ISSN: 234-5197
Impact Factor: 3.765

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

INVESTMENT SIMULATION OF REPLACING PRODUCTION MACHINERY AT A RICE FACTORY SUKORENO MAKMUR

Rizky Dwi Prawoto*[1], Isti Fadah[2] & Sumani[3]
Magister Management, Departement Of Economic And Business, University Of Jember, Indonesia

DOI: 10.5281/zenodo.3342941

Keywords: Replacement of Production Machines, Monte Carlo Simulation, Investment Feasibility.

Abstract

This study aims to assess the feasibility of investing in production machinery replacement in the Sukoreno Makmur rice mill business. In this study, Monte Carlo simulation was used to project various conditions that might occur in the future. This study uses 3 methods to assess the feasibility of investing in production machinery replacement, namely NPV, IRR, and DPP methods. The results of the calculation show that the investment plan for replacing the old production machine with a new production machine is feasible with the result of a positive NPV value, the IRR value is greater than the WACC value, and the payback time is equal to the expected payback time of the company owner. In this study data data to be simulated are production costs, sales revenue, and bank loan interest rates.

Introduction

Rice is an agricultural commodity that becomes a necessity and must be fulfilled every day, because rice is the staple food of the Indonesian people. In Jember Regency, there were approximately 1,993 grain milling businesses, of which 56.75% were fixed grain milling businesses (BPS, 2012). Each rice factory must have a product brand to indicate that the rice is produced by a company, so in the market there are many brands of rice with varying prices and quality of rice. With the many brands of rice in the market, there has been intense competition between one rice factory and another. One way that can be done by a grain milling company or a Rice Factory is to develop their business in order to compete and survive in the market by investing, both in building investment, namely expanding or opening new branches, investing in production machinery, or investing in other assets. Sukoreno Makmur Rice Factory is one of the grain mills in Jember Regency. To develop the company, the Sukoreno Makmur rice factory plans to replace the old production machine with a new production machine. To assess whether the investment plan for replacing old production machines with new production machines is feasible or not, then the prosperous Sukoreno rice mill can apply capital budgeting or capital budgeting analysis. In addition, using capital budgeting, it can also be known whether or not production machinery replacement project planning in risky conditions. Because rice factory companies are always associated with risks in their production process activities, such as unstable price of grain, drunken uninterrupted grain, and uncertain product prices. Some studies using Monte Carlo simulations on feasibility studies including Nugraha (2017) examined the optimal rejuvenation time in rubber plants. The method used in this study is NPV and Monte Carlo analysis. The purpose of this study is to determine the optimal rejuvenation time of rubber plants based on the NPV value generated from the Monte Carlo simulation. This study made several calculation simulations to determine the optimal time for rejuvenation of rubber plants based on the value of NPV with 2 scenarios, namely by using their own capital and by using a loan from the bank.

Kusyanto (2014) examines the feasibility of establishing a regional company for construction services. In this study using NPV, IRR, Net B / C, DPP, sensitivity analysis and Monte Carlo analysis, and SWOT analysis. The Monte Carlo analysis used in this study uses the crystall ball program. In this study try to combine the sensitivity analysis method with the Monte Carlo simulation method. The sensitivity analysis used is a decrease in income of 26%, then another scenario is an increase in operating and pet costs by 52%, the third scenario is a decrease in income and an increase in operating and maintenance costs together with each increase and decrease of 17%. In addition to analyzing project feasibility financially, this study also uses SWOT analysis to determine or develop strategies - strategies and weaknesses, strengths, opportunities, and threats for the project to be

carried out. Supeni, Fadah, and Utami (2015) examined the feasibility of investing in packaging printing machines. This study aims to assess the feasibility of investing in packaging printing machines using the PP, ARR, NPV, IRR, MIRR, and Monte Carlo simulation methods. In this study before the Monte Carlo simulation, the first thing to do is to forecast the growth method, then the researcher carries out the Monte Carlo simulation. The Monte Carlo simulation used was 300 simulations.

Literature review

Capital Budgeting Capital budgeting is the process of analyzing projects that are carried out as a whole to decide which projects to choose, by attaching details of expenditures to be made during a certain period in the future (Brigham and Houston, 2013: 46). Sjahrial (2007: 18) defines capital budgeting or capital budgeting as a planning process and decision-making process regarding corporate funds to be issued with a repayment period of more than one year. From some definitions above, it can be concluded that capital budgeting is a process of planning, identifying and analyzing the expenditure of corporate funds on an investment to select which projects to choose. **Monte Carlo Simulation** Monte Carlo simulation is a risk analysis technique of a project, where the possibility of future risks will be simulated, resulting in estimated returns and risks (Brigham and Houston, 2013: 103). Simulation can also be interpreted as testing various possible outcomes that might occur on an investment to be carried out, the purpose of the simulation is to estimate the expected value of the investment before making a decision whether the investment plan to be made is accepted or rejected (Horne and Wachoicz, 2013: 65). **Net Present Value (NPV)** NPV is the difference between the present value or the present value of an investment with the present value of future net cash receipts, the NPV method for a company will show the return received from a project at a certain discount rate (Mulyawan, 2015: 130) Calculations for the NPV method are as follows (Brigham and Houston 2013: 50): NPV = CF0 + $CF1$ (1+r)1 + $CF2$ (1+r)2 + …….+ CFN (1+r)N = CFt (1+r)t Nt=0 **Internal Rate Of Return (IRR)** IRR is a discount rate that equates the present value of net cash flow with initial cash outlay or initial expenditure for capital, the IRR method can be said as an indicator of efficiency of an investment, while the NPV method indicates the amount of money or investment velocity (Mulyawan, 2015: 131). One calculation of IRR by interpolation, the following is the calculation of IRR by interpolation (Sjahrial, 2007:38 - 43): r = IRR = P1 – C1$P2$−$P2$ $C2$− $C1$ Where r is the IRR sought, P1 is the discount rate 1, P2 is the discount rate 2, C1 is NPV 1, and C2 is NPV 2. **Discounted Payback Period** The discounted payback period method is basically the same as the calculation of the payback period method, which is to calculate the payback period for an investment. The DPP method uses net cash flow that has been changed to its present value (Sjahrial, 2007: 25). The equation for calculating the DPP method is the same as the PP method, which is different namely in the DPP method in its calculation using net cash flow after it has been converted to its present value.

Method

The type of research used in this study is quantitative with a descriptive approach. The object under study is the Sukoreno Makmur rice mill company or it can be referred to as the Sukoreno Makmur Rice Factory located in Dusun Grugul Sukoreno, Kalisat District, Jember Regency. The type of data used in this study is primary data obtained by interviewing the owner of the Sukoreno Makmur rice factory. Data analysis was divided into 3 stages, namely grouping costs, Monte Carlo simulation, and calculation of NPV, IRR, and DPP methods. In this study the data will be simulated using the Monte Carlo simulation, namely the cost of raw materials (the amount of grain yield and price per kg of raw material), product sales revenue (amount of rice sales and price per kg of rice), and bank loan interest rates. Determining whether the production engine replacement project is said to be feasible or not will be seen from how much simulation calculation produces positive and negative NPV, how much simulation calculation produces IRR above WACC and below WACC, and how much simulation calculation produces DPP below the capital payback desired by the owner company. Random simulation calculations in this study using Microsoft Excel. raw material cost data and sales revenue data are randomly used the function "= randbetween", while for bank lending rates will be randomized with the function "= rand () * (max-min) + min". **Results and Discussion** The investment financing plan that will be used in this study is 70% of own funds and 30% of loan funds from banks, with the price of new production machines amounting to IDR 10,500,000,000. old production meisn sales of Rp. 400,000,000, so the price of a new production machine is Rp. 10,100,000,000. If in replacing a new production machine the owner of the Sukoreno Makmur rice

factory borrows funds from the bank at 30% of the purchase price of a new production machine, the owner of the Sukoreno Makmur rice factory will get a loan of Rp 3,030,000,000, while the funds themselves are Rp 7,070 .000,000. The data that will be carried out in the Monte Carlo simulation are production costs and sales revenue. Production costs consist of the number of kg of grain purchases and the price per kg of grain. sales revenue consists of the amount of kg of rice sold, the price per kg of rice, the sale of husks and bran, and the selling price of bran and husk. Simulation calculations are carried out per month for each data that will be simulated. In this study the first step in calculating the Monte Carlo simulation is determining the number of classes, then determining the class intervals for each data to be simulated, the last step is to create the next class table for random data.The following is a calculation of the Monte Carlo simulation on the number of kg grain purchases in January:

Table 1: simulation of the amount of purchases of kg of grain per January

		2	3	4	5	6	7
average	194.027	195.882	197.738	199.593	201.448	203.304	205.156
lowest (kg)	193.100	194.955	196.811	198.666	200.521	202.376	204.232
highest (kg)	194.954	196.810	198.665	200.520	202.375	204.231	206.080
Min random number	0	15	30	45	60	75	90
Max random random	14	29	44	59	74	89	100

Source: primary data 2016 – 2019

Number 1 to 7 in the table above show the number of classes. Based on the table above, random numbers can be used as a basis for projecting or forecasting the amount of kg of grain to be purchased by the Sukoreno Makmur rice factory in the future. For example, the random number listed is 10, the number 10 is between 0 and 14, then the amount of kg of grain that will be purchased by the Sukoreno Makmur rice factory in the future is projected or forecast as many as 194,027 kg. For the following months, from February to December the simulation calculation is the same. For other data to be simulated, the price per kg of grain, sales of 5kg of rice and 25kg of packaging, sales of bran and husks, and the selling price of husks and bran the same simulation calculation

The following is the result of calculating the investment feasibility of replacing a production machine with the NPV, IRR, and DPP methods:

Table 2: NPV, IRR, DPP simulation 1-25

simulation	NPV	IRR	WACC	DPP	
				year	month
1	5.417.501.583	17,97%	8,47%	6	6
2	5.295.386.252	18,46%	8,76%	6	2
3	6.052.451.511	19,35%	8,54%	6	2
4	6.843.877.720	20,74%	8,53%	6	1
5	6.176.141.624	19,45%	8,57%	6	1
6	5.657.743.444	19,30%	8,72%	6	1
7	6.230.419.239	19,78%	8,76%	6	2
8	6.147.443.583	19,34%	8,49%	6	2
9	5.630.603.680	18,81%	8,67%	6	3
10	5.528.521.905	18,68%	8,67%	6	5
11	5.987.675.066	19,61%	8,67%	6	1
12	5.733.993.258	18,84%	8,55%	6	2
13	6.205.334.750	19,52%	8,55%	6	3
14	6.539.824.760	19,95%	8,52%	6	5
15	5.967.136.505	18,95%	8,61%	6	1
16	5.698.602.544	18,56%	8,59%	6	4
17	5.697.690.332	18,64%	8,48%	6	2
18	6.507.094.296	19,98%	8,61%	6	1
19	5.950.037.138	19,48%	8,76%	6	0
20	6.001.736.232	19,62%	8,74%	6	1
21	4.686.551.564	16,79%	8,65%	6	9
22	5.529.626.332	18,32%	8,57%	6	5
23	6.694.715.215	19,97%	8,52%	6	1
24	5.382.885.405	18,63%	8,73%	6	2
25	5.165.045.830	17,55%	8,48%	6	8

Table 2 is the result of calculating the NPV, IRR, and DPP methods for simulation 1 through simulation 25 of the investment plan for replacing the old production machine with a new production machine.

Table 3: NPV, IRR, DPP simulation 26-50

Simulation	NPV	IRR	WACC	DPP	
				tahun	bulan
26	6.245.088.858	19,83%	8,64%	6	2
27	5.289.789.082	17,96%	8,77%	6	5
28	5.614.002.621	18,91%	8,73%	6	1
29	5.940.004.307	19,43%	8,76%	6	1
30	5.946.374.417	19,41%	8,50%	6	2
31	5.968.735.097	19,00%	8,60%	6	0
32	6.514.308.075	19,79%	8,53%	6	7
33	5.664.771.183	18,78%	8,63%	6	1
34	6.166.518.700	19,64%	8,68%	6	5
35	6.116.991.424	19,51%	8,72%	6	1
36	4.368.156.990	16,67%	8,62%	6	8
37	5.543.457.859	18,63%	8,63%	6	4
38	5.581.412.559	18,69%	8,76%	6	2
39	4.876.470.957	17,50%	8,57%	6	0
40	5.619.012.402	18,80%	8,75%	6	3
41	5.138.310.920	17,72%	8,53%	6	3
42	5.136.823.945	17,84%	8,58%	6	4
43	6.479.035.452	19,71%	8,47%	6	3
44	5.578.984.680	18,58%	8,65%	6	3
45	5.226.206.775	17,98%	8,67%	6	3
46	5.802.564.707	18,85%	8,75%	6	2
47	5.457.469.914	18,50%	8,72%	6	4
48	5.507.694.398	18,72%	8,76%	6	2
49	5.476.372.986	17,93%	8,55%	6	6
50	6.135.906.803	19,35%	8,54%	6	2

Source: primary data 2016 – 2019

Table 2 is the result of calculating the NPV, IRR, and DPP methods for simulation 26 through simulation 50 of the investment plan for replacing the old production machine with a new production machine. The calculation of NPV on financing 70% of its own capital and 30% of loans from banks yields a positive NPV value, it can be concluded that the investment plan for replacing an old production machine with a new production machine provides benefits for the company so it is feasible. The level of profit that will be obtained by the owners of the Sukoreno Makmur rice parchment is ranging from 4,368,156,990 to 6,843,877,720, after the owner of the prosperous Sukoreno rice factory paid off the loan installment to purchase a new production machine and also a 30% interest on bank loans.

The results of the IRR calculation on 70% financing of own capital 30% of loans from banks ranged from 16.67% to 20.74%, while the WACC value ranged from 8.47% to 8.77%. Based on the calculation of the IRR of up to 50 simulations, it is concluded that the investment plan for replacing the old production machine with the new production engine is feasible, because the IRR calculation results from 50 simulations exceed the WACC value. A higher IRR level than the WACC means that the project cash flow generated from the investment in replacing the old production machine with the new production machine provides a rate of return of 16.67% to 20.74% for each period. Based on the calculation of IRR with financing of 70% of its own capital and 30% of bank loans, it can be concluded that within 10 years investment in engine replacement production returns above the WACC, if the difference is in the range of 9% to 12% each period, thus at each the period of the owner of the Sukoreno Makmur rice factory benefited from 9% to 12%. Based on the calculation of the DPP 50

simulation on financing 70% of its own capital 30% of loans from the bank the result of investment will return with a vulnerable period of around 6 years, the payback period of capital desired by the owner of the Sukoreno Makmur rice factory that is for 6 years, so it can be said production machinery is feasible, because the payback period of capital based on the DPP calculation is the same as in accordance with the payback period of capital desired by the owner of the Sukoreno Makmur rice factory. **Conclusion** Based on the results of the Monte Carlo simulation calculation on the investment plan for replacing the old production machine with the new production engine, it was concluded that based on the NPV method it was said to be feasible, the NPV value showed a positive overall result. The IRR calculation results state that the investment plan for production machinery replacement is said to be feasible, because based on the calculation of 50 simulations it shows that the IRR value is entirely greater than the WACC value. The results of calculations using the DPP method show the returns on capital for 6 years, the results of the DPP calculation indicate that the investment plan for replacing the production machine is feasible, because the payback period based on the DPP calculation is equal to the return period of the company that is 6 years.

References

[1] Akbar, N., H., Paramu., and Nurhayati (2018). Determination Of Rubber Plant Life: An Application Of Capital Budgeting In Agricultural Sector. Scholars Journal Of Economics, Business And Management. http://saspjournals.com/wp-content/uploads/2018/04/SJEBM-53-270- 279-c.pdf.
[2] Badan Pusat Statistik. 2012. Perusahaan Industri Penggilingan Padi Tahun 2012.
[3] Brigham, E., F. and J. F. Houston. 2013. Dasar – Dasar Manajemen Keuangan Essentials Of Financing Management Buku 2. Jakarta: Salemba Empat.
[4] Horne, J. C., and J. M. Wachowicz, Jr. 2013. Prinsip – Prinsip Manajemen Keuangan Buku 2. Jakarta: Salemba Empat.
[5] Kusyanto. 2014. Analisis Kelayakan Ekonomi Dan Finansial Pendirian Perusahaan Daerah Jasa Pelaksana Konstruksi Di Kabupaten Pemalang. EKO – REGIONAL. Vol. 9, No. 2. http://jp.feb.unsoed.ac.id/ index.php/eko-regional/article/view/487.
[6] Mulyawan, S. 2015. Manajemen Keuangan. Bandung: CV Pustaka Setia.
[7] Sjahrial, D. 2007. Manajemen Keuangan. Jakarta: Mitra Wacana Media.
[8] Supeni, N., I. Fadah, dan E. S. Utami. 2015. Analisis Kelayakan Investasi Mesin Pencetak Kemasan Pada UD Robin Jaya Sentosa Situbondo. JURNAL EKONOMI. http://jurnal.stie-mandala.ac.id/ index.php/relasi/article/ view/36/24/.