Journal of Computer Networks, Architecture and High Performance Computing
Volume 7, Number 1, January 2025
https://doi.org/10.47709/cnahpc.v7i1.5569

Submitted : Feb 20, 2025
Accepted : Feb 24, 2025
Published : Feb 27, 2025

Credit Risk Analysis on Motor Vehicle Financing Using the Kealhofer Merton Vasicek Model (KMV)

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ABSTRACT

The development of the automotive sector in Indonesia continues to show significant growth, in line with the increasing demand for motor vehicles, both cars and motorcycles. Although it has great potential, the vehicle financing sector is not without challenges, particularly related to credit risk. The Kealhofer Merton Vasicek (KMV) model will be suitable for calculating vehicle credit risk because it can predict default (failure to pay) when the borrower reaches the end of the loan term. The objective of this research is to apply the KMV model to calculate the Expected Default Frequency (EDF) value and determine the minimum credit risk. From the analysis and estimation results, the time-to-maturity equity value for motor vehicles was obtained at Rp9.616.709.886 and the time-to-maturity liability value at Rp1.865.460.114, while for cars, the equity value was obtained at Rp2.057.843.305 and the time-to-maturity liability value at Rp468.544.695. Additionally, the Expected Default Frequency (EDF) value for motor vehicles was obtained at 4,26% and the EDF value for cars at 0,01%. The results indicate that the likelihood of default experienced by Adira Finance is low, especially for cars. Therefore, Adira Finance can be stated to have sufficient capital, so the likelihood of default is not high.

Keywords: Credit Risk, Financing, Kealhofer Merton Vasicek Model

INTRODUCTION

The development of the automotive sector in Indonesia continues to show significant growth, along with the increasing demand for motorized vehicles, both cars and motorcycles. One industry that contributes significantly to the national Gross Domestic Product (GDP) is the automotive sector (Gaikindo, 2024). The Indonesian Automotive Industry Association noted that the automotive sector contributes around 2.8% - 3.0% to Indonesia's total GDP. This figure covers vehicle production, distribution, and supporting sectors such as spare parts and after-sales services. As the fourth most populous country in the world, demand for motor vehicles continues to grow, which directly impacts the country's GDP.

Based on data from the Central Statistics Agency (BPS, 2024) and (Gaikindo, 2024) by 2023 the number of motorized vehicles in Indonesia will exceed 140 million units, consisting of approximately 115 million motorcycles and more than 25 million four-wheeled vehicles or more. Motorcycles still dominate the market, due to their relatively affordable price and ability to reach various regions, including rural areas. Meanwhile, cars, both for personal and commercial use, are also showing an increasing trend in line with the improvement in people's purchasing power.

This significant growth is inseparable from the role of financing institutions that provide access to the public to own vehicles, one of which is by providing vehicle loans. Bank Indonesia (BI, 2024) noted that lending towards 2024 grew 9.7% on an annual basis (year-on-year/YoY), reaching Rp6,930.1 trillion. Based on the Analysis of Money in Circulation report released by BI, bank credit growth in November 2023 reached 9.7% YoY, faster than credit growth in the previous month, October 2023, which reached 8.7% YoY. In addition, motor vehicle loans grew 12.6% on an annualized basis to IDR 134.1 trillion in January.

One of the leading financing institutions in Indonesia is Adira Finance, which has been operating for more than two decades and serves various segments of society throughout Indonesia. PT Adira Finance is a finance company that was established in 1990 and is part of the Bank Danamon Group. The company concentrates on providing various types of financing, such as electronic, car and motorcycle financing. Adira Finance is committed to providing financing solutions that make life easier for customers.

As a subsidiary of Bank Danamon, throughout 2023, Adira Finance experienced an increase in automotive financing and lending, both retail and corporate. In 2023 (Danamon, 2024), Adira Finance also experienced an increase in trade and finance, with total loans amounting to 174.9 trillion or an increase of 19% on an annualized basis. The Enterprise Banking & Financial Institution segment grew 15% YoY to reach Rp 78.8 trillion as a factor in this

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increase and was supported by the credit portfolio.

Despite the great opportunities, the vehicle financing sector is not free from challenges, especially related to credit risk. Credit risk is defined as the possibility of a debtor failing to fulfill payment obligations in accordance with the credit agreement (Sari et al., 2020). In order for the credit given to reach the target, which is safe, then credit analysis needs to be conducted (Leidiyana 2013). In the vehicle financing sector, credit risk is often influenced by factors such as regional economic conditions, fluctuations in debtor income, and automotive market dynamics. In the Kota Pinang region, most of the community's economy relies heavily on the trade and agriculture sectors.

Adira Finance faces challenges in ensuring the sustainability of its business amidst increasing credit risk. Based on data from the Financial Services Authority (OJK, 2024), the national non-performing loan (NPL) rate in the vehicle financing sector has been in the range of 2-5% in recent years. This figure shows that the risk of default is still a major concern, especially in areas with high economic vulnerability such as Kota Pinang. PT Adira Finance in the process of tackling prepayment risk, in general can use a strategy to avoid this risk by making a policy regarding the procedures and procedures for payment of motor vehicle loans where one of the procedures procedure requires customers to pay in accordance with the predetermined time period, cannot be less than that time or more than that time. (Saharuddin 2017)

In facing this challenge, the right method is needed to analyze and manage credit risk effectively, including the CreditRisk + method, Credit Scoring Models, Credit Metrics, and the Kealhofer Merton Vasicek (KMV) Model (Afifah et al., 2022). The KMV model is the method used by the author, in its application this model is based on capital structure theory and uses financial data and market information to calculate default probability, especially for the vehicle financing sector. The KMV model can calculate the potential for corporate failure and see in the future whether the company is experiencing financial difficulties or not, thus affecting the level of debt repayment made by the borrower (Malasari et al., 2020).So the use of the Kealhofer Merton Vasicek model is very suitable for use in this case.

The purpose of this study is to determine the minimum credit risk of PT Adira Finance Kota Pinang satellite company by applying the Kealhofer Merton Vasicek (KMV) model to calculate the probability value of default for each debtor known as Expected Default Frequency (EDF) (Wijoyo, 2021).

LITERATURE REVIEW

Jarque Bera Test

One of the requirements for estimating the volatility of the company's assets is the Log Natural Return (ln return) normality test (Anggoro et al., 2023).The normality test with the Jarque-Bera test is carried out in the following stages.

1. Hypothesis test

   H_0 : Ln asset return data is normally distributed
   H_1 : Ln asset return data is not normally distributed

2. Test Statistics

$$JB = \frac{n}{6}\left(S^2 + \frac{(K-3)^2}{4}\right) \quad (1)$$

with S being Skewness and K being Kurtosis.

$$S = \frac{m_3}{m_2^{3/2}} \text{ and } \quad K = \frac{m_4}{m_2^2} \quad (2)$$

$$m_2 = \frac{\Sigma\left(x_i - \tilde{x}\right)^2}{n}, m_3 = \frac{\Sigma\left(x_i - \tilde{x}\right)^3}{n}, m_4 = \frac{\Sigma\left(x_i - \tilde{x}\right)^4}{n} \quad (3)$$

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3. Significance Test
   α = 5%
4. Rejection Area
   H_0 is rejected if $JB > x_2^2$, or if the probability value < sig. α
5. Decision
   If H_0 is accepted then the data is normally distributed and if H_0 is rejected then the data is not normally distributed.

Asset Return Volatility

Volatility can be estimated through historical return data. A number of asset values of the company concerned need to be obtained through publication reports or financial data (Sunaryo, 2020). This value is used to estimate a return that is compounded continuously as in equation 4 below.

$$R_t = \ln\left(\frac{V_t}{V_{t-1}}\right), t = 1, 2, ..., T \quad (4)$$

Description:
R_t : Asset return in period t
V_t : Asset value at time t
V_{t-1} : Asset value at time t

Estimated Value of Equity and Liabilities

(Shen and Chen 2024) The value of liabilities, equity, and the probability of default can be estimated using the Merton Model developed in 1974 based on concepts introduced by Black-Scholes in 1973. The equation is as follows:

$$V_t = F(V_t, \tau) + E(V_t, t) \quad (5)$$

Description:
V_t : Total asset value of the corporation at time *t*
τ : Period until the credit period expires *(T - t)*
$F(V_t, \tau)$: Value of debt (liability) at time *t*
$E(V_t, t)$: Value of the corporation's equity at time *t*

(Audyna, 2023) states that if it is assumed that the general hypothesis of the Black-Scholes-Merton model can be related to the company's equity value E_{merton}, with the asset value V_t and the volatility of asset returns B using the following equation.

$$E_{merton} = V_T N(d_1) - Ke^{-r_v(T-t)} N(d_2) \quad (1)$$

$$d_1 = \frac{\ln\left(\frac{V_T}{B} + \left(r_v + \frac{1}{2}\sigma^2\right)(T-t)\right)}{\sigma\sqrt{(T-t)}} \quad (2)$$

$$d_2 = d_1 - \sigma\sqrt{(T-t)} \quad (3)$$

The determination of the value of liabilities is as follows.
Where:
E_{merton} : Equity value of the company
L_{merton} : The value of the company's liabilities
V_T : Asset value at time T
$N(d)$: $\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{d} e^{-\frac{z^2}{2}} dz$, estimated with values d_1 and d_2
B : Face value of debt
r_v : interest rate

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T-t : Maturity time
V_t : Asset value at time t
σ : Asset volatility

Kealhofer Merton Vasicek (KMV) Model

The Kealhofer Merton Vasicek (KMV) model is a method used to assess corporate credit risk by calculating the probability of default and distance to default. The model was introduced by Stephen Kealhofer, John McQuown, and Oldřich Vašíček through their company KMV Corporation in 1997 (Su, 2022). One of the main contributions of KMV was the introduction of the concept of "distance to default", which measures how far the value of a company's assets is from the default threshold. The greater this distance, the less likely the company will default. KMV also developed a method to determine the model using actual market data, so that the estimated probability of default better reflects real market conditions (Chen & Chu, 2014). Based on Merton's (1974) analytical approach, the KMV model calculates the probability of default for each debtor, known as the Expected Default Frequency (EDF) (Wijoyo, 2021).

(Kulkarni et al., 2019) assumes that the first step that can be taken in the KMV model to find the probability of default is to determine the total value of the corporation which is formulated in equation 10 as follows.

$$dV_t = AV_t dt + \sigma V_t dW_t \tag{10}$$

The value of dV_t is the value of the company's total assets at time t, the variable A is the expectation of the ln return of the company's total assets (asset drift), and the variable σ indicates the volatility of the value of total assets and dW_t according to the standard Wiener process.

The risk-free interest rate or risk-free rate is the risk-neutral probability with a drift price (Siregar et al., 2018). Thus, (A) can be replaced with (r) then the formula for determining the distance-to-default (DD) is in the following equation 11.

$$DD = \frac{\ln\left(\frac{B}{V_0}\right) + \frac{1}{2}\sigma^2\tau - r\tau}{\sigma\sqrt{\tau}} \tag{11}$$

Description:
DD : Distance to default value
V_0 : The total value of the company's assets at the beginning of the agreement (t = 1)
B : Face value of debt
r : Interest risk free rate
τ : The period until the debt expires (T - t)
σ : Asset volatility

Distance to default (DD) shows how far the company is from default. It shows the number of standard deviations to the default point (Audyna, 2023). So, after getting the DD value, the Expected Default Frequency (EDF) value is obtained with the formula in equation 12 below.

$$EDF = \Phi\left(\frac{\ln\left(\frac{B}{V_0}\right) + \frac{1}{2}\sigma^2\tau - r\tau}{\sigma\sqrt{\tau}}\right)$$
$$EDF = \Phi\left(-DD\right) \tag{12}$$

Description:
EDF : Expected Default Frequency Value
Φ : Cumulative Normal Distribution
DD : Distance to default

METHOD

The data used in this study are secondary data in the form of evidence, records or reports obtained from Adira Finance Kota Pinang, South Labuhan Batu Regency, North Sumatra. The report data to be used is motor vehicle credit data, namely motorcycle and car vehicles for the period June 2023 - June 2024. the approach used in this research is

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the quantitative approach, which is a research methodology measured by numbers, from the data collection process to the process of analyzing and interpreting the research results. The basic theory used is the Kealhofer Merton Vasicek (KMV) model to find out how to calculate the risk of motor vehicle loans at Adira Finance.

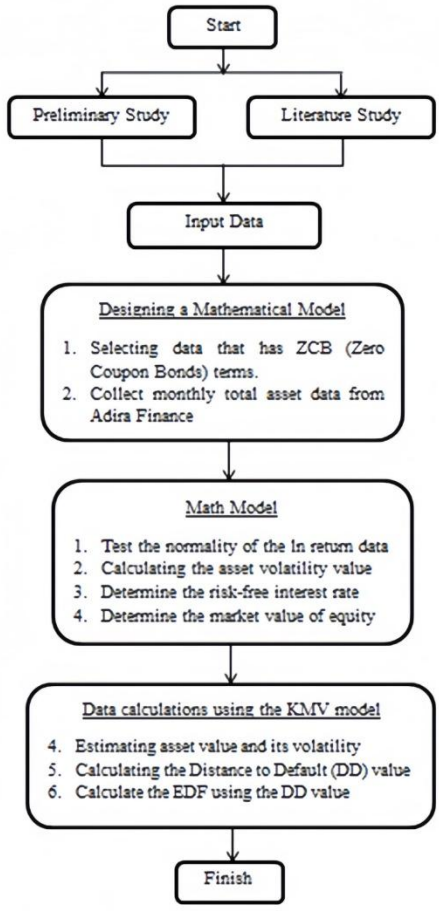

Fig 1. Flow Chart

RESULT

To get the appropriate decision, the initial stage is to find what variables are used to calculate the risk of motor vehicle loans, namely the company's total assets or the total amount of the total price of cars and motorcycles provided, the face value of the debt, the interest rate, which is 6% for cars and 15.9% for motorcycles and the period until the debt expires (tenor). The data used is overdue car and motorcycle loan data for the period June 2023 - June 2024 at Adira Finance Kota Pinang. The time interval from issuance (t = 2) to maturity (T) is 72 months for cars and 36 months for motorcycles.

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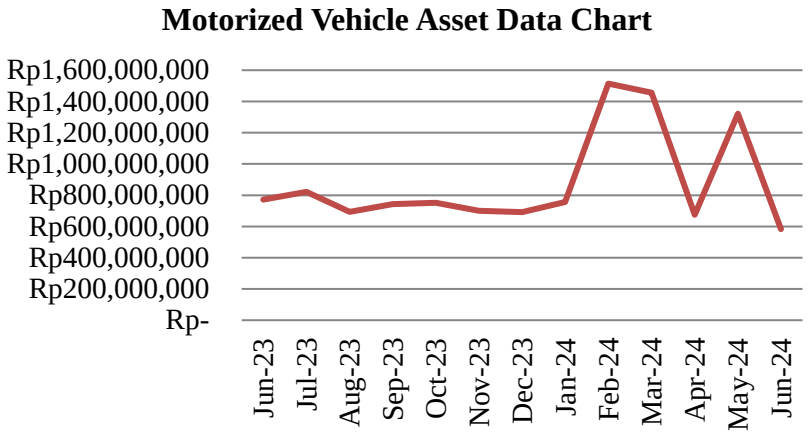

Fig 2. Motorized Vehicle Asset Data Chart

Figure 2. shows a graph of total motor vehicle asset data at PT Adira Finance Kota Pinang.

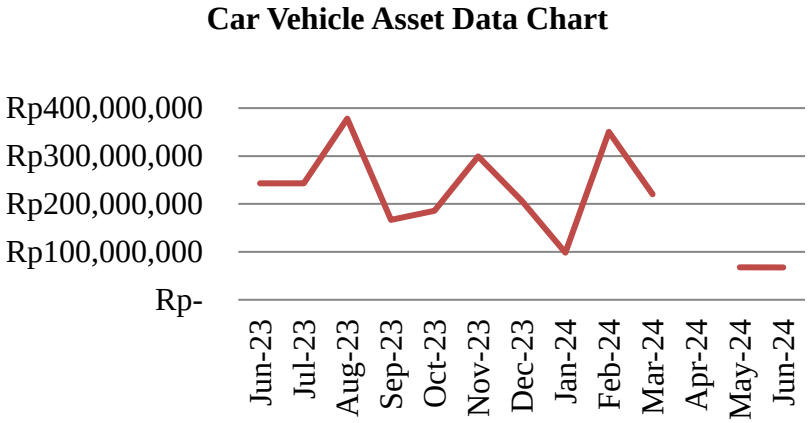

Fig 3. Car Vehicle Asset Data Chart

Figure 3. shows a chart of total car vehicle asset data at the company PT Adira Finance Kota Pinang.

The Jarque Bera statistical test is used in order to test the normality assumption, namely to determine whether the return data is normally distributed or not. The results of this test indicate that the return data is normally distributed and the assumption is met if the probability value < sig α (5%), so H_0 is rejected. The formulas used are in equations (1), (2) and (3).

$$JB = \frac{n}{6}\left(S^2 + \frac{(K-3)^2}{4} \right)$$

$$JB = N\left[\frac{skewness^2}{6} + \frac{(kurtosis-3)^2}{24} \right]$$

The test statistics are written in the following table.

Table 1. Normality Test Results of Return on Assets Data

Value	Motor Vehicle	Car Vehicles
Skewness (S)	1,329	0,088
Kurtosis (K)	-0,065	-0,745

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Chi-Square Count (JB)	8,23	7,03
P-Value	0,242	0,263
Alpha	0,05	0,05
Chi-Square Table	5,991	5,991

In table 1. obtained the value (JB) on motor vehicles of 8.23 and JB on car vehicles of 7.03 where this value shows that the JB value > *Chi-Square* Table value of 5.991, it is concluded that H_a is accepted and H_0 is rejected. Based on the significance level α = 0.05 and the test criteria to reject H_0 if the *P-Value* < α, the value obtained on motorized vehicles is *P-Value* = 0.242 > α = 0.05 so that H_0 is accepted and the result on car vehicles is *P-Value* = 0.263 > α = 0.05 so that H_0 is accepted.

After the jarque bera test, it can be concluded that the asset return data is normally distributed and it can be stated that the normality assumption is met. The next step is to estimate asset volatility with the aim of knowing the movement of assets.

The results of estimating asset returns are obtained using data on the total assets (V_t) of the company's motor vehicles for the period June 2023 - June 2024, namely IDR 11,482,170,000 and the total assets (V_t) of the company's car vehicles for the period June 2023 - June 2024, namely IDR 2,526,388,000. A high volatility value indicates that assets change rapidly, so asset volatility is estimated with equation 4.

Motor Vehicle

$$R_t = \ln\left(\frac{11.482.170.000}{V_{t-1}}\right), t = 1, 2, ..., T$$

Car Vehicle

$$R_t = \ln\left(\frac{2.526.388.000}{V_{t-1}}\right), t = 1, 2, ..., T$$

With the following results.

Table 2. Adira Finance Motor Vehicle Asset Return Data

Period	*Return* Aset
June 2023	
July 2023	0.06311761
August 2023	-0.17028882
September 2023	0.06899883
Oktober 2023	0.01234926
November 2023	-0.07095316
Desember 2023	-0.01196967
January 2024	0.08876518
February 2024	0.69392279
March 2024	-0.03857568
April 2024	-0.77037924
May 2024	0.67324541
June 2024	-0.81876300

It is known that the highest increase in asset returns reached 0.69392279 in the February 2024 period and the lowest decrease in asset returns was -0.81876300 in the June 2024 period.

Table 3. Adira Finance Car Vehicle Asset Return Data

Period	***Return* Aset**
June 2023	
July 2023	-0.001366222
August 2023	0.442512569

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September 2023	-0.819499718
Oktober 2023	0.108544491
November 2023	0.477633281
Desember 2023	-0.370165308
January 2024	-0.745909758
February 2024	1.273280147
March 2024	-0.463617610
April 2024	
May 2024	-1.177822547
June 2024	-0.005230740

It is known that the highest increase in asset returns reached 1.273280147 in the February 2024 period and the lowest decrease in asset returns was -1.177822547 in the May 2024 period.

Furthermore, the asset return variable changes from the time period T - t = 21 months for motor vehicles and T-t=41 months for car vehicles. The entire prediction results from changes in asset returns were carried out 561 times on motor vehicles and 68 times for car vehicles.

After prediction, the average results of all changes in asset return movements are obtained as follows.

Average movement of motor vehicle asset returns:

$$\bar{r} = \frac{1}{T}\sum_{t=1}^{T} R_t$$

$$\bar{r} = \frac{1}{23}\sum_{t=1}^{23} -0,02337754, t = 1,2,.....,T$$

$$\bar{r} = 1,114784$$

These results are then substituted for the $\varepsilon\sqrt{(T-t)}$in the V_T equation. Based on the average prediction results, is $\varepsilon\sqrt{(T-t)} = 1,114784$. obtained.

Average movement of car vehicle asset returns:

$$\bar{r} = \frac{1}{T}\sum_{t=1}^{T} R_t$$

$$\bar{r} = \frac{1}{41}\sum_{t=1}^{41} -0,1165129, t = 1,2,.....,T$$

$$\bar{r} = 1,538375$$

These results are then substituted for the notation $\varepsilon\sqrt{(T-t)}$in the V_T equation. Based on the average prediction results, $\varepsilon\sqrt{(T-t)} = 1,538375$ is obtained. After obtaining the asset return data, the next step is to estimate the volatility value of asset returns owned where:

Estimation of asset return volatility on motor vehicles:

$$\sigma = \sqrt{\frac{1}{T-1}\sum_{t-1}^{T}\left(R_t - \bar{r}\right)^2}$$

$$\sigma = \sqrt{\frac{1}{23-1}\sum_{t-1}^{23}\left(-0,02337754 - 1,114784\right)^2}, t = 1,2,.....,T$$

$$\sigma = 0,4517167$$

Estimation of asset return volatility on car vehicles:

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$$\sigma = \sqrt{\frac{1}{T-1}\sum_{t-1}^{T}\left(R_t - \bar{r}\right)^2}$$

$$\sigma = \sqrt{\frac{1}{41-1}\sum_{t-1}^{41}\left(-0,1165129 - 1,538375\right)^2}, t = 1,2,.....,T$$

$$\sigma = 0,6982025$$

The result of asset return volatility in motor vehicles is 0.4517167 or 0.45% and in car vehicles the result of asset return volatility is 0.6982025 or 0.70%. This states that the deviation of return from the average or movement of asset returns fluctuates by 0.4517167 or 0.45% for motor vehicles and 0.6982025 or 0.70% for car vehicles. It can be said that the results of this fluctuation value allow failing or not failing to pay debts, meaning that it is estimated to experience higher or lower risks.

After obtaining the results of the movement of asset returns, the next step is to estimate the value of equity and liabilities. To calculate the risk-free interest rate and also the market value of equity is calculated with the BI rate. The following is BI Rate data for the period June 2023 - June 2024.

Table 4. BI Rate Data

Month	BI-7Day-RR
Jun-23	5,75%
Jul-23	5,75%
Agu-23	5,75%
Sep-23	5,75%
Okt-23	6,00%
Nov-23	6,00%
Des-23	6,00%
Jan-24	6,00%
Feb-24	6,00%
Mar-24	6,00%
Apr-24	6,25%
Mei-24	6,25%
Jun-24	6,25%

Source: Bank Indonesia website (www.bi.go.id)

Asset Return data is estimated from the change in W_t over a short period of time T - t. The relationship between asset values, bonds and equity can be seen in the following table.

Table 5. Equity Maturity Time

State	Assets	Bonds	Equity
Not Bankrupt	$V_T \geq B$	B	$V_T - B$
Bankrupt	$V_T < B$	V_T	0

To get the value of VT, equation 10 is differentiated using Ito's Lemma so that the results of the differentiation process are:

Motorcycle:

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$$V_T = V_t \exp\left\{\left(r_v - \frac{1}{2}\sigma^2\right)(T-t) + \sigma\varepsilon\sqrt{(T-t)}\right\}$$

$$V_T = 11.482.170.000 \ \exp\left\{\left(0{,}159 - \frac{1}{2}0{,}4517167^2\right)(23-2) + 0{,}4517167\ (1{,}114784)\right\}$$

$$V_T = \ 66.096.547$$

Car vehicles:

$$V_T = V_t \exp\left\{\left(r_v - \frac{1}{2}\sigma^2\right)(T-t) + \sigma\varepsilon\sqrt{(T-t)}\right\}$$

$$V_T = 2.526.388.000 \ \exp\left\{\left(0{,}06 - \frac{1}{2}0{,}6982025^2\right)(41-2) + 0{,}6982025\ (1{,}538375)\right\}$$

$$V_T = 91.211.639$$

After that, the equity value of the Emerton company can be linked to the asset value Vt in equations (6), (7), (8) and (9).

On motorized vehicles:

$$d_1 = \frac{\ln\left(\frac{V_t}{B} + \left(r_v + \frac{1}{2}\sigma^2\right)(T-t)\right)}{\sigma\sqrt{(T-t)}}$$

$$d_1 = \frac{\ln\left(\frac{11.482.170.000}{2.616.235.725} + \left(0{,}159 + \frac{1}{2}(0{,}4517167)^2\right)(23-2)\right)}{0{,}4517167\ \sqrt{(23-2)}}$$

$$d_1 = 19{,}28182882$$

$$d_2 = 19{,}28182882 - 0{,}4517167\ \sqrt{(23-2)}$$

$$d_2 = 17{,}21180285$$

$$E_{merton} = V_t N(d_1) - Be^{-r_v(T-t)} N(d_2)$$

$$E_{merton} = 11.482.170.000 \ \ N(19{,}28182882) - \ 2.616.235.725\ e^{-0{,}159(23-2)} N(17{,}21180285)$$

$$E_{merton} = \text{Rp}9.616.709.886{,}-$$

$$L_{merton} = V_t - E_{merton}$$

$$L_{merton} = \text{Rp}11.482.170.000 - \text{Rp}9.616.709.886$$

$$L_{merton} = \text{Rp}1.865.460.114$$

Based on the estimation results, the value of equity at maturity is Rp9,616,709,886 and the value of liabilities at maturity is Rp1,865,460,114.

On car vehicles:

$$d_1 = \frac{\ln\left(\frac{V_t}{B} + \left(r_v + \frac{1}{2}\sigma^2\right)(T-t)\right)}{\sigma\sqrt{(T-t)}}$$

$$d_1 = \frac{\ln\left(\frac{2.526.388.000}{682.447.852} + \left(0{,}06 + \frac{1}{2}(0{,}6982025)^2\right)(41-2)\right)}{0{,}6982025\ \sqrt{(41-2)}}$$

$$d_1 = 23{,}12439446$$

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$$d_2 = 23,12439446 - 0,6982025\sqrt{(41-2)}$$
$$d_2 = 18,76412125$$

$$E_{merton} = V_t N(d_1) - Be^{-r_v(T-t)} N(d_2)$$
$$E_{merton} = 2.526.388.000\ \ N(23,12439446) - \ 682.447.852\ e^{-0,06(41-2)} N(18,76412125)$$
$$E_{merton} = \text{Rp}2.057.843.305,-$$

$$L_{liabilitas} = V_t - E_{merton}$$
$$L_{liabilitas} = \ \text{Rp}2.526.388.000 - \text{Rp}2.057.843.305$$
$$L_{liabilitas} = \text{Rp}468.544.695$$

Based on the estimation results, the value of equity at maturity is IDR 2,057,843,305 and the value of liabilities at maturity is IDR 468,544,695. It is known that the difference between the value of equity and liabilities is quite large, it can be said that the company has sufficient wealth and capital to pay face value to customers at maturity.

Furthermore, with the KMV approach in order to estimate how far the distance between the value of the company's assets and the point of default (Distance to Default). Distance to Default (DD) at maturity is estimated using equation 11.

For motor vehicles:

$$DD = \frac{\ln\left(\frac{B}{V_0}\right) + \frac{1}{2}\sigma^2\tau - r\tau}{\sigma\sqrt{\tau}}$$
$$DD = \frac{\ln\left(\frac{2.616.235.725}{771.794.000}\right) + \frac{1}{2}(0,4517167)^2(23-2) - 0,159(23-2)}{0,4517167\sqrt{(23-2)}}$$
$$DD = 0,246294462$$

For car vehicles:

$$DD = \frac{\ln\left(\frac{B}{V_0}\right) + \frac{1}{2}\sigma^2\tau - r\tau}{\sigma\sqrt{\tau}}$$
$$DD = \frac{\ln\left(\frac{682.447.852}{243.172.000}\right) + \frac{1}{2}(0,6982025)^2(41-2) - 0,06(41-2)}{0,6982025\sqrt{(41-2)}}$$
$$DD = 73,32531937$$

From this DD value, it can be used as a reference material for comparison of the Distance to Default value estimation in the next period. The probability of bankruptcy or Expected Default Frequency (EDF) can be estimated by equation 12.

For motor vehicles:

$$EDF = \Phi(DD)$$
$$EDF = \Phi(0,246294462)$$
$$EDF = 4,25927\text{E} - 51$$

For car vehicles:

$$EDF = \Phi(-DD)$$
$$EDF = \Phi(73,32531937)$$
$$EDF = 0,014078812$$

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Journal of Computer Networks, Architecture and High Performance Computing
Volume 7, Number 1, January 2025
https://doi.org/10.47709/cnahpc.v7i1.5569

Submitted : Feb 20, 2025
Accepted : Feb 24, 2025
Published : Feb 27, 2025

Discussion

The results of the analysis performed on Adira Finance data are summarized in the following table.

Table 6. Calculation Results of Kealhofer Merton Vasicek Model Analysis

Data	Motor Vehicle	Car Vehicle
Total Assets	Rp11.482.170.000	Rp2.526.388.000
Face Value	Rp2.616.235.725	Rp682.447.852
Asset Volatility	0,45%	0,70%
Interest risk free rate	15,9%	6%
Time to maturity	36 Months	72 Months
Market Value of Equity	Rp9.616.709.886	Rp2.057.843.305
Liability Value	Rp1.865.460.114	Rp468.544.695
Distance to Default	0,25	73,33
EDF Value	4,26%	0,01%

Based on the results of table 6, the Expected Default Frequency (EDF) value is 4.26% for motor vehicles and 0.01% for car vehicles. These results indicate that the possibility of company failure (default) experienced by Adira Finance shows a small number, especially in car vehicles. So Adira Finance can be declared to have sufficient capital so that the chances of default are not great.

CONCLUSION

Based on the results of analysis and estimation, the value of equity at maturity on motor vehicles is Rp9,616,709,886 and the value of liabilities at maturity is Rp1,865,460,114, while on car vehicles, the equity value is Rp2,057,843,305 and the value of liabilities at maturity is Rp468,544,695. Also obtained is the Expected Default Frequency (EDF) value on motor vehicles of 4.26% and the EDF value on car vehicles of 0.01%. From these results, it can be said that the possibility of Adira Finance experiencing failure (default) is very small, especially in car vehicles. So Adira Finance can be declared to have sufficient capital so that the chances of default are not great.

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Journal of Computer Networks, Architecture and High Performance Computing
Volume 7, Number 1, January 2025
https://doi.org/10.47709/cnahpc.v7i1.5569

Submitted : Feb 20, 2025
Accepted : Feb 24, 2025
Published : Feb 27, 2025

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