Modern Portfolio Theory and Forecast Implementation Using Monte Carlo Simulation in Automotive Financing Company

Review of Integrative Business & Economics Research

Rian Fajartama
School of Business and Management, Institut Teknologi Bandung

Taufik Faturohman*
School of Business and Management, Institut Teknologi Bandung

ABSTRACT

Automotive is a product that can support Indonesia's economic improvement and increase Indonesian's society productivity. The role of multi-finance companies is vital for a consumer to own a vehicle. A high efficiency is important for financing companies to remain stable in the Covid-19 era, with the financing portfolio management as one of the vital aspects. Through the Risk and Return concept, it can be determined whether a risk level is acceptable or what action must be taken to determine the trade-off between risk and return. Through Markowitz's Modern Portfolio Theory, an optimal portfolio composition is also developed. This research aims to find and analyze optimal portfolio compositions for the Indonesian Automotive Financing Company. The study used annual return data over the 2019-2020 period along with the standard deviations. The probability of an optimum yield is simulated using Monte Carlo Simulation with 10,000 trials. The minimum target yield is determined using the existing yield. Two kinds of simulations are conducted to find the maximized return portfolio and the minimized risk portfolio to avoid Covid-19 economic conditions risk. Monte Carlo Simulation and Markowitz's Methods are reliable for forecasting financing portfolio composition and determining the best composition.

Keywords: Modern Portfolio Theory, Monte Carlo Simulation, Financing Company, Automotive.

1. INTRODUCTION

Automotive is a product that supports the economic improvement in Indonesia, especially in the motorcycle and car segments, which can increase the productivity of Indonesian society to improve their economy. Sales of motorized vehicles themselves have decreased in 2020, whether motorcycles or cars. The Association of Indonesia Car Automotive Industries (GAIKINDO) data shows a decrease in car sales by 44.65% compared to 2019 from 1,045,717 down to 578,762 units. Meanwhile, the Association of Indonesia Motorcycle Automotive Industries (AISI) data shows a decrease in motorcycle sales by 43.5% compared to 2019 from 6,487,460 down to 3,660,616 units.

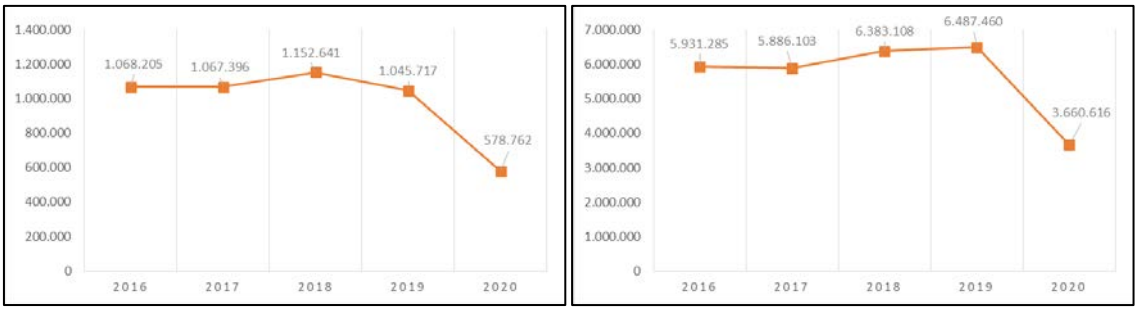

Figure 1. Indonesian Car & Motorcycle Sales 2016-2020
(Source: GAIKINDO & AISI)

Along with those automotive product declining sales, The Indonesian Financial Services Authority (OJK, 2021) stated that 25% of multifinance companies in Indonesia are in crisis due to decreased returns. Cost reduction and optimization between risk and return are essential for financing companies to remain stable. Referring to data from the Indonesian Financial Services Authority (OJK), the average multifinance industry is already doing efficiently on their cost by reducing marketing costs by 25.83% YoY as of September 2020, following rental costs fell 23.61% and administrative and general costs also reduced by 6.48%. Each company performs cost reduction, but it depends on the form of the organization, the condition of the company, and the strength of the company funding.

With the decline in vehicle sales, it will undoubtedly decrease the sales of credit products from the multifinance company itself, reducing their income. Indonesian Automotive Multifinance Company (not the real name) is a multifinance company being researched that experienced a decline in sales in 2020 compared to the previous year. The company then has also attempted to increase sales. Efforts to increase sales were made by making breakthroughs through digital technology, which is by creating an Online Autoshow that consumers can visit online to be in line with the implementation of the Large Scale Social Restrictions in this Covid-19 pandemic era, by then the company can effectively offer its wide range of products that are classified in eight portfolios. Apart from Online Autoshow's breakthrough, the company has also begun to maximize sales again in the typical selling method. However, it is also necessary to search for a way to increase profit by considering its portfolio composition's best return and risk levels.

2. LITERATURE REVIEW

2.1. Risk and Return

Risk can be described as the variability of returns associated with a given asset. The return itself is the outcome value of investment whether it is gain or loss in a particular period. Generally, return consists of income and capital gains of an investment, and it is usually stated in a percentage number. (Gittman, 2012)

Relationship between risk and return is aligned, where when the risk level of investment is higher, it can produce a higher rate of return as well. Conversely, when the risk level of investment is lower, the rate of return obtained may be lower. In order to get a large profit, the investor must take a certain level of risk. The main responsibility function of risk

management is to understand the level of risk of each portfolio currently carried out by the company so that it can make a good plan for the future. The acceptance level of the risk must be concluded, and an action plan to do in the future. A trade-off concept between risk and return is needed, which is between the risk level and the expected return.

2.2 Credit Financing

Credit financing is a transaction between two parties in which the creditor or lender supplies money, goods, services, or securities in return for a promised future payment by the selected debtor or borrower in some period time agreed by the two parties. Credit transactions normally include the payment of the creditor services in a form of interest to the lender with the agreed mechanism between the two parties before the credit is started. Credit may be extended by public or private institutions to finance personal activities, business activities, agricultural operations, consumer expenditures, or government projects.

2.3 Modern Portfolio Theory

Modern Portfolio Theory (MPT) or analysis of mean-variance is a mathematical framework theory about how risk-averse investor, who prefer a less risky portfolio to a riskier one for a given level of return, can arrange investment portfolios to maximize expected return based on a given level of risk which is defined as variances. MPT shows that an investor can arrange a portfolio of multiple assets that will maximize returns with some level of risk. In other ways, with the desired level of expected return, an investor can arrange a portfolio with the lowest risk possible.

An efficient frontier of optimal portfolios can be developed along with the MPT theory. Efficient frontier offering the maximum possible expected return for a level of risk. MPT is also called portfolio theory or portfolio management theory developed by Harry Markowitz, an economist who introduced MPT in 1952, which awarded him a Nobel Prize in economics. Lately, mean-variance optimization is the primary technique applied by hedge funds and pension funds for managing portfolio diversification. MPT theory is used in this research because the theory could give an illustration about the trade-off between risk and return of the chosen portfolio composition using the efficient frontier diagram.

2.4 Monte Carlo Simulation

The term Monte Carlo came from a conversation between two mathematicians employed by Los Alamos National Laboratory as a code word for their secret work on the atomic bomb (Macrae 1992). John von Neumann and Stanislaw Ulam applied Monte Carlo methods to some problems involving direct simulation of behavior concerned with random neutron diffusion in fissionable material (Rubinstein 1981). The name was inspired by the similarity of the computer-generated results of these methods to the action of the gambling devices used at the casinos of Monte Carlo in Monaco. The term is getting popular and now is widely used in finance, engineering, and science.

Monte Carlo methods are based on an analogy between probability and volume. The idea is packed in the following method for calculating the volume of the unit circle. General Monte Carlo methods are primarily known for the possibility of picking many random variables

from a set of probability distributions. But then this concept grew to be able to simulate almost any distribution can be simulated from a uniform distribution. (Haft, 2014:1)

3. RESEARCH METHODOLOGY

Research methodology or a research framework represents the researcher's synthesis of the literature on how to explain the research. It maps out the actions required in the process of the study given his previous knowledge of other researcher's points of view and his observations on the subject of research (Regoniel, 2015). The methodology is defined in this research as a flow process in order to solve the problem that starts from business issues that occur, business analysis, optimization to solve the issue with the used method until proposed the business solution and business implementation plan to implement the solution. The details of the methodology can be seen in the figure below.

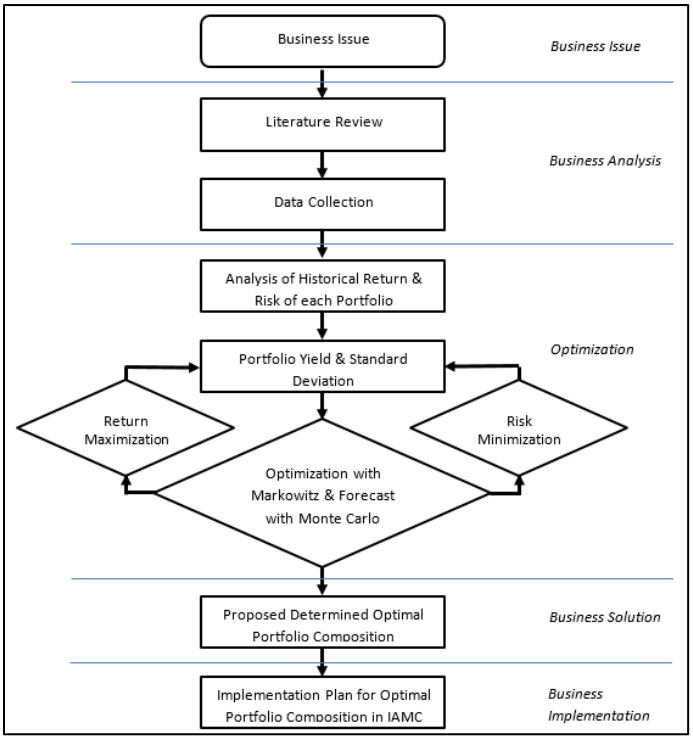

Figure 2. Research Methodology

3.1 Risk And Return

In order to quantify the risk, there is an approach that is commonly used, namely the standard deviation of a return in one year with the following formula.

$$\sigma = \sqrt{E(R^2) - [E(R)]^2)}$$

Where,
R is the annual return.
E is a symbol of expected value so that E (R) can be said to be the annual expected return.

The expected return is the weighted average of the expected rate of return for each portfolio investment. To get the expected return value, investors need to calculate the expected return

through historical return data for each portfolio, the greater frequency of historical data collected is better.

After knowing the expected return of each portfolio investment, then the expected return on the investment can be calculated:

$$E(R_{port}) = \sum_{i=1}^{n} WiR_i$$

Where,
Wi is the weight of an asset i
Ri is expected return for an asset i

3.2 Modern Portfolio Theory

In MPT investors are assumed as risk-averse as possible, which means that if two portfolios offer the same expected return, investors will prefer a portfolio with a lower level of risk. Then, investors will only take higher risks if they are compensated by a higher expected return following the level of risk taken. On the contrary, investors who want the higher expected return must take a higher level of risk. The exact trade-off method can be the same concept for all investors, but different investors will evaluate the trade-off differently based on the individual characteristics of risk aversion. This theory implies that rational investors will not invest in one portfolio if there is a second portfolio with a more favorable risk profile and expected return, for example, if there is an alternative portfolio with a better-expected return for this level of risk.

Under the model:

- The portfolio return is the proportion-weighted combination of the constituent assets' return.
- Portfolio volatility is a function of the correlations ρij of the component assets, for all asset pairs (i, j).

In general:

- Expected return
  $E(R_p) = \sum_i w_i E(R_i)$
  Where,
  Rp is the portfolio return
  Ri is the return of asset i
  Wi is the weighting of asset i (or the asset i proportion in the portfolio).

- Portfolio return variance
  $\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j \rho_{ij},$
  Where,
  σ is the (sample) standard deviation of the periodic return on an asset
  ρij is the correlation coefficient between the returns on asset i and j

  In another way, the expression can be written as

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij}$$

where ρij = 1 for i = j, or,

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_{ij}$$

where σij = σiσjρij is the (sample) covariance of the periodic returns on the two asset, or alternatively denoted as σ(i,j), covij, or cov(i,j)

- Portfolio return volatility (standard deviation):

$$\sigma_p = \sqrt{\sigma_p^2}$$

- Portfolio coefficient of variance

$$CV = \frac{\sigma}{\mu}$$

Modern Portfolio Theory can function as a means to diversify portfolios. By integrating a diverse set of instruments, the variance or the volatility of a portfolio can be reduced.

3.3 Monte Carlo Simulation

Monte Carlo analysis can be run on the Crystal Ball program. Risk analysis using Crystal Ball relies on developing a mathematical model in Excel that represents a situation with a parameter value that is interesting to develop. After developing the deterministic model, it needs to replace point estimates with probability distribution assumptions and forecast the output distribution. The forecasted output distribution is used by the user to assess the risk level of the situation. With Crystal Ball, an approximate solution can be obtained using Monte Carlo simulation to generate the output distribution.

The more simulation trials that are run, will produce a closer approximation to the true distribution. The Monte Carlo simulation technique has been used for this purpose for many years by researchers and engineers who work with large and expensive mainframe computers. In combination with today's trend of small and inexpensive personal computers, Crystal Ball and Excel bring the ability to run Monte Carlo simulations on a PC or laptop.

Steps in forecast credit portfolio by using Crystal ball:

- Collecting data Performing Loan (PL), Non-Performing Loan (NPL), and Yield per brand
- Calculate the yield of each loan portfolio by using this formula:

  $$\text{Yield (\%)} = \frac{\text{Interest Income}}{\text{PL+NPL}}$$

  or

  $$\text{Yield (\%)} = \frac{\text{loan1Yield1+loan2Yield2+}\cdots\text{+loannYieldn}}{\text{PL+NPL}}$$

  or

  $$\text{Yield (\%)} = w_1Y_1 + w_2Y_2 + \ldots + w_nY_n$$

- Calculate the standard deviation for each assumption variable
- Run crystal ball simulation

3.4 Analysis of Business Situation

3.4.1 External Analysis

Porter's Five Forces is an analytical method used to break down and understand the competitive nature of an industry or business. Porter's Five Forces are used because the method could help to find where the influence of the power lies in a competitive industry within the supplier's aspect, buyers, substitutes, and competitors. This model also does not involve political or environmental aspects that are less relevant to the scope of industry under research. Porter's Five Forces could help a company to find the strength of a position that the company may look to move into and to help the company to determine its competitive strategies that will be explained in the next sub-chapter. The model was developed by Harvard Business School professor Michael E. Porter as part of his book "Competitive Strategy: Techniques for Analyzing Industries and Competitors," published in 1980 (Porter, 2008). The model can be applied to any segment of the economy. The theory is based on the concept that five forces could determine the competitive intensity and attractiveness level of a market.

a. Bargaining Power of Suppliers (High)
   Multifinance companies are different from banks, where the companies do not sell products that raise funds but only sell products that are lending funds. It means the supplier for multifinance companies is the fund supplier. The Association of Indonesian Multifinance Companies (APPI) stated that around 70% of the financing sources for the multifinance industry came from banks, where the rests were issuances of debt securities and corporate equity. The strength of funding from the supplier bank will affect the strength of the multifinance itself. Along with the vital role of suppliers for multifinance companies, the bargaining power of suppliers also becomes high. Policies made by multifinance companies can also be influenced by banks as the fund supplier.
b. Bargaining Power of Buyers (High)
   At the end of February 2021, based on data from the Indonesian Financial Services Authority (OJK), there were 173 multifinance companies with active status in Indonesia. This indicates that there are many options for the Indonesian people to obtain financing facilities. In addition, the presence of the Indonesian Automotive Multifinance Company, which is 5 years old, is still relatively short compared to other multifinance companies whose age has reached more than 20 years. So that the level of public knowledge of the company is still lower when compared to other multifinance companies, which could make consumer's probability to choose another company high.
c. Substitutes Products or Services (Medium)
   Currently, in Indonesia there are many choices of financing products. The largest product substitutes are the banking loan products, which are the longest-running financing products in Indonesia with a more common product for all aspects of Indonesian society, even though banking loan products do not have integrated facilities with vehicle dealers or showrooms. In addition, technology-based finance companies or so-called "fintech" in Indonesia have recently developed. As said by Niki Luhur, Chief of Indonesian Fintech Association, the number of fintech in Indonesia has grown from 24 in 2016 to 362 in 2020. Fintech provides financial assistance for the public that could be used to buy motorized vehicles, although fintech is likely to only affect the motorcycle segment because the limited financing limits that will not be enough to pay for a car or premium motorcycle.
d. The Threat of New Entrants (Low)

Following the regulations of the Indonesian Financial Services Authority (OJK), establishing a multifinance company requires a large initial capital deposit of IDR 100 billion, with maximum foreign ownership of 85%. After these requirements are met, OJK will review the application and approve or reject the application within 30 days of receiving the application. If the application is approved, business activities must already run within two months. Then the implementation of the company's business activities must also be reported to the OJK. With the current economic conditions which are still affected by the Covid-19 pandemic, it is difficult to get the trust of funding providers for new multifinance companies, not to mention the problem of decreasing people's purchasing power due to the Covid-19 pandemic. It can be concluded that the threat of a new entrant for multifinance business is low in the present-day situation.

e. The Intensity of Rivalry Among Competitor (High)
   The rivalry among multifinance companies is competitive even in normal situations before Covid-19 pandemic. This could be seen from the downward trend in the number of finance companies from 203 companies in 2015 to 184 companies in 2019, which if calculated the average annual decline is around 2.3%. In 2020 during the Covid-19 pandemic, the number of companies decreased again to 176 companies, where this decline was around 4.3% or around 186% from the average decline in the previous 4 years before the Covid-19 pandemic. These numbers show that the intensity of rivalry among competitors is high.

3.4.2 Internal Analysis

An internal analysis can examine an organization's internal environment in order to assess its resources, competencies, and competitive advantages. Performing an internal analysis allows us to identify the strengths and weaknesses of the organization.

The resource-based view (RBV) could provide better financial performance to the firm’s resources and capabilities (Bharadwaj, 2000). Furthermore, RBV could emphasize the internal resources of a firm throughout firm capability and limited managerial resources (Penrose, 1995). Firms possess different types of resources and capabilities, among them there are several that could be strongly associated with better performance. These differences in the association are a result of efficiency that is used to translate firm resources in capability as well as in performance also (Liebermann and Dhawan, 2005). Capabilities are generally described as a complex group of skills and accumulated knowledge that enable firms to coordinate activities and make use of their assets. Hereby the conceptual framework of Resource-Based View analysis.

In line with the RBV conceptual framework (Barney, 1991), the author will analyze each internal capability of the Indonesian Automotive Multifinance Company both tangible and intangible resources in Table 1 and Table 2.

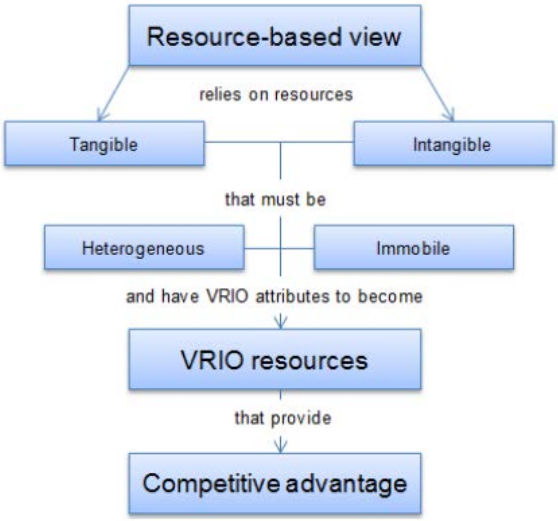

Figure 3. Resources Based View Conceptual Framework

Table 1. Resources Based Analysis (Tangible Resources)

Tangible Resources	
Physical Resources	Branches network spread across Indonesia
	Use only selected equipment
Technological Resources	Mobile application for consumer
	Internal mobile system that is linked with the internal office system

Table 2. Resources Based Analysis (Intangible Resources)

Intangible Resources	
Human Resources	Lean organizational structure with quick coordination
	Most of the workers under management level have a demographic of productive young age
	Employee are open and are used to face changing
Innovation Resources	Strong networking and database from parent company
	Online auto show
	Online assistant 24 hours
	Product availability of eight portfolios
Reputational Resources	Created and lead by the creator and ex-leader of one of the biggest multifinance in Indonesia
	Have one of the reputable banks in Indonesia as the parent company

Accumulated from all of the company's resources, author will generate all the data according to the Resource-Based View key managers comprising VRIO (Valuable, Rare, Imperfectly Imitable, and Organizational). Firm resources consist of capabilities, assets, firm attributes, organizational processes, knowledge which are guided by the company and lead into the company's bundle of strategies and improve the effectiveness and company's efficiency (Barney, 1991). Below is the further analysis of each firm's tangible and intangible resources analyzed with the VRIO framework in Table 3 and Table 4.

Table 3. VRIO Analysis Tangible Resources

Tangible Resources		Valuable	Rare	Inimitable	Organized to Exploit	Impact On Competitive Advantage
Physical Resources	Branches network spread across Indonesia	✓	✓	✓	✓	Sustainable Competitive Advantage
	Use only selected equipment	✓			✓	Competitive Parity
Technological Resources	Mobile application for consumer	✓	✓		✓	Temporary Competitive Advantage
	Internal mobile system that is linked with the internal office system	✓	✓		✓	Temporary Competitive Advantage

Table 4. VRIO Analysis Intangible Resources

Intangible Resources		Valuable	Rare	Inimitable	Organized to Exploit	Impact On Competitive Advantage
Human Resources	Lean organizational structure with quick coordination	✓	✓		✓	Temporary Competitive Advantage
	Most of the workers under management level have a demographic of productive young age	✓	✓		✓	Temporary Competitive Advantage
	Employee are open and are used to face changing	✓	✓		✓	Temporary Competitive Advantage
Innovation Resources	Strong networking and database from parent company	✓	✓	✓	✓	Sustainable Competitive Advantage
	Online auto show	✓	✓		✓	Temporary Competitive Advantage
	Online assistant 24 hours	✓			✓	Competitive Parity
	Eight portfolios of product availability	✓	✓		✓	Temporary Competitive Advantage
Reputational Resources	Created and lead by the creator and ex-leader of one of the biggest multifinance in Indonesia	✓	✓	✓	✓	Sustainable Competitive Advantage
	Have one of the reputable banks in Indonesia as the parent company	✓	✓	✓	✓	Sustainable Competitive Advantage

Based on the VRIO analysis above, the conclusion of Indonesian Automotive Multifinance Company product competitive parity, temporary competitive advantage, and sustained competitive advantage will be described furthermore. The internal analysis will be used to examine the competitive advantage in competing in Indonesian multifinance industry.

- Competitive Parity
  VRIO analysis comprises Valuable, Rare, Imperfectly Imitable, and Organizational. For the case of competitive parity, it indicates that the company has valuable resources even though the resources are not extraordinary enough to compete with competitors (Barney and Wright, 2009). It also means that the resources are not rare to find and easy to treasure. In the form of tangible resources, there are selected quality equipment that is used in the office, and in the form of intangible resources, there are 24 hours online assistants, which is the basic foundation for the company to be able to compete in the industry.
- Temporary Competitive Advantage
  Temporary competitive advantage performance in the company is described as strong and distinctive. However, it is temporary and not sustainable due to the competitor's chance to imitate the company resources (Maulana, 2019). The tangible resources are mobile applications for consumers and internal mobile systems that are linked with internal office systems, which create a fast operational process to give a better service level for consumer satisfaction. The intangible resources are lean organizational structure and coordinate quickly, most of the workers under management level have a demographic of productive young age, and the employee is open and is used to face changing, those will cause a temporary competitive advantage because those resources will make innovation to be easier and faster to adapt in the competitive multifinance environment. The online auto show is also the best innovation to effectively promote the product to consumers in the large-scale social restrictions related to the Covid-19 pandemic situation, and also offered all products that are available in the market through the company's eight portfolio products.
- Sustained Competitive Advantage
  The first introducer of competitive advantage was Michael Porter as a vocabulary of the strategy discipline (Shannassy, 2008). A company may achieve a competitive advantage when they create an appliance valuable strategy that is not being simultaneously imitated by prospective or indeed major competitors (Barney, 1991). Furthermore, competitive advantage may go sustainable if the company can create appliance strategies that are imperfectly imitable by their competitors, and also a hardship for competitors to achieve similar values like the initiator (Shannassy, 2008). From all of the resources owned, several resources caused sustainable competitive advantage for the company, which is having branches networking to a suburban area, with strong networking and database from the parent company, that causing the company to be able to reach the geographically widespread market in Indonesia with extra networking and database from the parent company that already has strong networking across Indonesia. The company also has reputational resources which has one of the reputable banks in Indonesia as the parent company, then created and led by the creator and ex-leader of one of the biggest multifinance companies in Indonesia. This is an important foundation to penetrate the competitive market for a relatively young company in the industry.

3.5 Conclusion of the Business Analysis

Based on external analysis, in the form of industrial analysis can be concluded that Indonesian Automotive Multifinance Company is running its business in a very competitive industrial environment, which is characterized by large number of competitors who have entered the industry and the continued decline in the number of multifinance company operating in Indonesia over the past five years as, moreover when entering the Covid-19 pandemic, the rate of decline was doubled the previous average decline. Although there are already many competitors, the market size in Indonesia is big. According to Nikkei Asia in 2020, Indonesia is the country with the second-largest car sales in South East Asia. Furthermore, according to ASEAN Automotive Federation, Indonesia is the country with the largest motorcycle sales in Southeast Asia. This availability of a big market is supported by a large portion of credit purchases, making this industry an attractive one.

Based on internal analysis, in order to compete in this industry, several resources differ Indonesian Automotive Multifinance Company from its competitor. Those are strong reputations with one of the most reputable banks in Indonesia as their parent company, and also created and led by the creator and ex-leader of one of the biggest multifinance companies in Indonesia. This reputation background is useful for the company to enter the competitive market, supported by strong networking and databases from the parent company as the foundation for the company to conduct market penetration. The company also developed the first online automotive show to enter the market in the Covid-19 pandemic situation, offering a wide-range product variety consisting of eight portfolios that not many competitors have. However, companies in the scope of research have never conducted an analysis regarding which portfolio focus needs to be increased in sales.

This causes one of the intangible resources from Innovation Resources in the form of Eight Portfolios of Product availability to be not developed optimally, whereas those aspect can still be developed with the development of optimal portfolio composition. Therefore, it is necessary to conduct a study on portfolio management to determine the composition of the portfolio that provides the maximum return or minimum risk level. The analysis of optimal portfolio composition will be discussed In the next chapter.

4. RESULTS

4.1 Analysis of Historical Data

Below is a table of average returns for each portfolio of Car A, Car B, Car C, Car D, Mcy A, Mcy B, Mcy C, and Mcy D based on monthly annual return data. Historical data used comes from data from January 2019 to December 2020.

Table 5. Annual Return and Standard Deviation of each Portfolios

Portfolio	Yield	StDev
Car A	17.64%	0.62%
Car B	19.46%	0.76%
Car C	19.68%	0.79%
Car D	12.71%	1.66%
Mcy A	32.69%	1.05%
Mcy B	32.39%	1.72%
Mcy C	37.58%	0.80%

Mcy D	27.73%	2.15%

Yield is the average monthly annual return of each portfolio from January 2019 to December 2020. The highest returns are Mcy C and the lowest returns are Car D, while the highest standard deviation or risk, are held by Mcy D and the lowest are Car A. Then the expected return will be calculated, where previously the proportion of each portfolio must be known. The proportion of each portfolio is known by calculating the percentage of the total loan for each portfolio. Below is a table of proportions for each portfolio.

Table 6. Portfolios Proportion

Portfolio	Amount Loan	Loan Proportion
Car A	39,504,675,572	16.64%
Car B	36,143,712,529	15.23%
Car C	5,737,071,816	2.42%
Car D	65,256,310,255	27.49%
Mcy A	40,211,109,581	16.94%
Mcy B	28,039,785,905	11.81%
Mcy C	3,408,659,133	1.44%
Mcy D	19,084,088,062	8.04%

From the Mean and Loan Proportion of each portfolio, the expected return can be found through the following equation.

$$E(R_{port}) = \sum_{i=1}^{n} WiR_i$$

Wi is the weight for each portfolio that is calculated above mentioned as Loan Proportion, while E(Rport) is the mean from monthly annual return of each portfolio for the 24 months of the data studied. So that the Average Return value is obtained of 22.00% with a standard deviation value is 0.59%.

4.2 Return Maximization Scenario

Optimization is done with the forecast method. Forecast is conducted in the form of Return Maximization using Monte Carlo Simulation, to get the maximum return. The data inputted into the Monte Carlo Simulation is from January 2019 to December 2020. The probability level of the optimum yield is simulated using the Crystal Ball software for as many as 10,000 trials with the historical annual return as the assumption

The minimum yield target is set using the minimum value of the business potential that can be worked. The minimum mean is set from current conditions, which is 22.00%. The objective is set by looking for the maximum return. Below is a table showing a list of the return maximization portfolio scenarios to obtain the maximum return.

Table 7. Return Maximization Portfolio Scenario

StDev	E(r)	Mcy A	Mcy B	Mcy C	Mcy D	Car A	Car B	Car C	Car D
0.41%	24.48%	8.47%	5.91%	22.47%	7.24%	33.34%	7.62%	1.21%	13.75%
0.41%	25.68%	8.47%	5.91%	30.09%	4.02%	28.94%	7.62%	1.21%	13.75%

0.41%	25.90%	8.47%	5.91%	31.22%	4.02%	27.82%	7.62%	1.21%	13.75%
0.41%	26.06%	8.47%	5.91%	31.99%	4.03%	27.03%	7.62%	1.21%	13.75%
0.42%	26.41%	8.47%	5.91%	33.75%	4.03%	25.28%	7.62%	1.21%	13.75%
0.43%	27.20%	8.47%	5.91%	37.73%	4.02%	21.30%	7.62%	1.21%	13.75%
0.43%	27.11%	8.47%	5.91%	37.28%	4.02%	21.75%	7.62%	1.21%	13.75%
0.43%	27.38%	13.74%	5.91%	34.66%	4.03%	19.09%	7.62%	1.21%	13.75%
0.42%	22.64%	8.47%	5.91%	3.81%	4.02%	55.22%	7.62%	1.21%	13.75%
0.45%	28.18%	20.83%	8.98%	31.02%	4.02%	12.58%	7.62%	1.21%	13.75%
0.45%	28.22%	8.47%	5.91%	42.85%	4.03%	16.16%	7.62%	1.21%	13.75%
0.46%	28.45%	8.47%	5.91%	43.98%	4.02%	15.05%	7.62%	1.21%	13.75%
0.50%	29.80%	8.47%	5.91%	50.72%	4.02%	8.32%	7.62%	1.21%	13.75%
0.49%	29.59%	8.47%	5.91%	48.67%	6.07%	8.32%	7.62%	1.21%	13.75%
0.48%	29.40%	12.59%	6.93%	44.15%	5.44%	8.32%	7.62%	1.21%	13.75%
0.47%	28.92%	14.73%	11.88%	35.85%	6.65%	8.32%	7.62%	1.21%	13.75%
0.46%	28.45%	8.47%	5.91%	43.98%	4.02%	15.05%	7.62%	1.21%	13.75%
0.49%	29.61%	8.47%	6.87%	48.38%	5.39%	8.32%	7.62%	1.21%	13.75%
0.48%	29.19%	12.59%	6.93%	42.02%	7.57%	8.32%	7.62%	1.21%	13.75%
0.42%	20.01%	8.47%	5.91%	1.65%	4.02%	57.39%	7.62%	1.21%	13.75%

The table above shows that the Maximum Return can be obtained with a portfolio composition of Car A of 8.47%, Car B of 5.91%, Car C of 50.72%, Car D of 4.02%, Mcy A of 8.32%, Mcy B of 7.62%, Mcy C of 1.21%, Mcy D of 13.75%. Through the portfolio composition, a maximum yield of 29.8% can be obtained with a risk or standard deviation of 0.5%. From these results, Car C portfolio has the potential to generate large returns. If its seen from historical data, the companies need to increase sales in the Car C portfolio if they want to focus on maximizing return.

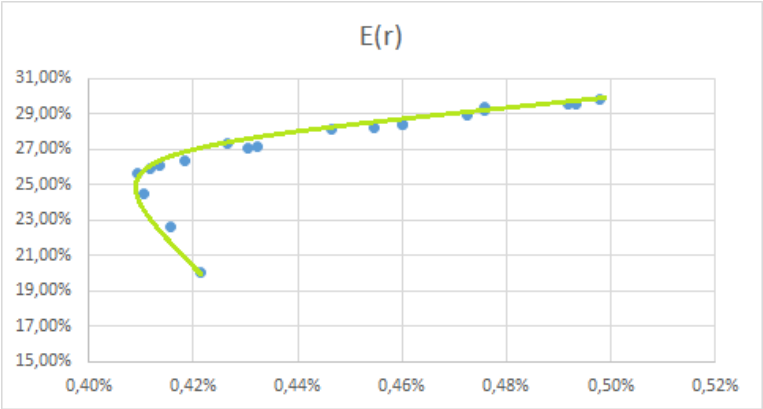

Figure 4. Maximized Return Scenario Efficient Frontier Diagram

If the forecast data from the table above is plotted on a diagram with E(r) on Y axis and StDev on X axis, it will produce an Efficient Frontier Diagram as shown above in Figure 4. Following the Efficient Frontier concept by Markowitz, the diagram above shows that the efficient frontier is located starting from the Expected Return of 25.68% upwards with a minimum standard deviation of 0.41%.

4.3 Risk Minimization Scenario

Forecast calculations are also done to find the smallest possible risk value. With the same method as the Return Maximization process, the minimum yield target is set using the minimum value of the potential mean that can be obtained. The minimum yield target is set from the current condition, which is 22.00% with the smallest standard deviation possible. Below is a table showing a list of the optimum return portfolio scenarios to obtain the minimized risk.

Table 8. Minimized Risk Portfolio Scenario

StDev	E(r)	Car A	Car B	Car C	Car D	Mcy A	Mcy B	Mcy C	Mcy D
0.38%	24.26%	22.00%	13.00%	12.00%	13.00%	11.00%	5.00%	20.00%	4.00%
0.38%	24.25%	21.78%	13.20%	12.02%	13.00%	11.18%	5.05%	19.75%	4.02%
0.38%	24.20%	21.59%	13.00%	12.39%	13.02%	11.60%	5.09%	19.06%	4.26%
0.38%	24.18%	21.33%	13.00%	12.67%	13.00%	11.89%	5.00%	18.67%	4.44%
0.38%	24.22%	21.37%	13.35%	12.22%	13.06%	11.75%	5.16%	18.89%	4.20%
0.38%	24.27%	19.00%	16.00%	12.00%	13.00%	11.45%	5.07%	19.30%	4.19%
0.38%	24.19%	20.80%	13.00%	13.10%	13.10%	11.80%	5.35%	18.56%	4.29%
0.38%	24.27%	19.95%	14.66%	12.00%	13.39%	11.00%	5.00%	20.00%	4.00%
0.38%	24.17%	19.00%	13.00%	14.80%	13.20%	11.00%	5.70%	18.32%	4.98%
0.39%	24.16%	19.00%	13.23%	14.36%	13.41%	11.00%	5.69%	18.39%	4.92%
0.39%	24.17%	19.00%	14.55%	12.91%	13.53%	11.00%	5.99%	18.45%	4.56%
0.39%	24.16%	19.00%	13.00%	14.45%	13.55%	11.00%	5.67%	18.46%	4.87%
0.39%	24.12%	20.19%	13.00%	12.89%	13.92%	11.23%	5.22%	18.73%	4.83%
0.39%	24.12%	19.00%	13.00%	14.21%	13.79%	11.00%	5.30%	18.43%	5.26%
0.39%	24.10%	19.00%	13.23%	13.81%	13.96%	11.00%	5.69%	18.15%	5.15%
0.39%	24.11%	19.00%	13.78%	13.05%	14.17%	11.00%	5.68%	18.32%	5.00%
0.39%	24.10%	19.00%	13.78%	13.05%	14.17%	11.00%	5.68%	18.31%	5.01%
0.40%	24.06%	19.00%	13.00%	13.50%	14.50%	11.00%	6.00%	18.00%	5.00%
0.40%	24.05%	19.00%	13.09%	13.09%	14.82%	11.00%	5.18%	18.52%	5.30%
0.40%	24.02%	19.00%	13.00%	12.54%	15.46%	11.00%	5.00%	18.76%	5.24%

The table above shows that the Optimum Risk can be obtained with a portfolio composition of Car A at 22.00%, Car B at 13.00%, Car C at 12.00%, Car D at 13.00%, Mcy A at 11.00%, Mcy B at 5.00%, Mcy C at 20.00%, and Mcy D at 4.00%. Through the portfolio composition, an optimum risk of 0.38% can be obtained with a return of 24.26%. From these results, it can be seen that the Car A and Mcy C are portfolios that make a big contribution to get optimum risk. So that companies need to increase sales in the Car A and Mcy C portfolios.

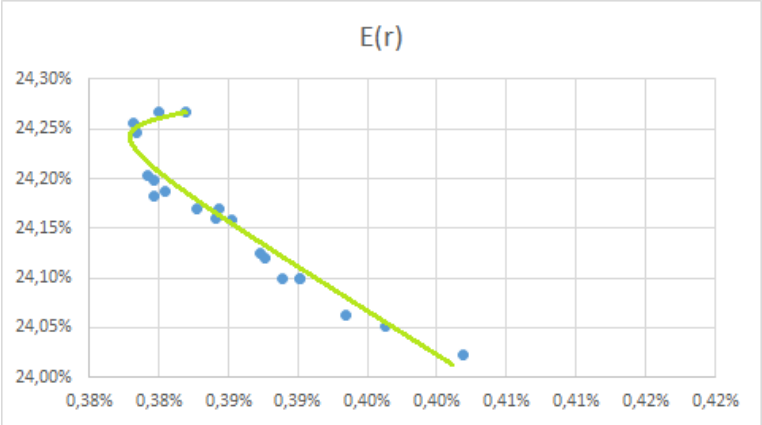

Figure 5. Minimized Risk Scenario Efficient Frontier Diagram

If the forecast data from the table above is plotted on a diagram with E(r) on Y axis and StDev on X axis, it will produce an Efficient Frontier Diagram as above in Figure 5. Following the Efficient Frontier concept by Markowitz, the diagram above shows that the efficient frontier is located starting from the Expected Return of 24.26% upwards with a minimum standard deviation of 0.38%.

4.4 Coefficient of Variance

After finding alternative solutions in the form of portfolio composition scenarios for optimum return and optimum risk, the value of the Coefficient of Variance for each solution will be calculated. The purpose is to find out the number of ratios between the risk and return of each solution, and compare it with the current condition. Below is a table showing a list of Coefficients of Variance between the Current Portfolio, Optimum to obtain the minimized risk.

Table 9. Coefficient of Variance Comparison

Portfolio Composition	Mean of Return	St.Dev/Risk	Coefficient of Variance
Current Portfolio	22.00%	0.59%	0.0268
Maximized Return	29.80%	0.50%	0.0167
Minimized Risk	24.26%	0.38%	0.0156

The maximized return portfolio composition provides biggest return with 35.45% return improvement and 15.25% risk improvement compared to the current portfolio, with coefficient of variance of this solution is 0.0167. Lowest risk could produced from the minimized risk portfolio composition, with the biggest risk improvement 35.59% of the current portfolio and 10.27% return improvement compared to the current portfolio. The coefficient of variance of this solution is 0.0156.

5. CONCLUSION

Modern Portfolio Theory and Monte Carlo Simulation can be used to find business solutions for Indonesian Automotive Multifinance Company in the form of optimum portfolios composition as follows:

- The best financing portfolio composition to maximize return is Car A 8.47%, Car B 5.91%, Car C 50.72%, Car D 4.02%, Mcy A 8.32%, Mcy B 7.62%, Mcy C 1.21%, Mcy D 13.75%. Through the portfolio composition, a maximum return of 29.8% can be obtained with a risk of 0.5%.
- The best financing portfolio composition to minimize risk is Car A 22.00%, Car B 13.00%, Car C 12.00%, Car D 13.00%, Mcy A 11.00%, Mcy B 5.00%, Mcy C 20.00%, and Mcy D 4.00%. Through the portfolio composition, a minimized risk of 0.38% can be obtained with a return of 24.26%.

By applying optimum portfolio composition will optimize the company's intangible resources which is the Eight Portfolios of Products, where the better potential return or risk level of the company through the Eight Portfolios of Products will be generated.

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