

## MANAGERIAL FLEXIBILITY ROLE ON FINANCIAL INVESTMENT ANALYSIS: A CASE STUDY PUBLIC HOUSING



### Introduction

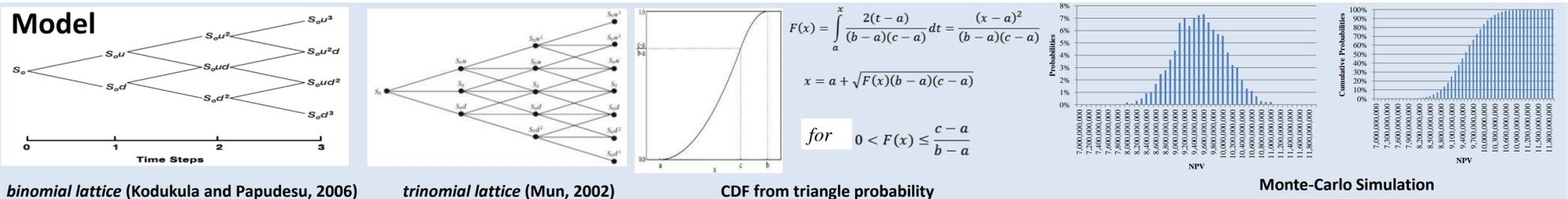
The limitations of Discounted Cash Flow (DCF) method for capturing the opportunity value phenomenon in the uncertainty of housing investment analysis cause difficulties in the decision-making process for the investors. Flexibility factor becomes the obstacle for investors in project uncertainty. Real Options Analysis (ROA) is an important factor included in the DCF method because it offers managerial flexibility in the uncertainty of housing investment decision making. Flexibility in ROA is a right and investors do not have an obligation to respond the uncertainty in project investment. The purpose of this research is to calculate the added value due to managerial flexibility in evaluating a low-cost housing investment and analyze the role of managerial flexibility in maximizing profits and minimizing potential losses due to uncertainties that arise when the project is in progress. A case study project is located at Pemalang Regency, Central Java, Indonesia.

### Material and Methods

The simulation conducted by a quantitative approach, and the numerical data were used to explain the phenomenon. The quantitative section included making DCF models, Monte Carlo simulations, and Real Options models. This model was applied to evaluate the feasibility of a housing project. The assumptions were used as presented in Table 1. There were 33 house sale scenarios which was a combination of optimistic, realistic and pessimistic scenarios. After that, the Monte Carlo simulation was conducted to calculate the volatility of NPV due to uncertainty. By using ROA, we could calculate the probability of the optimistic, realistic and pessimistic scenarios based on the volatility. Then, the scenario diagram model was created, which contained the cash flow each year along with its probability. By using a weighted average, the NPV value could be calculated based on the scenario.

Table 1. The assumptions used and NPV in DCF calculations

Scenario	Pessimistic	Realistic	Optimistic
Number of houses sold/year	83 units (16,66%)	125 units (25%)	250 units (50%)
Growth in selling price / year	6%	8%	10%
Number of houses built / year	100 units (20%)	175 units (35%)	300 units (60%)
Growth in construction cost / year	14%	10%	8%
Growth in operational cost / year	9%	7%	5%
NPV (in Rupiah/ IDR)	5.442.201.615	7.860.963.805	10.535.867.714



### Results

At first, affordable housing projects are evaluated using the Discounted Cash Flow (DCF) method to find out the NPV of the project in various conditions with the pessimistic, realistic, and optimistic scenarios. Table 1 shows three scenarios used in DCF modeling, namely pessimistic, realistic (most likely), and optimistic scenarios. With the pessimistic scenario, the NPV of Rp. 5,442,201,615 is obtained, and it assumes to take six years to sell the entire houses. With a realistic scenario, the NPV of Rp. 7,860,963,805 with an expectation of 4 years to sell the entire house. While in the optimistic scenario, it takes only two years to sell the entire house and the NPV obtained can reach Rp. 10,535,867,714.

Binomial Lattice Risk-Neutral Probabilities		
	Old	New
Up probabilities (pu) =	70.32%	100% - 14.84% = 85.16%
Down probabilities (pd) =	29.68%	0.5 x 29.68% = 14.84%
Trinomial Lattice Risk-Neutral Probabilities		
	Old	New
Up probabilities (pu) =	41.19%	100% - 45.98% - 12.83% = 62.78%
Middle probabilities (pm) =	45.98%	0.67 x 45.98% = 30.81%
Down probabilities (pd) =	12.83%	0.5 x 12.83% = 6.41%

Are there any promotional activities? (Year)						NPV	Δ NPV 1	Promotion Cost	Δ NPV 2
1	2	3	4	5	6				
No	No	No	No	No	No	8.761.910.056	-	-	-
Yes	No	No	No	No	No	9.161.965.315	400.055.259	100.000.000	300.055.259
No	Yes	No	No	No	No	9.006.577.715	244.667.659	100.000.000	144.667.659
No	No	Yes	No	No	No	8.862.887.355	100.977.299	100.000.000	97.977.299
No	No	No	Yes	No	No	8.768.885.057	6.975.001	100.000.000	(99.024.999)
No	No	No	No	Yes	No	8.762.721.480	811.424	100.000.000	(99.188.576)
No	No	No	No	No	Yes	8.761.910.056	0	100.000.000	(100.000.000)

Are there any promotional activities? (Year)						NPV	Δ NPV 1	Promotion Cost	Δ NPV 2
1	2	3	4	5	6				
No	No	No	No	No	No	8.761.910.056	-	-	-
Yes	No	No	No	No	No	9.161.965.315	400.055.259	100.000.000	300.055.259
Yes	Yes	No	No	No	No	9.417.635.320	655.725.263	200.000.000	455.725.263
Yes	Yes	Yes	No	No	No	9.478.871.253	716.961.197	300.000.000	416.961.197
Yes	Yes	Yes	Yes	No	No	9.480.734.941	718.824.885	400.000.000	318.824.885
Yes	Yes	Yes	Yes	Yes	No	9.480.810.334	718.900.277	500.000.000	218.900.277
Yes	Yes	Yes	Yes	Yes	Yes	9.480.810.334	718.900.277	600.000.000	118.900.277



### Discussions & Conclusions

The results of the research using a case study of low-cost housing in Pemalang Regency, limited to the type of uncertainty, in terms of housing demand, growth in house selling prices, number of houses built, construction costs, and operational costs, as well as flexibility used viz. promotional activities. The obtained results are also caused by the aspect of interviewee subjectivity in assessing various existing variables. Projects with different types of uncertainty and the same risk profile can produce different results using ROA. The role of managerial flexibility in providing added value to the evaluation of affordable housing investment is to include the flexibility aspect when conducting promotional activities to increase house sales. With the increase in house sales, the NPV value or potential profits that can be obtained will be even greater. This flexibility factor proves that affordable housing profits have increased by 5.2%. Promotional activities carried out in the 3<sup>rd</sup> to 6<sup>th</sup> years do not provide significant added value for NPV. The simulation results indicate a decrease in NPV value and profit potential (See Table 2 and 3).

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