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ALTERNATIVE HOME FINANCING: A SIMULATION APPROACH

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ABSTRACT

This paper looks at alternative financing for first-time buyers to accommodate an unprecedented occasion that may have a greater impact on homebuyers' credibility and default risk. The existing financing under the common conventional mortgages may need to be studied to move towards Musharakah Mutanaqisah (MM) provided under Islamic financing. The simulation indicates that MM could deliver a much stable and affordable platform for buyers as the financing is on a sharing basis because the risk will be shared between the financier and the buyer. The finding also demonstrates the possibility of changing to MM as both parties could benefit even if the buyer faces total default. This simulation highlights the possibilities of alternative home financing and promoting affordable homeownership.

Keywords: Musharakah mutanaqisah, affordable homeownership, simulation approach, housing loan default.

INTRODUCTION

Owning a house is mostly everyone's dream. Homeownership brings intangible benefits, such as a sense of stability, belongingness to a community, and pride. Researchers and policymakers have been

discussing issues on home financing to find the best solution to accommodate both parties: the lender and the borrower. In Malaysia, the dual banking system offers two forms of financing method: Islamic home financing and conventional home financing. For those who seek a halal alternative, Islamic mortgage offers homeownership a substitute for financing method. Islamic Banking and Finance (IBF) in Malaysia, started in 1983 and offers various schemes of home financing based on the principle of Bay' Bithaman Ajil (BBA), Murabahah and Commodity Murabahah (Yustiardi et al., 2019). The dominant products used in a sale and purchase transaction are Bai' Bithaman Ajil, BBA (deferred payment sale) and Musharakah Mutanaqisah (MM; diminishing partnership).

BBA is designed based on debt-based financing with the element of bay' inah contract, which is the amount of financing facility that customers could use to enjoy a deferred payment agreed by both parties throughout the financing tenure and is typically paid on monthly instalments. Since then, Islamic banking has evolved and adapted to all the changes in the economy and customers' needs and preferences. However, the implementation of BBA home financing has received many criticisms. Mohammed and Taib (2016) claimed that BBA practices in Malaysia are incompliant with the Shariah principle as the bank does not take the risk of ownership and liability on the property. Other scholars have also highlighted the issue of the Shariah principle in BBA in their studies (Meera & Razak, 2005; Razak, 2011).

Even though BBA is an Islamic bank financing mode, it relies on the market interest rate as its benchmark. This is unacceptable because it is similar to conventional banking, implying that such a mode supports the injustices of the interest-based system. The fluctuations and inconsistency in the interest rate cause the product pricing for Islamic home financing variable and uncertain. The stability of prices may affect the product pricing as the amount financed will be higher than when the market interest rate is low for a conventional loan, causing customers to withdraw from Islamic banks and transfer its facility to a conventional loan. Consequently, when the market interest rate is higher than the BBA profit rate, Islamic banks suffer losses as they cannot increase the profit rate in BBA due to its fixed selling price. Due to these problems, there is a crucial need to reform Islamic banking home financing applications under the BBA modes. A gradual move towards a better Islamic banking system that can eliminate interests and be in line with Shariah is needed, i.e., a mode of financing based on profit-and-loss sharing.

Musharakah mutanaqisah (MM) is a possible alternative for home financing as it is based on the concept of diminishing partnership (Subky et al., 2017). MM comprises three contracts: Musharakah (partnership), Ijarah (renting), and Bay' (sales). These contracts combine two basic Islamic concepts. First, the customer enters into a partnership (Musharakah) under a joint ownership agreement with the bank. Second, the bank leases its share in the house ownership to the customer under the concept of ijarah (leasing) (Aris et al., 2012). Even though scholars agree that it is best to implement MM (Lim et al., 2019; Meera & Razak et al., 2005; Subky et al., 2017; Yusof et al., 2011), the current practice of MM in home financing contains significant shortcomings, particularly on the issue of partnership and Islamic banks operating the contract more closely to conventional practices. Currently, MM home financing links their rental rate to an interest-based index, such as the London inter-bank offered rate (LIBOR) in the UK and bank's base rate in Malaysia, which resembles the conventional finance in practice (Amin et al., 2013; Meera & Razak, 2005, 2009).

This paper draws from the literature (Amin et al., 2013; Meera & Razak, 2005, 2009; Smolo & Hassan, 2011) to argue that when a rental is tied to a rental index and the value of the property is periodically revalued, both economic and social benefits should be substantially higher. This paper

proposes a better structure of MM without wa'd by incorporating the profit rate (to proxy for rental index) and utilising the original concept of MM so that profit-and-loss sharing is realised.

METHODOLOGY

Traditional jurists differed on whether wa'd is binding or otherwise. However, many opined that fulfilling a promise is recommended and is not binding and enforceable in law (Zaini, 2011, p. 30). Contemporary scholars have reached the consensus that wa'd is enforceable by law until and unless the promisor is not in a position to fulfil it in the count of any force majeure. For example, A promises to sell a house next month to B for RM100,000.00. However, A sells the house to C before the month elapses. A would be liable to make up for any loss incurred by B since B might have arranged to lease the house or sell it or use it to accommodate B's staff, incurring some costs.

The practice of wa'd in Musharakah mutanaqisah (MM) home financing invalidates the Shari'ah's principles for Musharakah contract (Abdullah, 2016). According to Abdullah (2010, p. 84), contemporary jurists allow the usage of wa'd as a necessity for the interest of the contracting parties. The paper affirms the importance of wa'd as an innovative tool to structure many forward contracts that require flexibility with full commitment of the parties involved without jeopardising the basic principles and maqasid Al-Shari'ah. The paper also highlights that the right of a promisee is well protected in both Shari'ah and civil law and enforceable in the court of law. Sawari et al. (2018) and Al-Masri (2002) argued that the practice of wa'd in some Islamic financial products are fictitious (i.e., hilah) to legalise the prohibited forward sale.

Since an alternative loan scheme (MM) without wa'd is not offered in the market, we used a simulation approach. Simulation enabled us to examine the behaviours/outcomes of the MM system (not available in the Malaysian mortgage market for empirical observations) and performs the "what-if" analysis based on a case with realistic assumptions. To probe MM as an alternative for financing, we used the following case in one town of Selangor, Malaysia, to illustrate the benefits and feasibility of the proposed alternative loan scheme of MM without wa'd as compared to the existing loan scheme in the market. According to the Bank Negara Malaysia (BNM) or the Central Bank of Malaysia (2017), "*A wa'd is a unilateral promise or undertaking which refers to an expression of commitment given by one party to another to perform a certain action(s) in the future.*"

According to BNM,

- i. Wa'd is a unilateral promise or undertaking, which is binding or non-binding.
- ii. The wa'd is not a contract.
- iii. A binding wa'd is a unilateral promise or undertaking attached to a condition, time, price, conduct or event that shall be enforceable on the promisor.
- iv. In relation to ii, the wa'd is binding from the date the promisor makes the wa'd.

ANALYSIS

Based on the above definition of wa'd, we used an example of Bank ABC with their existing mortgage loan description. Table 1 provides the information of the case studied.

Table 1
Case Study Description

Location	Taman Puchong Perdana, Selangor		
House Price	RM350,000		
Type of house	Single storey low-cost terrace		
Mortgage Loan Description	Deposit 20%,	Loan 80%,	Loan Tenure of 30 years
Example of the existing loan scheme	Bank ABC Islamic Loan	4.3% profit rate	Monthly instalment RM1,386
Alternative loan scheme	MM without wa'd		
	MM contract Cost (c): Benefit (B) =20:80		
	Average rental RM600		
	Bank gain RM874		
	Monthly redemption RM615		
	Total payment RM1,489		
Housing price growth at the historical rate	3.7%		
The discount rate used to calculate the present value	4.3% (i.e., the profit rate of Bank ABC loan scheme).		
Forced sale at auction	20%	35%	50%

Note:

1. The actual name of the bank was changed to protect the bank's confidentiality.
2. The example of loan scheme was taken from the existing bank's offering.
3. Housing price growth at the historical rate from 1999-2010 of overall Selangor State.
4. Forced sale at auction is based on a survey on auction for housing in Selangor.

We used the following steps to perform the simulation.

Step 1: Based on the parameters of the selected case in Table 1, we simulated the cash flow of MM with wa'd (the existing loan scheme). Then, the bank's profit rate was calculated. The profit rate was the rate that could discount the entire cash flow to get a zero net present value. Thus, the profit rate represented the return to the bank, such that the higher was more desirable. The profit rate of MM with wa'd could serve as a benchmarking point for MM without wa'd.

Step 2: The MM without wa'd, i.e., the alternative loan scheme as the default, was incorporated into the calculation of profit rate. The expected value of cash flow where the bank would share the losses and profits with its customer (MM without wa'd) was simulated. Based on this expected cash flow, the bank's rate of return was calculated. This was also the rate of return of MM without wa'd.

Step 3: From the values obtained in Step 1 and 2, we compared the benefits to the bank and customers of the existing loan scheme (with wa'd) and alternative loan scheme (without wa'd) in terms of the gains/losses under the scenarios of no default, defaults with 20%, 30%, and 50% force sales.

RESULTS

Cash flow of the bank when default

In the case of default with wa'd, all losses or gains are borne by the customer, similar to the conventional housing loan. Thus, the bank is guaranteed for the cash flow, resembling the case of no default. The MM with wa'd housing loan is based on a house price of RM350,000, a monthly instalment RM1,489, a monthly redemption RM615, a monthly rental income RM1,386, a deposit RM70,000, a loan amount RM280,000, and loan tenure of 30 years (see Table 1). Table 2 presents the calculations.

Appendix 1 shows that the bank's equity (Share of Bank) is diminishing over the loan tenure, while the rental income is assumed to be constant over the loan tenure. The equity of the customer (Share of Customer) is shown to increase over time, enabling the loan to be settled early. In the present case, the loan could end in the 25th year instead of the 30th year. This is one of the attractive features of a housing loan of MM without wa'd (Yahia & Abdullah, 1999).

In the case of default at the profit rate of ABC loan of 4.3% and MM is treated without wa'd, a loan default does not necessarily lead to an auction of the house. As a standard of practice, the bank will take pre-auction steps, such as negotiating to re-schedule the loan. In the present paper, for simplicity of calculation, the worst case of loan default, i.e., the bank would auction the house, was assumed. The forced sale occurs with the 20%, 30%, and 50% (the worst scenario not likely to happen) discount from the market values. The detailed calculations are presented in Appendix 1. Table 2 shows that if a loan default occurs in year 2 (of loan tenure), the house market price will be RM376,379. Under the ABC loan, at a profit rate of 4.3% with wa'd, the bank will recover its loan fully through a property auction. Thus, there is no gain or loss for the bank regardless of the amount of the forced sale discount, shown as zero in Table 2. Yet, the borrowers must pay the loan fully as stated in the earlier agreement, making this situation similar to a conventional loan mortgage loan.

But under MM without wa'd, even if there is default and an auction is made at a discount rate of 20%, 30%, or even at the worst scenario of 50%, both parties (the bank and the customer) will bear the losses due the sharing concept. For example, as default occurred in year 2, the house price dropped at a growth rate of 3.7%, the MM without wa'd shows that the bank can share the loss.

Table 2
Cash Flow of Bank for MM with and without Wa'd

Yr	House price	Bank ABC at 4.3%			MM without Wa'd		
		If default, the gain/loss to the bank at forced sale of discount of:			If default, the gain/loss to the bank at forced sale of discount of:		
		20%	35%	50%	20%	35%	50%
1	362950	0	0	0	-46454	-60590	-131267
2	376379	0	0	0	-37055	-51317	-122625
3	390305	0	0	0	-27816	-42194	-114083
4	404746	0	0	0	-18752	-33235	-105650
5	419722	0	0	0	-9878	-24455	-97337
6	435252	0	0	0	-1211	-15868	-89152
7	451356	0	0	0	7232	-7491	-81108
8	468056	0	0	0	15433	658	-73215

9	485374	0	0	0	23371	8562	-65485
10	503333	0	0	0	31028	16201	-57932
11	521957	0	0	0	38381	23556	-50569
12	541269	0	0	0	45407	30604	-43411
13	561296	0	0	0	52082	37323	-36471
14	582064	0	0	0	58381	43689	-29767
15	603600	0	0	0	64276	49678	-23315
16	625933	0	0	0	69740	55261	-17133
17	649093	0	0	0	74742	60412	-11239
18	673109	0	0	0	79251	65100	-5653
19	698014	0	0	0	83234	69295	-396
20	723841	0	0	0	86655	72964	4509
21	750623	0	0	0	89478	76072	9041
22	778396	0	0	0	91664	78583	13175
23	807197	0	0	0	93172	80458	16885
24	837063	0	0	0	93959	81657	20144
25	868034	0	0	0	93980	82137	22925
26	900152	0	0	0	93186	81854	25196
27	933457	0	0	0	91528	80761	26928
28	967995	0	0	0	88953	78809	28086
29	1003811	0	0	0	85406	75945	28636
30	1040952	0	0	0	80828	72114	28543

Figure 1 depicts the gain/loss for the bank. Under MM without wa'd, the bank faces losses if the default occurs in the first six years of the loan tenure (forced sale with 20% discount), seven years (forced sale with 35% discount), and 19 years (forced sale with 50% discount). The bank gains for the remaining years if a default occurs. If there is any default after these years, the bank will still have the chance to make profit.



Figure 1. Benefits to customer: MM with and without Wa'd

From the customer's perspective, under Bank ABC Islamic loan, at the profit rate of 4.3%, and with wa'd, a loss is incurred due to default in year 2, amounting to RM44,305; RM63,124, and RM157,218 if the forced sale is directed at 20%, 35%, and 50% discount respectively (see Table 3). Under MM without wa'd, the loss can be reduced to RM11,841, RM16,399, and RM39,186 due to the concept of risk-sharing with the bank.

The benefit of MM without wa'd for the customers is illustrated in Figure 2. The losses (negative values) due to default are reduced. Therefore, customers who default on their housing loans in the early loan tenure are cushioned by the risk-sharing concept. The MM without wa'd provides an alternative loan scheme to risk-averse customers.

Table 3
Customer's Cash Flow with and without Wa'd

Yr	House price	Bank ABC at 4.3%			MM without Wa'd		
		If default, the gain/loss to the bank at forced sale of discount of:			If default, the gain/loss to the bank at forced sale of discount of:		
		20%	35%	50%	20%	35%	50%
1	362950	-59640	-77788	-168525	-13186	-17198	-37258
2	376379	-44305	-63124	-157218	-11841	-16399	-39186
3	390305	-28374	-47890	-145466	-9939	-15077	-40765
4	404746	-11826	-32063	-133250	-7451	-13205	-41977
5	419722	5365	-15621	-120552	-4344	-10754	-42802
6	435252	23223	1460	-107353	-587	-7693	-43222
7	451356	41774	19206	-93633	3853	-3991	-43214
8	468056	61046	37643	-79371	9013	384	-42757
9	485374	81066	56797	-64546	14928	5469	-41827

10	503333	101864	76698	-49136	21638	11299	-40401
11	521957	123470	97373	-33117	29184	17912	-38452
12	541269	145916	118853	-16464	37608	25348	-35955
13	561296	169235	141170	846	46955	33649	-32881
14	582064	193459	164356	18840	57270	42859	-29201
15	603600	218626	188446	37546	68604	53023	-24885
16	625933	244772	213475	56992	81007	64189	-19901
17	649093	271935	239480	77207	94532	76408	-14215
18	673109	300154	266499	98221	109237	89732	-7792
19	698014	329472	294571	120068	125178	104216	-596
20	723841	359931	323739	142778	142418	119917	7411
21	750623	391575	354044	166388	161020	136895	16270
22	778396	424452	385532	190933	181053	155215	26023
23	807197	458609	418249	216450	202585	174940	36713
24	837063	494097	452244	242978	225692	196141	48387
25	868034	530967	487565	270557	250448	218889	61093
26	900152	569274	524267	299229	276935	243259	74880
27	933457	609074	562401	329037	305238	269332	89801
28	967995	650426	602026	360027	335443	297188	105912
29	1003811	693390	643199	392246	367643	326914	123269
30	1040952	738029	685982	425744	401934	358600	141933

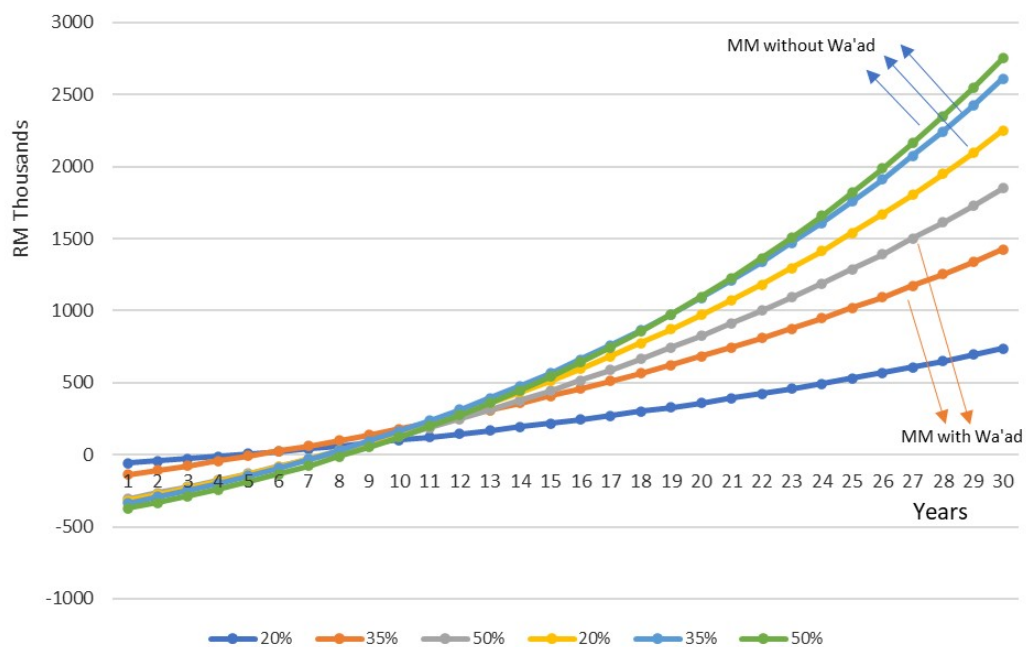


Figure 2. Customer's loss/gain if default.

Benefits to the Bank: MM with and without Wa'd

The paper further evaluates the bank's profitability to implement the MM without wa'd compared to the existing loan scheme. The existing loan scheme of Bank ABC at 4.3% has the expected profit of RM145,435¹ (as at present value, with a discount rate of 4.3%). This is the amount of profit the bank expected to receive. It serves as a benchmarking amount. If the expected profit of the alternative scheme (MM without wa'd) could generate an expected profit of equal to or more than RM145,435, it is profitable for the bank to sell this loan scheme.

To compare with the expected profit of RM145,435, we converted the gain/loss of the bank (see Table 1) into the present values. Table 4 presents the calculated present values. It shows that in the case of default if the discount of force sale is 20%, the bank will generate a profit of RM568,704, substantially higher than Bank ABC at 4.3% (RM145,435). Based on Table 4, it is clear that the gains outweigh the losses. However, if the forced sale discount is at 35% or 50%, it is not profitable for the bank because the profit obtained is less than the case of ABC at 4.3%. Thus, the profitability of a bank depends on the amount of discount on forced sales. Moreover, the rate of default could influence the probability.

Table 4
Bank's Gain/Loss in Present Value

Year	MM without Wa'd		
	If default, the gain/loss to the bank at forced sale of discount of:		
	20%	35%	50%
1	-44539	-55697	-120666
2	-34063	-43363	-103619
3	-24516	-32775	-88616
4	-15846	-23731	-75439
5	-8003	-16052	-63890
6	-941	-9574	-53792
7	5386	-4155	-44986
8	11020	335	-37329
9	16000	4013	-30692
10	20366	6980	-24959
11	24154	9329	-20028
12	27397	11142	-15804
13	30129	12491	-12206
14	32381	13440	-9157
15	34181	14049	-6593
16	35558	14366	-4454
17	36537	14436	-2686
18	37144	14300	-1242
19	37402	13993	-80
20	37334	13544	837
21	36961	12980	1543
22	36303	12326	2067

¹ Please refer to Appendix 2 for the calculation

23	35379	11601	2435
24	34207	10823	2670
25	32804	10007	2793
26	31186	9168	2822
27	29368	8315	2772
28	27365	7459	2658
29	25191	6607	2491
30	22858	5767	2283
TOTAL	568704	52124	-690870

According to the expected value (EV) theory, an anticipated value of gain/loss can be calculated by multiplying the gain/loss of each outcome by its probability of occurring and summing up these values. As a simple example, if a speed ticket costs RM300 and the probability of detection is 0.2, the expected value for a speeding ticket is RM60 (RM300 x 0.2). We had three outcomes of a forced sale, i.e., discount at 20%, 35%, and 50%, with values of RM568,704, RM52124, and -RM690,870 respectively. We could evaluate the expected value of the bank's gain/loss of the three forced sale discounts at the various default rates.

Without empirical evidence, we assumed the probability of discount of 20%, 35%, and 50%, respectively. The expected value would be RM161,815², higher than the expected profit of RM145,435. Incorporating the default rate ranging from 1% to 10%, we calculated the expected values of each outcome. Table 5 shows the expected values. For example, assuming that the default rate of 5% with the probability of default with forced sales of discount of 20%, 35%, and 50% is at the 0.5, 0.3 and 0.2 respectively, the expected value would be RM150069³, higher than the expected profit of the existing loan scheme (RM145,435).

Table 5
Expected Value of Profit Received (Bank)

	No default	Default with forced sales of discount at a market value of:			Expected value (EV)
		20%	35%	50%	
PV of profit received	145435	589082	355113	-814730	
Prob of occurring		0.5	0.3	0.2	
0. The default rate of 0%					
Prob of occurring	1	0	0	0	
EV of profit received	145435	0	0	0	145435
1. The default rate of 1%					
Prob of occurring	0.99	0.005	0.003	0.002	
EV of profit received	143980	2945	1065	-1629	146362
2. The default rate of 2%					
Prob of occurring	0.98	0.01	0.006	0.004	
EV of profit received	142526	5891	2131	-3259	147289

² RM161815 = (0.5 x 568704) + (0.3 x 52122) + (0.2 x -690870)

³ RM150069 = (0.95 x 145435) + (0.025 x 589082) + (0.015 x 355113) + (0.01 x -814730) where 0.95 = 1-0.05 (default rate); 0.025 = (0.05) x 0.5; 0.015 = (0.05) x 0.3; 0.01 = (0.05) x 0.2.

3. The default rate of 3%					
Prob of occurring	0.97	0.015	0.009	0.006	
EV of profit received	141072	8836	3196	-4888	148216
4. The default rate of 4%					
Prob of occurring	0.96	0.02	0.012	0.008	
EV of profit received	139617	11782	4261	-6518	149143
5. The default rate of 5%					
Prob of occurring	0.95	0.025	0.015	0.01	
EV of profit received	138163	14727	5327	-8147	150069
6. The default rate of 6%					
Prob of occurring	0.94	0.03	0.018	0.012	
EV of profit received	136709	17672	6392	-9777	150996
7. The default rate of 7%					
Prob of occurring	0.93	0.035	0.021	0.014	
EV of profit received	135254	20618	7457	-11406	151923
8. The default rate of 8%					
Prob of occurring	0.92	0.04	0.024	0.016	
EV of profit received	133800	23563	8523	-13036	152850
9. The default rate of 9%					
Prob of occurring	0.91	0.045	0.027	0.018	
EV of profit received	132346	26509	9588	-14665	153777
10. The default rate of 10%					
Prob of occurring	0.9	0.05	0.03	0.02	
EV of profit received	130891	29454	10653	-16295	154704

Table 5 shows that the expected value of profit for a bank under various rates of default (1% to 10%) is higher than RM145,435 (the profit of MM with wa'd), suggesting that banks should be able to generate higher profit if the alternative loan scheme, MM without wa'd, is implemented.

CONCLUSION

The current practice of MM in home financing contains significant shortcomings, particularly the partnership issue. In a default payment, banks do not want to share the risk and let the customers suffer. In this case, the principle of partnership is lacking. In addition, most banks prefer to undertake a contractual partnership instead of joint ownership as it does not contradict the tenets of Shariah principles. In other words, the Islamic banking industry today applies contractual partnership since the banks could generate profit and not incur losses because the customer is liable to buy all shares of the bank. This paper demonstrates how banks could still gain profit and customers could counter their losses in the event of default using joint ownership. This paper provides evidence and offers opportunities for further research.

Using the existing case of a current bank rate, this paper compared Islamic financing with the MM element. We calculated the bank's and customer's gain/loss in the case of default between Bank ABC at 4.3% and MM without wa'd. For customers, the benefit of MM without wa'd is illustrated in Figure 2. The risk-sharing concept provides a safety net for the customer since the losses due to default are reduced. The MM without wa'd provides an alternative loan scheme to risk-averse customers. This

paper also evaluated the profitability of banks to implement the MM without wa'd as compared to the existing loan scheme using real cases in Malaysia. Based on the simulation, banks would generate higher profit, dismissing the assumption of facing greater losses when defaulting. This paper calls for further study and understanding of the benefits of MM as the alternative for Islamic financing.

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APPENDIX 1: BANK ABC at 4.3% vs MM without Wa'd: Gain/loss for bank and customer

APPENDIX B: RESULTS OF 45% TO 100% WITHOUT WAIVER OF COLLATERAL FOR BANK AND CUSTOMER														
					Market price of house	Default and forced sale discount at								
Shares						20%			35%			50%		
Year	Bank gain	Redemption	Customer	Bank		Price sold	C-gain or loss	B-gain or loss	Price sold	C-gain or loss	B-gain or loss	Price sold	C-gain or loss	B-gain or loss
0			70000	280000	350000									
1	10488	7380	77380	272620	362950	290360	-13186	-46454	272213	-17198	-60590	181475	-37258	-131267
2	10488	7380	84760	265240	376379	301103	-11841	-37055	282284	-16399	-51317	188190	-39186	-122625
3	10488	7380	92140	257860	390305	312244	-9939	-27816	292729	-15077	-42194	195153	-40765	-114083
4	10488	7380	99520	250480	404746	323797	-7451	-18752	303560	-13205	-33235	202373	-41977	-105650
5	10488	7380	106900	243100	419722	335778	-4344	-9878	314792	-10754	-24455	209861	-42802	-97337
6	10488	7380	114280	235720	435252	348201	-587	-1211	326439	-7693	-15868	217626	-43222	-89152
7	10488	7380	121660	228340	451356	361085	3853	7232	338517	-3991	-7491	225678	-43214	-81108
8	10488	7380	129040	220960	468056	374445	9013	15433	351042	384	658	234028	-42757	-73215
9	10488	7380	136420	213580	485374	388300	14928	23371	364031	5469	8562	242687	-41827	-65485
10	10488	7380	143800	206200	503333	402667	21638	31028	377500	11299	16201	251667	-40401	-57932
11	10488	7380	151180	198820	521957	417565	29184	38381	391467	17912	23556	260978	-38452	-50569
12	10488	7380	158560	191440	541269	433015	37608	45407	405952	25348	30604	270634	-35955	-43411
13	10488	7380	165940	184060	561296	449037	46955	52082	420972	33649	37323	280648	-32881	-36471
14	10488	7380	173320	176680	582064	465651	57270	58381	436548	42859	43689	291032	-29201	-29767
15	10488	7380	180700	169300	603600	482880	68604	64276	452700	53023	49678	301800	-24885	-23315
16	10488	7380	188080	161920	625933	500747	81007	69740	469450	64189	55261	312967	-19901	-17133
17	10488	7380	195460	154540	649093	519274	94532	74742	486820	76408	60412	324546	-14215	-11239
18	10488	7380	202840	147160	673109	538488	109237	79251	504832	89732	65100	336555	-7792	-5653
19	10488	7380	210220	139780	698014	558412	125178	83234	523511	104216	69295	349007	-596	-396
20	10488	7380	217600	132400	723841	579073	142418	86655	542881	119917	72964	361920	7411	4509
21	10488	7380	224980	125020	750623	600498	161020	89478	562967	136895	76072	375312	16270	9041
22	10488	7380	232360	117640	778396	622717	181053	91664	583797	155215	78583	389198	26023	13175

23	10488	7380	239740	110260	807197	645757	202585	93172	605398	174940	80458	403598	36713	16885
24	10488	7380	247120	102880	837063	669650	225692	93959	627797	196141	81657	418532	48387	20144
25	10488	7380	254500	95500	868034	694428	250448	93980	651026	218889	82137	434017	61093	22925
26	10488	7380	261880	88120	900152	720121	276935	93186	675114	243259	81854	450076	74880	25196
27	10488	7380	269260	80740	933457	746766	305238	91528	700093	269332	80761	466729	89801	26928
28	10488	7380	276640	73360	967995	774396	335443	88953	725996	297188	78809	483998	105912	28086
29	10488	7380	284020	65980	1003811	803049	367643	85406	752858	326914	75945	501906	123269	28636
30	10488	7380	291400	58600	1040952	832762	401934	80828	780714	358600	72114	520476	141933	28543

Note: B=bank; C=customer.

APPENDIX 2: Present value of expected profit of BANK ABC at4.3%

Yr	PV factor	Loan collection	Profit received	Loan balance	Default	Expected loan collection	Expected profit paid	PV of expected loan collection	PV of expected profit received
0	\$1.00	0	0	280000	0	0	0	\$0	\$0
1	\$0.96	16632	12040	275408	0	16632	12040	\$15,946	\$11,544
2	\$0.92	16632	11843	270619	0	16632	11843	\$15,289	\$10,886
3	\$0.88	16632	11637	265623	0	16632	11637	\$14,659	\$10,256
4	\$0.85	16632	11422	260413	0	16632	11422	\$14,054	\$9,652
5	\$0.81	16632	11198	254979	0	16632	11198	\$13,475	\$9,072
6	\$0.78	16632	10964	249311	0	16632	10964	\$12,919	\$8,517
7	\$0.74	16632	10720	243399	0	16632	10720	\$12,387	\$7,984
8	\$0.71	16632	10466	237233	0	16632	10466	\$11,876	\$7,473
9	\$0.68	16632	10201	230802	0	16632	10201	\$11,386	\$6,984
10	\$0.66	16632	9925	224095	0	16632	9925	\$10,917	\$6,514
11	\$0.63	16632	9636	217099	0	16632	9636	\$10,467	\$6,064
12	\$0.60	16632	9335	209802	0	16632	9335	\$10,035	\$5,633
13	\$0.58	16632	9021	202192	0	16632	9021	\$9,622	\$5,219
14	\$0.55	16632	8694	194254	0	16632	8694	\$9,225	\$4,822
15	\$0.53	16632	8353	185975	0	16632	8353	\$8,845	\$4,442
16	\$0.51	16632	7997	177340	0	16632	7997	\$8,480	\$4,077
17	\$0.49	16632	7626	168333	0	16632	7626	\$8,130	\$3,728
18	\$0.47	16632	7238	158940	0	16632	7238	\$7,795	\$3,393
19	\$0.45	16632	6834	149142	0	16632	6834	\$7,474	\$3,071
20	\$0.43	16632	6413	138923	0	16632	6413	\$7,166	\$2,763
21	\$0.41	16632	5974	128265	0	16632	5974	\$6,870	\$2,468
22	\$0.40	16632	5515	117148	0	16632	5515	\$6,587	\$2,184
23	\$0.38	16632	5037	105554	0	16632	5037	\$6,315	\$1,913

24	\$0.36	16632	4539	93460	0	16632	4539	\$6,055	\$1,652
25	\$0.35	16632	4019	80847	0	16632	4019	\$5,805	\$1,403
26	\$0.33	16632	3476	67692	0	16632	3476	\$5,566	\$1,163
27	\$0.32	16632	2911	53970	0	16632	2911	\$5,337	\$934
28	\$0.31	16632	2321	39659	0	16632	2321	\$5,117	\$714
29	\$0.29	16632	1705	24733	0	16632	1705	\$4,906	\$503
30	\$0.28	16632	1063	9164	0	16632	1063	\$4,703	\$301
31	\$0.27	9558	394	0	0	9558	394	\$2,592	\$107
TOTAL		508518	228518	5314374	0	508518	228518	280000	145435