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A Modification of *Bai Bithaman Ajil* Instrument through *Musharakah Mutanaqisah*: Fixation of Robust Optimisation into Rule 78

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Abstract- The development of Islamic financial system in Malaysia had lead to various innovation and establishment of new instruments and concepts whether in debt-based financing or equity-based financing. Though several concepts have been modified to fulfill consumer's need, however, each and every one of the models should abide the law of *Shariah*. For over a few decades, Malaysia has been the lead country in applying the *Bai Bithaman Ajil* instrument in property financing. Until recently, a few legal cases have emerged and its compliancy towards *Shariah* has been debated among the scholars and consumers itself. In spite of the expose issues, a new proxy has been introduced. *Musharakah Mutanaqisah* is introduced as an equity-financing and is proven to be conforming towards *Shariah* as its ownership is shared between the bank and consumer. In contemplation of making the debt-based financing compliance towards *Shariah*, this journal is to schemed a new model in which the original model of *Bai Bithaman Ajil* is embedded with profit sharing ratio exist in *Musharakah Mutanaqisah.*

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I. Introduction

The evolution of Islamic banking and finance as the modern corporate entity for the past few years has brought the industry into several new perspectives [7]. Since its emergence in 1983, various products have been introduced and schemed to meet consumer's demands corresponding to Shariah law. Shariah law is the basis in the innovation of Islamic system instruments and its objectives must conform to the law. The law constitutes from several set of rules and relationship control between human and its creator (ALLAH s.w.t) and relationship in between human which bestow the aspects of life including the financial and banking [5].

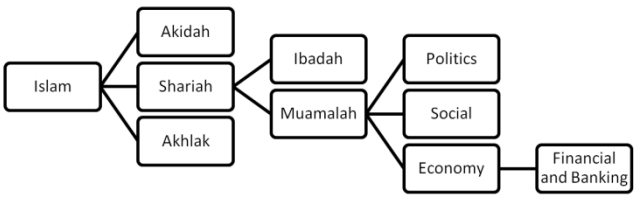

Figure 1 : The law constitutes in Islam

For an instrument to be justified as valid, void or voidable, the issues and the legal effects of a contract rely on the Islamic commercial law which is *fiqh al mu'amalat* [4]. In spite of that, the upbringing of Islamic economy system is mainly emphasises on the benefit of both the corporate entity as well as the customer. The practice of *riba,*

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gharar and *masyir* is strictly prohibited in Islamic economy system as it is obviously burdening especially towards customer. As been told earlier, the Islamic financial system is bounded by the principle of *fiqh.* It encompasses concepts such as risk sharing in which each participant should share both the risk and return from the transaction, the rights and duties of individuals where no exploitation should exist in the transaction and the sanctity of the contract in which any sinful activities should be prohibited.

Being a growing and developing industries, Islamic financial system also face on several issues and challenges. Various factors such as legal framework, taxation, stamp duty, accounting treatment and other similar considerations have yet to influence the innovation and the enhancement of Islamic financial product. Realistically, these factors pose significant and practical considerations prior to undertaking any product development and enhancement [8]. Despite of being *Shariah* compliant, a financial product must also be legal and compatible to current practice in terms of the mention factors, or otherwise, Islamic financial product will be inferior to the conventional financial product. According to [4], theoretically speaking, Islamic law has introduced variety of alternative when it comes to replacing proxy to conventional banking and financial products. It is precisely of this regard that the Islamic law declare *riba* as unlawful but trading as lawful [9].

II. Bai Bithaman Ajil (BBA)

Unlike equity-based financing, debt-based financing focus solely on the accountability of risk in instruments such as *Bai Bithaman Ajil* (BBA) *Murabahah* and *al-Ijarah Thumma al-Bai* (AITAB). The conformity of debt-based financing towards *Shariah* has always been debated by the scholars as it is working almost similarly to the interest-based financing that has been practice by the conventional financial institute [2]. In terms of property financing, BBA has always been the most popular modes in Malaysia [1]. Basically, BBA is a financing instrument based on deferred instalment.

The instrument BBA can be computed as follows:

$$\beta = \frac{P + U_n}{n} \tag{1}$$

where,

β: Periodical payment of BBA contract

P: Principal

U_n: Profit margin

n: Period

and the selling price can be obtained as follows:

$$\beta n = P + U_n \tag{2}$$

From equation (2), U_n can be computed as:

$$U_n = P \times r \times n \tag{3}$$

where r is the profit rate. The purchasing price, P, is originally a mixed of contribution made by the bank and the customer. Based on the Hire – Purchased Act 1967, customers (lessee) are entitled to contribute at least 10% from its purchasing price, and the remaining 90% will be contributed by the bank (lessor) [5]. Mathematically, this can be simpy put as follow:

$$P = X_t^{pp} + Y_t^{p} \tag{4}$$

Ref

8. Sudin Haron dan Norafifah Ahmad. (2000). The Islamic banking system in Malaysia: Some issues. *Proceedings of the Fourth Harvard University Forum on Islamic Finance: Islamic Finance: The Task Ahead.* Massachusetts: Center for Middle Eastern Studies, Harvard University.

X_t^{pp}: Lessor's financial contribution

Y_t^{p}: Lessee's financial contribution

In this journal however only consider the contribution made by the lessor.

III. Rule 78

There are two methods that are used by the Islamic financial system in the evaluation of profit for BBA contract that is:

i. Rule 78
ii. Constant Rate of Return (CRR)

This journal will focus only on Rule 78. Rule 78 is the method used to determine the interest charges incurred during the period of annual payments. Rule 78 is basically based on the reduction of interest rate in this case, the profit margin on monthly basis. Eventually, the customer is obligated to pay only the principal with a slight of profit margin.

The profit gained by the bank is simply the selling price minus by the purchasing price. Mathematically, the profit gained can be computed as equation (5):

$$\begin{aligned} U_n &= \beta n - P \\ &= [P + (P \times r \times n)] - P \\ &= P \times r \times n \end{aligned} \tag{5}$$

Then by using Rule 78, the profit amortisation, B_t^{pp} gain by the bank at time t can be computed as in equation (6):

$$B_t^{pp} = \frac{[(n+1)-t] \times U_n}{\frac{n+1}{2} \times n} \tag{6}$$

IV. Musharakah Mutanaqisah (Diminishing Partnership)

Unlike the debt-based financing, equity-based financing emphasised on the profit-loss sharing [4]. The example of instrument which applied the equity-based financing is *Musharakah* and *Mudharabah.* Since the debt-based financing had been debated its compliancy towards *Shariah* for over a decade among the scholars and Islamic economist, an alternative proxy has been introduced to overcome the problems that is known as *Musharakah Mutanaqisah* or simply put as the diminishing partnership [3].

Musharakah Mutanaqisah is a partnership between two parties in which the first party (customer) promise to buy an asset own by the second party (bank) which eventually the ownership of the asset will be owned by the first party. This concept has been developed after it is identified that the bank is not subjected to any risks and liabilities towards the asset in the BBA document even though during the periodic payment the asset is fully own by the bank.

Musharakah Mutanaqisah is said to be compliance towards *Shariah* because of the profit-loss sharing between the customer and the bank [3] [10].

V. Profit Sharing Ratio (PSR): Robust Optimisation

Profit sharing ratio (PSR) can be categorised into two category that is:

i. PSR Robust optimization
ii. PSR Single constraint

This paper only considers the PSR robust optimisation. According to [5], robust optimisation of PSR must fulfil all the constraints. Decision maker should not tolerate on any error or breach regarding the optimisation constraints. By considering where

Ref

5. Nurfadhlina Abdul Halim. (2012). *Pemodelan matematik instrumen sewa-beli Islam alternatif.* Tesis Doktor Falsafah, Pusat Pengajian Sains Matematik, Universiti Kebangsaan Malaysia.

$a = \frac{X_0}{n}$ and $u_t(\omega)$ is the Base Financing Rate (BFR) at time t, robust optimisation of PSR can be computed as in equation (7)

$$\{\min\{\vartheta_t^{pp} : \mathrm{P}\{u_t(\omega) : \vartheta_t^{pp} \geq \frac{(X_0 - ta)r_f}{u_t(\omega)P} = 1\} u_t(\omega) \in U\} \quad (7)$$

The optimum PSR through equation (6) is obtained through the highest probability of $u_t(\omega)$ where all the value of $u_t(\omega)$ fulfill the constraints. If there is any $u_t(\omega)$ does not fulfill the constraints, thus the valid solution does not exist and no solution for optimum PSR. In other word, we consider the local optimum for each t.

VI. Modification of Rule 78 by Fixation of Profit Sharing Ratio

BBA improvements occur on the payment to be paid by the customer to the bank after obtaining the assets. If seen from the modus operandi of the BBA, the payment occurs on a monthly basis until settled and then at the end of the payment the assets will be transferred to the customer.

After the approach of *Musharakah Mutanaqisah* is embedded in the BBA model, the execution of BBA is changed and the ownership of assets is transferred gradually from the bank to the customer [6]. Although, given the approach of equity-based financing, the concept is still identified as financing-based debt because the ownership of the assets is still retained by the bank until the last periodical payment is settled in which the customer will become the sole owner of the asset.

The modified of Rule 78 by applying PSR into the model can be computed as in equation (8):

$$\tilde{B}_t^{pp} = \frac{[(n+1)-t] \times (X_t^{pp} \times \omega \times \vartheta_t^{pp})}{\frac{n+1}{2} \times n} \quad (8)$$

Thus, the new rectification of BBA model after been embedded by the *Musharakah Mutanaqisah* model is in equation (9) which is the periodical payment for each period:

$$\beta_t = \frac{P}{n} + \frac{[(n+1)-t] \times (X_t^{pp} \times \omega \times \vartheta_t^{pp})}{\frac{n+1}{2} \times n} \quad (9)$$

And the amount for BBA contract is computed as in equation (10):

$$\beta^* = \sum_{t=1}^{n} \beta_t \quad (10)$$

VII. Empirical Test on the Existing and the Modified Rule 78 and its Comparisons

Consider the following situation, customer A makes an agreement with the bank to obtain an asset by using the BBA contract. The purchasing price of the asset is RM 1,000,000 with profit margin of 10% in 6 years payment. So, the customer will be paying in 72 instalments. The selling price will be:

$$\beta n = P + U_n$$

$$= 1{,}000{,}000 + (10\% \times 6 \times 1{,}000{,}000)$$

Ref
6. Saiful Azhar Rosly. (1999). Al- Bay' Bithaman Ajil Financing: Impacts on Islamic Banking Performance. *Thunderbird International Business Review*, 41 (4-5), 461-480.

$$= 1{,}600{,}000 \quad (11)$$

The periodical payment that will be paid by the customer will be:

$$\beta = \frac{P + U_n}{n} = \frac{1{,}000{,}000 + (10\% \times 6 \times 1{,}000{,}000)}{72} = 22{,}222.22 \quad (12)$$

Notes

The profit gained by the bank will be:

$$U_n = \beta n - P = 1{,}600{,}000 - 1{,}000{,}000 = 600{,}000 \quad (13)$$

By using the existing rule 78, the profit amortisation will be:

$$B_t^{pp} = \frac{[(n+1)-t] \times U_n}{\frac{n+1}{2} \times n} = \frac{[(72+1)-1] \times 600{,}000}{\frac{72+1}{2} \times 72} = 16{,}438.36 \quad (14)$$

Figure 2 : illustrate the execution of existing Rule 78.

Period, t	Periodical Payment, β	Profit amortisation, B_t^{pp}	Principal amortisation	Remaining principal, P
0				1,000,000.00
1	22,222.22	16,438.36	5,783.86	994,216.14
2	22,222.22	16,210.05	6,012.17	988,203.96
3	22,222.22	15,981.74	6,240.48	981,963.48
4	22,222.22	15,753.42	6,468.80	975,494.68
5	22,222.22	15,525.11	6,697.11	968,797.58
6	22,222.22	15,296.80	6,925.42	961,872.16
7	22,222.22	15,068.49	7,153.73	954,718.43
8	22,222.22	14,840.18	7,382.04	947,336.40
9	22,222.22	14,611.87	7,610.35	939,726.05
10	22,222.22	14,383.56	7,838.66	931,887.39
11	22,222.22	14,155.25	8,066.97	923,820.42
12	22,222.22	13,926.94	8,295.28	915,525.14
13	22,222.22	13,698.63	8,523.59	907,001.55
14	22,222.22	13,470.32	8,751.90	898,249.65
15	22,222.22	13,242.01	8,980.21	889,269.44
16	22,222.22	13,013.70	9,208.52	880,060.92
17	22,222.22	12,785.39	9,436.83	870,624.09

18	22,222.22	12,557.08	9,665.14	860,958.94
19	22,222.22	12,328.77	9,893.45	851,065.49
20	22,222.22	12,100.46	10,121.76	840,943.73
21	22,222.22	11,872.15	10,350.07	830,593.65
22	22,222.22	11,643.84	10,578.38	820,015.27
23	22,222.22	11,415.53	10,806.69	809,208.57
24	22,222.22	11,187.21	11,035.01	798,173.57
25	22,222.22	10,958.90	11,263.32	786,910.25
26	22,222.22	10,730.59	11,491.63	775,418.63
27	22,222.22	10,502.28	11,719.94	763,698.69
28	22,222.22	10,273.97	11,948.25	751,750.44
29	22,222.22	10,045.66	12,176.56	739,573.88
30	22,222.22	9,817.35	12,404.87	727,169.02
31	22,222.22	9,589.04	12,633.18	714,535.84
32	22,222.22	9,360.73	12,861.49	701,674.35
33	22,222.22	9,132.42	13,089.80	688,584.55
34	22,222.22	8,904.11	13,318.11	675,266.44
35	22,222.22	8,675.80	13,546.42	661,720.02
36	22,222.22	8,447.49	13,774.73	647,945.29
37	22,222.22	8,219.18	14,003.04	633,942.24
38	22,222.22	7,990.87	14,231.35	619,710.89
39	22,222.22	7,762.56	14,459.66	605,251.23
40	22,222.22	7,534.25	14,687.97	590,563.25
41	22,222.22	7,305.94	14,916.28	575,646.97
42	22,222.22	7,077.63	15,144.59	560,502.38
43	22,222.22	6,849.32	15,372.90	545,129.47
44	22,222.22	6,621.00	15,601.22	529,528.26
45	22,222.22	6,392.69	15,829.53	513,698.73
46	22,222.22	6,164.38	16,057.84	497,640.89
47	22,222.22	5,936.07	16,286.15	481,354.75
48	22,222.22	5,707.76	16,514.46	464,840.29
49	22,222.22	5,479.45	16,742.77	448,097.52
50	22,222.22	5,251.14	16,971.08	431,126.44
51	22,222.22	5,022.83	17,199.39	413,927.05
52	22,222.22	4,794.52	17,427.70	396,499.35
53	22,222.22	4,566.21	17,656.01	378,843.34
54	22,222.22	4,337.90	17,884.32	360,959.02
55	22,222.22	4,109.59	18,112.63	342,846.39
56	22,222.22	3,881.28	18,340.94	324,505.45
57	22,222.22	3,652.97	18,569.25	305,936.20
58	22,222.22	3,424.66	18,797.56	287,138.64
59	22,222.22	3,196.35	19,025.87	268,112.76
60	22,222.22	2,968.04	19,254.18	248,858.58
61	22,222.22	2,739.73	19,482.49	229,376.09

Notes

62	22,222.22	2,511.42	19,710.80	209,665.28
63	22,222.22	2,283.11	19,939.11	189,726.17
64	22,222.22	2,054.79	20,167.43	169,558.74
65	22,222.22	1,826.48	20,395.74	149,163.01
66	22,222.22	1,598.17	20,624.05	128,538.96
67	22,222.22	1,369.86	20,852.36	107,686.60
68	22,222.22	1,141.55	21,080.67	86,605.93
69	22,222.22	913.24	21,308.98	65,296.96
70	22,222.22	684.93	21,537.29	43,759.67
71	22,222.22	456.62	21,765.60	21,994.07
72	22,222.38	228.31	21,994.07	0.00

Fig.2. The empirical test on the existing Rule 78.

Whereas, by considering the same situation, using the modified Rule 78 Figure 3 is obtained. Figure 3 illustrate the execution of modified Rule 78. By considering the principal amortisation for each period is fixed, we will obtain:

$$\begin{aligned} a &= \frac{X_0}{n} \\ &= \frac{1{,}000{,}000}{72} \\ &= 13{,}888.89 \end{aligned} \tag{15}$$

Using the equation (7), (8) and (9), the PSR, profit amortisation and periodical payment for each period is obtained as shown in Figure 3.

Figure 3 : The empirical test on the modified Rule 78.

Period	Profit Sharing Ratio	Term charge	Principal Amortisation	Profit Amortisation	Periodical payment	Remaining Principal
0						1000000
1	0.007043651	6.72	13,888.89	11671.23	25,560.12	986,111.11
2	0.006944444	6.72	13,888.89	11347.03	25,235.92	972,222.22
3	0.006845238	6.72	13,888.89	11027.40	24,916.29	958,333.33
4	0.006746032	6.72	13,888.89	10712.33	24,601.22	944,444.44
5	0.006646825	6.72	13,888.89	10401.83	24,290.72	930,555.56
6	0.006547619	6.72	13,888.89	10095.89	23,984.78	916,666.67
7	0.006448413	6.72	13,888.89	9794.52	23,683.41	902,777.78
8	0.006349206	6.72	13,888.89	9497.72	23,386.61	888,888.89
9	0.00625	6.72	13,888.89	9205.48	23,094.37	875,000.00
10	0.006150794	6.72	13,888.89	8917.81	22,806.70	861,111.11
11	0.006106106	6.66	13,888.89	8634.70	22,523.59	847,222.22
12	0.00617284	6.48	13,888.89	8356.16	22,245.05	833,333.33
13	0.006060606	6.49	13,888.89	8082.19	21,971.08	819,444.44
14	0.006444444	6.00	13,888.89	7812.79	21,701.67	805,555.56
15	0.006797853	5.59	13,888.89	7547.95	21,436.83	791,666.67
16	0.006714628	5.56	13,888.89	7287.67	21,176.56	777,777.78
17	0.006594724	5.56	13,888.89	7031.96	20,920.85	763,888.89

18	0.00647482	5.56	13,888.89	6780.82	20,669.71	750,000.00
19	0.006354916	5.56	13,888.89	6534.25	20,423.14	736,111.11
20	0.006235012	5.56	13,888.89	6292.24	20,181.13	722,222.22
21	0.006115108	5.56	13,888.89	6054.79	19,943.68	708,333.33
22	0.005995204	5.56	13,888.89	5821.92	19,710.81	694,444.44
23	0.0058753	5.56	13,888.89	5593.61	19,482.50	680,555.56
24	0.005755396	5.56	13,888.89	5369.86	19,258.75	666,666.67
25	0.005635492	5.56	13,888.89	5150.68	19,039.57	652,777.78
26	0.005515588	5.56	13,888.89	4936.07	18,824.96	638,888.89
27	0.005154639	5.82	13,888.89	4726.03	18,614.92	625,000.00
28	0.005040092	5.82	13,888.89	4520.55	18,409.44	611,111.11
29	0.00472268	6.07	13,888.89	4319.63	18,208.52	597,222.22
30	0.00461285	6.07	13,888.89	4123.29	18,012.18	583,333.33
31	0.004324895	6.32	13,888.89	3931.51	17,820.40	569,444.44
32	0.004219409	6.32	13,888.89	3744.29	17,633.18	555,555.56
33	0.004113924	6.32	13,888.89	3561.64	17,450.53	541,666.67
34	0.004008439	6.32	13,888.89	3383.56	17,272.45	527,777.78
35	0.003902954	6.32	13,888.89	3210.05	17,098.93	513,888.89
36	0.003797468	6.32	13,888.89	3041.10	16,929.98	500,000.00
37	0.003691983	6.32	13,888.89	2876.71	16,765.60	486,111.11
38	0.003586498	6.32	13,888.89	2716.89	16,605.78	472,222.22
39	0.003481013	6.32	13,888.89	2561.64	16,450.53	458,333.33
40	0.003375527	6.32	13,888.89	2410.96	16,299.85	444,444.44
41	0.003121853	6.62	13,888.89	2264.84	16,153.73	430,555.56
42	0.003021148	6.62	13,888.89	2123.29	16,012.18	416,666.67
43	0.002920443	6.62	13,888.89	1986.30	15,875.19	402,777.78
44	0.002819738	6.62	13,888.89	1853.88	15,742.77	388,888.89
45	0.002719033	6.62	13,888.89	1726.03	15,614.92	375,000.00
46	0.002618328	6.62	13,888.89	1602.74	15,491.63	361,111.11
47	0.002517623	6.62	13,888.89	1484.02	15,372.91	347,222.22
48	0.002416918	6.62	13,888.89	1369.86	15,258.75	333,333.33
49	0.002316213	6.62	13,888.89	1260.27	15,149.16	319,444.44
50	0.002215509	6.62	13,888.89	1155.25	15,044.14	305,555.56
51	0.002114804	6.62	13,888.89	1054.79	14,943.68	291,666.67
52	0.002014099	6.62	13,888.89	958.90	14,847.79	277,777.78
53	0.001913394	6.62	13,888.89	867.58	14,756.47	263,888.89
54	0.001812689	6.62	13,888.89	780.82	14,669.71	250,000.00
55	0.001711984	6.62	13,888.89	698.63	14,587.52	236,111.11
56	0.001611279	6.62	13,888.89	621.00	14,509.89	222,222.22
57	0.001510574	6.62	13,888.89	547.95	14,436.83	208,333.33
58	0.001409869	6.62	13,888.89	479.45	14,368.34	194,444.44
59	0.001309164	6.62	13,888.89	415.53	14,304.41	180,555.56
60	0.001208459	6.62	13,888.89	356.16	14,245.05	166,666.67
61	0.001107754	6.62	13,888.89	301.37	14,190.26	152,777.78

Notes

62	0.001007049	6.62	13,888.89	251.14	14,140.03	138,888.89
63	0.000906344	6.62	13,888.89	205.48	14,094.37	125,000.00
64	0.000805639	6.62	13,888.89	164.38	14,053.27	111,111.11
65	0.000704935	6.62	13,888.89	127.85	14,016.74	97,222.22
66	0.00060423	6.62	13,888.89	95.89	13,984.78	83,333.33
67	0.000503525	6.62	13,888.89	68.49	13,957.38	69,444.44
68	0.00040282	6.62	13,888.89	45.66	13,934.55	55,555.56
69	0.000302115	6.62	13,888.89	27.40	13,916.29	41,666.67
70	0.00020141	6.62	13,888.89	13.70	13,902.59	27,777.78
71	0.000100705	6.62	13,888.89	4.57	13,893.46	13,888.89
72	0	6.62	13,888.89	0.00	13,888.89	0.00

Notes

VIII. Conclusion

We have done an empirical test towards the existing and modified model using Base Financing Rate (BFR) data from the year 2008 until 2013. It is proved that, the establishment of modified Rule 78 can be applied in the real world. The proposed model is able to be the proxy for existing *Bai Bithaman Ajil* (BBA).

The result from these empirical test shows that the amount of BBA contract by using modified Rule 78 is lower than the existing Rule 78. The BBA contract amount by using existing Rule 78 as the computation of profit gained is RM 1,600,000 whereas by applying the modified rule 78 in the BBA contract gives the amount of RM 1,284,000.00. This shows that, customer is obliged to pay lower profit margin by using the modified Rule 78. Besides, the modified Rule 78 is already embedded by profit sharing ratio (PSR) which applies the *Musharakah Mutanaqisah* contract and consider the dual-ratio sharing.

It can be concluded that, this new model is much more compliance towards *Shariah* because it consider the profit-loss sharing (PLS) compared to the existing BBA instrument. The application of dual-ratio sharing by the bank and customers shows that the assets acquired is owned by both parties and the string of payment made by customers will diminished the ownership from bank and increased the customer's ownership. Besides that, the profit margin that needed to be paid is much lower.

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