UNIVERSITI TUNKU ABDUL RAHMAN
Lee Kong Chian Faculty of Engineering and Science

Wholly owned by UTAR Education Foundation
Co. No. 578227-M
DU012(A)

A New Mortgage Loan Model: Smart Mortgage Loan

Chai Hui Yung | Chin Yi Sheen | Hoe Jing Yi | Ko Yint San | Ong Wen Qian , Mr. Tan Zong Ming

ABSTRACT

Smart Mortgage Loan (SMA) is an interest-only mortgage together with an investment-link scheme. By having an interest-only mortgage loan, the monthly payments are low during the loan term. Together with the investment-link scheme, borrowers can place extra money into investments to build net worth. Therefore, if the market performance is very well during the loan term, the borrowers have a chance to pay a lower total payment at the end of the loan term compared to the standard mortgage loan. Consequently, SMA is suitable for all types of property buyers in Malaysia. Meanwhile, the bank can make a higher profit with SMA compared to the standard mortgage loan. To develop SMA, we need to decide on a suitable guaranteed rate and investment proportion. We build the model to illustrate the loan repayment monthly installment and test the sustainability and affordability through the scenario testing. SMA has a tenure of 30 years. However, we decide to have an Extended Repayment Plan (ERP) for 5 years as an additional feature of SMA so that the borrowers can repay the deferred principal with a low monthly installment if they are unable to repay at the end of 30 years in a lump sum.

OBJECTIVES

- To identify the marketable guaranteed rate for the investment-link scheme.
- To determine the suitable investment proportion.
- To test the sustainability and affordability of SMA through scenario testing.
- To determine the profitability of SMA compared to standard mortgage loan.

METHODOLOGY

Build SMA model and standard mortgage loan model to illustrate the loan repayment monthly installment for both models

Test different guaranteed rate and investment proportion for SMA model

Test the sustainability and affordability of SMA model through the scenario testing

Compare and analyze the result and decide the suitable guaranteed rate and investment proportion

Compare two models to determine which one is more profitable to the bank

RESULTS & DISCUSSION

Risk Level	Mean	Std deviation	Highest	Lowest	Best Scenario	Worst Scenario	Guranteed Rate
Lowest	3.07%	0.32%	3.35%	2.46%	3.72%	2.42%	3.00%
Low	5.26%	1.01%	6.78%	3.68%	7.28%	3.24%	3.50%
Moderate	4.08%	2.07%	7.37%	1.05%	8.23%	-0.07%	4.00%

Guaranteed Rate

We found that moderate risk has a relatively high standard deviation, which means it is less reliable compared to others. Thus, we will only include the guaranteed rate for both lowest and low risk for further testing.

Lowest Risk Investment: 3.00% **Low Risk Investment: 3.50%**

Investment Proportion

The investment proportion of 20% is too low while 30% is relatively high. Therefore, **25% is the most suitable investment proportion** for both lowest and low risk investments.

Lowest Risk

Loan Amount	315,000.00	Investment Guaranteed Rate	3.00%
Interest Rate	4.50%	Best Scenario	3.72%
Loan Term	30	Worst Scenario	2.42%
Interest Payment	1,157.56		

Base

Percentage	Investment Amount	Accumulated Value at the end of year		
		10	20	30
10%	128.62	17,935.57	42,039.47	74,433.10
20%	289.39	40,355.03	94,588.81	167,474.48
25%	385.85	53,806.71	126,118.42	223,299.31
30%	496.10	69,180.05	162,152.25	287,099.11
40%	771.71	107,613.41	252,236.83	446,598.62
50%	1,157.56	161,420.12	378,355.25	669,897.93

Best

Percentage	Investment Amount	Accumulated Value at the end of year		
		10	20	30
10%	128.62	120.00	240.00	83,956.01
20%	289.39	18,597.07	45,381.04	188,901.01
25%	385.85	41,843.41	102,107.35	251,868.02
30%	496.10	55,791.21	136,143.13	323,830.31
40%	771.71	71,731.56	175,041.17	503,736.03
50%	1,157.56	111,582.42	272,286.27	755,604.05

Worst

Percentage	Investment Amount	Accumulated Value at the end of year			Bank Loss
		10	20	30	
10%	128.62	120.00	240.00	67,693.40	(6,739.70)
20%	289.39	120.00	240.00	152,310.16	(15,164.32)
25%	385.85	17,422.52	39,561.41	203,080.21	(20,219.10)
30%	496.10	39,200.67	89,013.17	261,103.13	(25,995.99)
40%	771.71	52,267.56	118,684.22	406,160.42	(40,438.20)
50%	1,157.56	67,201.15	152,594.00	609,240.64	(60,657.30)

Low Risk

Loan Amount	315,000.00	Investment Guaranteed Rate	3.50%
Interest Rate	4.50%	Best Scenario	7.28%
Loan Term	30	Worst Scenario	3.24%
Interest Payment	1,157.56		

Base

Percentage	Investment Amount	Accumulated Value at the end of year		
		10	20	30
10%	128.62	18,395.12	44,343.25	80,945.66
20%	289.39	41,389.02	99,772.32	182,127.73
25%	385.85	55,185.36	133,029.76	242,836.98
30%	496.10	70,952.61	171,038.26	312,218.97
40%	771.71	110,370.72	266,059.52	485,673.95
50%	1,157.56	165,556.08	399,089.28	728,510.93

Best

Percentage	Investment Amount	Accumulated Value at the end of year		
		10	20	30
10%	128.62	120.00	240.00	158,333.65
20%	289.39	22,317.98	67,373.92	356,250.72
25%	385.85	50,215.46	151,591.33	475,000.96
30%	496.10	66,953.95	202,121.77	610,715.51
40%	771.71	86,083.65	259,870.85	950,001.91
50%	1,157.56	133,907.90	404,243.54	1,425,002.87

Worst

Percentage	Investment Amount	Accumulated Value at the end of year			Bank Loss
		10	20	30	
10%	128.62	120.00	240.00	77,442.78	(3,502.88)
20%	289.39	120.00	240.00	174,246.26	(7,881.47)
25%	385.85	18,152.00	43,114.51	232,328.35	(10,508.63)
30%	496.10	40,842.00	97,007.65	298,707.88	(13,511.09)
40%	771.71	54,456.00	129,343.53	464,656.70	(21,017.25)
50%	1,157.56	70,014.86	166,298.83	696,985.05	(31,525.88)

Extended Repayment Plan

Risk Level	Scenario	Estimated Outstanding at the end of year 30	Estimated Extended Installment	Estimated Total Extended Loan Payment	Estimated Total Payment
Lowest	Base/Worst	91,700.69	1,756.99	105,419.55	677,719.67
	Best	63,131.98	1,209.61	72,576.83	644,876.95
Low	Base/Worst	72,163.02	1,382.65	82,958.96	655,259.07
	Best	(160,000.96)	-	-	412,299.16

Profitability of SMA

Type of Plan	NPV of Interest Payment
Standard Mortgage	182,916.21
Smart Mortgage	247,509.85

Without Extension

Lowest Risk

Scenario	Payoff at time 30	NPV of Profit	Difference
Base	0	247,509.85	35.31%
Best	0	247,509.85	35.31%
Worst	(20,219.10)	242,111.35	32.36%

Low Risk

Scenario	Payoff at time 30	NPV of Profit	Difference
Base	0	247,509.85	35.31%
Best	0	247,509.85	35.31%
Worst	(10,508.63)	244,704.05	33.78%

With Extension (5 years)

Lowest Risk

Scenario	Payoff at time 30	NPV of Interest (last 5 years)	NPV of Profit	Difference
Base	0	2,635.63	248,213.56	35.70%
Best	0	1,814.52	247,994.33	35.58%
Worst	(20,219.10)	2,635.63	242,815.06	32.75%

Low Risk

Scenario	Payoff at time 30	NPV of Interest (last 5 years)	NPV of Profit	Difference
Base	0	2,074.08	248,063.63	35.62%
Best	0	-	247,509.85	35.31%
Worst	(10,508.63)	2,074.08	245,257.83	34.08%

Conclusion

Although the Low Risk Investment will bring lower profit to the bank compared to the Lowest Risk Investment, the bank needs to bear fewer losses when the worst scenario occurred. Besides, the monthly installment for the Low Risk Investment is lower than the Lowest Risk Investment during the 5 years extended repayment. The estimated total payment at the end of 35 years (with ERP) for Low Risk Investment is much lower than the Lowest Risk Investment as well. Therefore, the Low Risk Investment is more attractive to buyers compared to the Lowest Risk Investment.

In conclusion, Low Risk Investment with a **3.50% guaranteed rate** and **25% of investment proportion** is the most suitable and marketable investment scheme for the SMA model. Besides, SMA is at least **30% more profitable** than the standard mortgage loan.