\{R^{(i)} < 0\} \tag{4}$$

According to Glasserman [22], the greater the value of N, the closer the simulation results will be to the actual distribution (based on the law of large numbers). Therefore, the selection of the number of simulations must consider both the level of accuracy and the available computational resources.

Variable Correlation Handling

If there is a correlation between variables, for example, between raw material prices and variable costs, the Cholesky transformation approach can be used [23]. This transformation ensures that the simulation results reflect the actual correlation between input variables.

Pseudocode

```
Input: distribusi untuk P, Qp, Qd, Crm, Cvar, Cfix; N

FOR i = 1 to N:
   sample P_i ~ dist_P
   sample Qp_i ~ dist_Qp
   sample Qd_i ~ dist_Qd
   sample Crm_i ~ dist_Crm
   compute sold_i = min(Qp_i, Qd_i)
   compute Revenue_i = P_i * sold_i
   compute Cost_i = Crm_i * Qp_i + Cvar * Qp_i + Cfix
   compute R_i = Revenue_i - Cost_i
END FOR

Compute mean_R = average(R_i)
Compute sd_R = std(R_i)
Compute percentiles (5%, 50%, 95%) from the empirical distribution
Compute P_loss = count(R_i < 0) / N
Compute CI_mean = mean_R ± z * sd_R / sqrt(N)

(Optional) Run sensitivity analysis: compute corr(input_j, R) for each input_j
```

3. RESULTS AND DISCUSSION

This section presents the results obtained from the Monte Carlo simulation applied to the rattan business model, which integrates production capacity, raw material prices, and market demand as primary determinants of revenue. The findings are discussed comprehensively to highlight not only the quantitative outcomes but also the implications of these results in the context of business decision-making. By systematically analysing the simulated profit distribution, sensitivity of input variables, and risk probabilities, this section provides deeper insights into the financial performance and sustainability of the rattan industry.

The results are further interpreted in relation to existing theories and empirical studies, ensuring that the discussion bridges numerical evidence with managerial implications. Each result is explained with an emphasis on practical relevance, demonstrating how changes in raw material prices, production levels, and demand fluctuations directly impact profitability. The discussion also highlights the strategic value of Monte Carlo simulation in forecasting uncertainties, providing rattan entrepreneurs with a structured framework to anticipate risks and optimise decision-making.

3.1. Results

The analysis in this study is based on a synthetic dataset specifically constructed to represent the dynamics of the rattan business. The dataset consists of six key variables, namely selling price, production quantity, market demand, raw material cost, other variable costs, and fixed costs. A total of 1000 data entries were generated to simulate realistic variations in production capacity, demand fluctuations, and cost structures. These variables were chosen because they directly influence business revenue and profitability, thereby serving as the foundation for the Monte Carlo simulation. The dataset provides a representative scenario for analysing uncertainty and risk in rattan business operations, enabling the model to capture possible outcomes under various market and production conditions.

Table 1. Dataset: The Rattan Business

No	Selling Price	Production Qty	Market Demand	Raw Material Cost	Other Var Cost	Fixed Cost
1	154967	915	953	56150	6224	20000000
2	148617	891	887	53519	11349	20000000
3	156476	1029	1047	57719	6238	20000000
4	165230	1046	1201	60907	5705	20000000
5	147658	850	718	62975	14094	20000000
...	...	...	...	...	...	...
996	147188	949	902	58366	14158	20000000
997	167976	928	819	54787	10028	20000000
998	156408	1003	843	54138	12951	20000000
999	144288	820	926	62321	6357	20000000
1000	155725	824	947	57247	14774	20000000

The dataset used in this study comprises 1,000 records, each representing a potential observation of the rattan business operation under varying market and production conditions. The dataset was generated synthetically to ensure sufficient variability and to capture the uncertainties typically found in real-world scenarios. Each record includes six key attributes that serve as the foundation for the Monte Carlo simulation:

1. Selling Price—Represents the unit selling price of rattan products (in Indonesian Rupiah). This attribute reflects fluctuations in market price influenced by demand, product quality, and external market factors.
2. Production Qty – Denotes the quantity of rattan produced within a certain period. This field captures variations in production capacity resulting from variations in resource availability, labour efficiency, and operational constraints.
3. Market Demand – Refers to the estimated demand for rattan products in the market. The variability in this field reflects consumer preferences, seasonal fluctuations, and market competition.
4. Raw Material Cost—Indicates the cost of raw rattan material per unit. This attribute is highly sensitive to supply chain conditions, availability of raw materials, and external economic factors.
5. Other Variable Cost—Represents additional variable costs, such as transportation, packaging, and labour expenses, per unit. This ensures that non-material production costs are incorporated into the revenue model.

6. Fixed Cost—Refers to fixed operational costs such as rent, machinery depreciation, and administrative expenses. In this dataset, fixed cost is set as a constant value across all records to represent a stable overhead condition.

Together, these six attributes form the basis for analysing business profitability. By simulating across 1,000 possible scenarios, the dataset allows the Monte Carlo algorithm to capture the impact of uncertainties in production, costs, and demand on revenue projections, thereby providing a comprehensive view of potential risks and opportunities in the rattan business.

Table 2. Monte Carlo Algorithm Simulation Result

Statistic	Revenue (Rp)	Profit (Rp)
Count	10,000	10,000
Mean	140,424,500,000	50,360,210,000
Std	17,163,440,000	17,086,940,000
Min	76,279,220,000	–21,388,560,000
25% (Q1)	129,515,000,000	40,586,900,000
50% (Median)	140,209,500,000	51,375,860,000
75% (Q3)	151,892,300,000	61,763,290,000
Max	202,893,500,000	105,805,500,000

The figure shows the summary statistics of the Monte Carlo simulation results for two key variables, revenue and profit, based on 10,000 iterations. From the revenue table column, we can see that:

1. Mean: Rp 140,424,500,000, which indicates the average projected revenue of the rattan business.
2. Standard Deviation (Std): Rp 17,163,440,000, which indicates a relatively large variability in revenue due to fluctuations in selling price, production, and demand.
3. Minimum: Rp 76,279,220,000, which indicates the lowest revenue observed in the worst-case scenario.
4. Maximum: Rp 202,893,500,000, which indicates the highest revenue observed in the best-case scenario.
5. 25% (Q1): Rp 129,515,000,000, which indicates 25% of the simulations yielded revenue below this value.
6. 50% (Median): Rp 140,209,500,000, which indicates half of the simulations produced revenue below this point.
7. 75% (Q3): Rp 151,892,300,000, which indicates 75% of the simulations produced revenue below this point.
8. This implies that most revenue values fall between Rp 129 billion and Rp 151 billion, with an average of Rp 140 billion.

Moreover, from the profit table column, we can see that:

1. Mean: Rp 50,360,210,000, which indicates the average net profit after accounting for costs.

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2. Standard Deviation (Std): Rp 17,086,940,000, which indicates a high level of uncertainty in profit outcomes.
3. Minimum: Rp 21,388,560,000, which indicates that in the worst-case scenario, the business could face financial losses.
4. Maximum: Rp 105,805,500,000, which indicates that, in the best-case scenario, the business could achieve very high profits.
5. 25% (Q1): Rp 40,586,900,000, which indicates 25% of simulations yielded profit below this value.
6. 50% (Median): Rp 51,375,860,000, which indicates half of the simulations produced profit below this point.
7. 75% (Q3): Rp 61,763,290,000, which indicates 75% of simulations produced profit below this point.
8. This suggests that most profit values lie between Rp 40 billion and Rp 61 billion, with an average of Rp 50 billion. However, there is still a possibility of incurring losses up to Rp 21 billion.

The results indicate strong profit potential, with an average net profit of approximately Rp 50 billion. Risk still exists, as indicated by the negative minimum profit value. The Monte Carlo simulation provides not only the expected outcomes but also a probabilistic view of risks and opportunities, helping business owners anticipate variability in demand, production, and costs.

Figure 3. Profit Distribution

The histogram illustrates the profit distribution generated from the Monte Carlo simulation of the rattan business model. The results demonstrate a bell-shaped distribution, indicating that most profit outcomes are concentrated around the mean. The average profit is approximately Rp 50.2 billion, as represented by the red dashed line in the centre. The simulation reveals that under the best-case scenario, profit can reach up to Rp 76.1 billion, while in the worst-case scenario, profit may decline to around Rp 19.5 billion. The spread of the distribution highlights the variability and uncertainty in the business, with the majority of outcomes falling within a relatively stable range. This finding emphasises that, while the business shows strong profit potential on average, managers must remain cautious of downside risks that could still result in significantly lower profitability under unfavourable conditions. The Monte Carlo results serve as a practical decision-support tool, enabling business stakeholders to balance risk and reward while planning for sustainable long-term profitability.

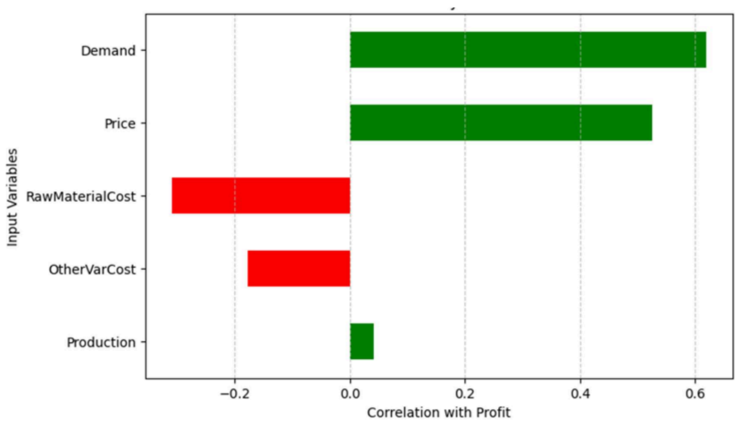

Figure 4. Sensitivity of Variables on Profit

The sensitivity analysis chart illustrates the correlation between input variables and profit outcomes in the rattan business simulation. Among the factors considered, market demand shows the strongest positive correlation with profit (around 0.62), indicating that higher consumer demand significantly boosts profitability. Similarly, selling price demonstrates a strong positive correlation (approximately 0.52), meaning that increases in product prices directly enhance profit margins. On the other hand, production quantity has only a minor positive correlation, suggesting that while production volume contributes to profit, its impact is relatively limited compared to demand and price.

Conversely, raw material costs exhibit a notable negative correlation (around –0.28), highlighting their role as a critical risk factor. Rising raw material prices directly reduce profit levels, underscoring the importance of cost control and effective supplier management. Other variable costs also negatively affect profitability, albeit to a lesser degree. Together, these findings suggest that strategic efforts should prioritise expanding demand and optimising pricing strategies, while also implementing measures to mitigate fluctuations in raw material costs. This balance between revenue drivers and cost risks is essential for achieving sustainable profitability in the rattan business.

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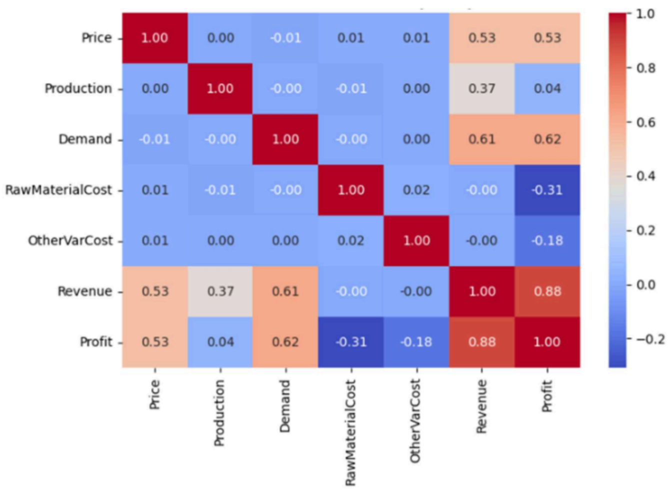

Figure 5. Correlation Matrix

Figure 5 represents a correlation heatmap that illustrates the relationships between various input and output variables in the dataset. Profit has the strongest positive correlation with revenue (r = 0.88), as expected, since revenue directly contributes to profit. Demand (0.62) and price (0.53) also exhibit strong positive correlations with profit, indicating that higher market demand and selling prices significantly enhance profitability. On the other hand, raw material cost (-0.31) and other variable costs (-0.18) display negative correlations with profit, highlighting that increased costs reduce overall profitability. These findings confirm the critical role of market demand and cost efficiency in determining financial performance, aligning with earlier Monte Carlo simulation results.

3.2. Discussion

Based on the results of Monte Carlo simulations of rattan business profitability, it can be concluded that external and internal factors greatly influence profit variability. From an external perspective, demand has the most dominant positive effect on profit, with a correlation value of 0.64. This means that an increase in demand significantly drives an increase in profit. This finding aligns with research by Mardiah, which suggests that market demand is the primary driver of sustainable profitability in the creative industry in Indonesia [24]. The raw material cost has the strongest negative influence, with a correlation coefficient of -0.29. This condition shows that an increase in raw material prices can significantly reduce profit margins. This finding is consistent with the results of research by Prihatini, which showed that fluctuations in raw material prices in the manufacturing sector significantly contribute to income uncertainty [25]. Therefore, cost management strategies and diversification of raw material sources are essential to reduce the risk of loss. This variation in results confirms that the Monte Carlo method is effective in providing a quantitative picture of potential risks and profitability opportunities [18]. The results also strengthen the theoretical assumption that market behaviour and input cost volatility jointly determine the resilience of small-scale industries. By translating these patterns into probabilistic outputs, the Monte Carlo model demonstrates its capacity to visualise uncertainty in measurable terms, thereby offering empirical evidence that supports the use of quantitative simulation in strategic business planning.

The discussion as a whole confirms that balancing increased market demand and controlling raw material costs is key to improving the financial performance of rattan businesses. The application of simulation-based analysis, such as Monte Carlo, not only provides more realistic projections but also helps management in designing appropriate risk mitigation strategies. In practical terms, this approach allows decision-makers to anticipate multiple market scenarios, evaluate financial outcomes under different conditions, and develop adaptive pricing or procurement strategies. Furthermore, the findings emphasise the importance of integrating simulation tools into policy formulation for UMKM, ensuring that interventions are evidence-based and data-driven. By connecting numerical analysis with managerial implications, this study makes a significant contribution to both the academic literature and real-world applications in creative and natural-resource-based industries.

4. CONCLUSION

This research provides a comprehensive understanding of how uncertainty in production, raw material prices, and market demand affects the financial performance of the rattan industry, using a Monte Carlo simulation. The model offers a probabilistic approach that allows business owners to anticipate profit variability and make more informed decisions under uncertain conditions. The primary implication of this study is that it bridges the gap between theory and practice by transforming abstract financial risks into measurable probabilities, thereby supporting both entrepreneurs and policymakers in designing effective strategies for sustainable business operations.

Despite its usefulness, this study has certain limitations, particularly the reliance on simulated data and the exclusion of external macroeconomic factors such as government policies and export market conditions. Future research should incorporate broader datasets, real-time business information, and hybrid analytical models, such as integrating Monte Carlo simulation with artificial intelligence or optimisation algorithms to improve predictive accuracy. The findings of this study contribute to the general public by promoting evidence-based decision-making in small and medium enterprises, offering a replicable framework that can enhance resilience and competitiveness in other industries facing similar market uncertainties.

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REFERENCES

[1] V. A. Islamy, "Pasang Surut Sentra Industri Kerajinan Rotan di Desa Tegalwangi Kecamatan Weru Kabupaten Cirebon dan Pengaruhnya Terhadap Kehidupan Sosial Ekonomi Masyarakat di Sekitarnya Tahun 1973-2017," UNDIP, 2019.

[2] V. A. Islamy and D. Yuliati, "The Ups and Downs of Rattan Handicraft Industrial Centers in Tegalwangi Village 1973-2017," *Paramita: Historical Studies Journal*, vol. 31, no. 1, pp. 56–63, Mar. 2021, doi: 10.15294/paramita.v31i1.23327.

[3] B. Przysucha, P. Bednarczuk, W. Martyniuk, E. Golec, M. Jasienski, and D. Pliszczuk, "Monte Carlo Simulation as a Demand Forecasting Tool," *EUROPEAN RESEARCH STUDIES JOURNAL*, vol. XXVII, no. Special Issue A, pp. 103–113, May 2024, doi: 10.35808/ersj/3391.

[4] Dyah Lintang Trenggonowati, M. Ulfah, A. Ridwan, and R. Arthafia, "Proposed Improvement on Supply Chain System to Minimize The Bullwhip Effect Phenomenon with Monte Carlo Simulation Approach," *Journal of Innovation and Technology*, vol. 2, no. 2, pp. 40–45, Oct. 2021, doi: 10.31629/jit.v2i2.3854.

[5] Y. D. R. Montororing and M. Widyantoro, "Model of Inventory Planning Using Monte Carlo Simulation in Retail Supermarket with Consider To Competitors and Stimulus Strategies," *Journal of Applied Engineering and Technological Science (JAETS)*, vol. 4, no. 1, pp. 342–350, Nov. 2022, doi: 10.37385/jaets.v4i1.1093.

[6] C. W. Oktavia and A. Sugioko, "Analisis Peramalan Dengan Simulasi Monte Carlo dan Implementasi Pengendalian Persediaan Gula Berdasarkan EOQ," *Jurnal METRIS*, vol. 23, no. 01, pp. 62–67, Aug. 2022, doi: 10.25170/metris.v23i01.3526.

[7] R. Pindyck and D. Rubinfeld, *Microeconomis*, 9th ed. Essex: Pearson Education Limited, 2018.

[8] A. M. Law, *Simulation Modeling and Analysis*. New York: McGraw Hill, 2014.

[9] H. A. Hakim, A. Mawadati, and C. I. Parwati, "Pengendalian Persediaan Bahan Baku Pembuatan Kaos Menggunakan Pendekatan Simulasi Monte Carlo Dan Min-Max Pada Konveksi Jaguar Screen Printing," *Journal of Engineering Environtmental Energy and Science*, vol. 3, no. 2, pp. 67–72, Jun. 2024, doi: 10.31599/s662th18.

[10] B. E. Cahyono, A. T. Nugroho, and I. W. Maulinida, "Klasifikasi Jenis Biji Kopi dengan Menggunakan Metode Gray Level Co-occurrence Matrix (GLCM)," *TEKNOTAN*, vol. 16, no. 3, p. 191, Mar. 2023, doi: 10.24198/jt.vol16n3.9.

[11] OECD, *Global value chains and UMKM in the creative industries*. Paris: OECD Publishing, 2020.

[12] M. Erwanto, K. Kosim, N. B. Riyanto, and S. B. Jogo, "Decision Tree Methodology (C4.5) for Predicting Students' Reading Interest in the Library SMK Negeri 1 Kota Cirebon," *Journal of Mathematics Instruction, Social Research and Opinion*, vol. 4, no. 1, pp. 195–204, Mar. 2025, doi: 10.58421/misro.v4i1.359.

[13] M. Elghamry, "The Role of Raw Material Price Fluctuations on Organizations' Financial Performance," Oct. 2023.

[14] M. Erwanto and M. R. Aziat, "Metode K-Nearest Neighbors Untuk Prediksi Penjualan Suku Cadang (Sparepart) Motor Honda," *INFOKOM*, vol. 17, no. 2, pp. 8–18, 2024.

[15] A. Kamel, M. Elwageeh, S. Bonduà, and M. Elkarmoty, "Evaluation of mining projects subjected to economic uncertainties using the Monte Carlo simulation and the binomial tree method: Case study in a phosphate mine in Egypt," *Resources Policy*, vol. 80, p. 103266, Jan. 2023, doi: 10.1016/j.resourpol.2022.103266.

[16] K. R. Penggalih and N. Wahyuhastuti, "Analisis Faktor-Faktor Yang Mempengaruhi Produksi Industri Kerajinan Rotan Di Desa Teluk Wetan Kecamatan Welahan Kabupaten Jepara," *Jurnal Spirit Edukasia*, vol. 1, no. 1, pp. 54–66, 2021.

[17] Y. Hendra, A. E. Syaputra, and A. P. Juledi, "Simulasi dalam Pengoptimalan Peningkatan Penjualan Kue Kareh," |*Journal Computer Science and Information Technology*, vol. 7, no. 1, pp. 107–118, 2023.

[18] D. Yuliana and P. Purjumatin, "Simulasi Monte Carlo dalam Memprediksi Tingkat Lonjakan Penumpang di Bandara Internasional Minangkabau," *JOURNAL OF SCIENCE AND SOCIAL RESEARCH*, vol. 8, no. 3, p. 4135, Aug. 2025, doi: 10.54314/jssr.v8i3.4151.

[19] Y. Su *et al.*, "Retrospect driving forces and forecasting reduction potentials of energy-related industrial carbon emissions from China's manufacturing at city level," *Environmental Research Letters*, vol. 15, no. 7, p. 074020, Jul. 2020, doi: 10.1088/1748-9326/ab858b.

[20] A. P. Nurhalizah and A. Ariesta, “Monte Carlo Simulation for Seasonal Stock Prediction of Seasoning at AH FOOD,” *Jurnal Algoritma*, vol. 22, no. 1, pp. 149–160, May 2025, doi: 10.33364/algoritma/v.22-1.2191.

[21] D. P. Kroese, T. Brereton, T. Taimre, and Z. I. Botev, “Why the Monte Carlo method is so important today,” *WIREs Computational Statistics*, vol. 6, no. 6, pp. 386–392, Nov. 2014, doi: 10.1002/wics.1314.

[22] P. Glasserman, *Monte Carlo Methods in Financial Engineering*, vol. 53. in Stochastic Modelling and Applied Probability, vol. 53. New York, NY: Springer New York, 2003. doi: 10.1007/978-0-387-21617-1.

[23] A. J. McNeil, R. Frey, and P. Embrechts, *Quantitative Risk Management*. New Jersey: Princeton University Press, 2005.

[24] Ainil Mardiah, Johni Eka Putra, Tio Devilishanti, Luthfi Nuraini, and Muh. Aksa, “Analisis Faktor-faktor yang Mempengaruhi Keberlanjutan Usaha Mikro Kecil dan Menengah (UMKM) yang Didirikan oleh Mahasiswa,” *El-Mal: Jurnal Kajian Ekonomi & Bisnis Islam*, vol. 6, no. 1, Jan. 2025, doi: 10.47467/elmal.v6i1.6427.

[25] R. Prihatni and I. G. K. A. Ulupui, “The effect of raw material supply and production costs on the profit of manufacturing companies listed on the Indonesia Stock Exchange,” *Accounting*, vol. 11, no. 2, pp. 145–150, 2025, doi: 10.5267/j.ac.2025.2.001.

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