

Optimization of hybrid model on hajj travel

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Abstract. Hajj travel insurance is an insurance product offered by the insurance company in preparing funds to perform the pilgrimage. This insurance product helps would-be pilgrims to set aside a fund of saving hajj with regularly, but also provides funds of profit sharing (*mudharabah*) and insurance protection. Scheme of insurance product fund management is largely using the *hybrid* model, which is the fund from would-be pilgrims will be divided into three account management, that is personal account, *tabarru'*, and *ujrah*. Scheme of *hybrid* model on hajj travel insurance was already discussed at the earlier paper with titled “*The Hybrid Model Algorithm on Sharia Insurance*”, taking the example case of Mitra Mabur Plus product from Bumiputera company. On these advanced paper, will be made the previous optimization model design, with partition of benefit the *tabarru'* account. Benefits such as compensation for 40 critical illness which initially only for participants of insurance only, on optimization is intended for participants of the insurance and his heir, also to benefit the hospital bills. Meanwhile, the benefits of death benefit is given if the participant is fixed die.

Keywords: *insurance of hajj travel, hybrid model, tabarru', rider*

1. Background

Islamic insurance industry in Indonesia was born in 1994, marked by the establishment of family *takaful* insurance and *takaful* insurance general [4]. From birth until now, it was growth and development, namely the increasing number of increasingly sharia insurance industry, the increasing number of asset investment, developments that are experiencing positive trends, and variations diverse insurance products adjust the needs of each person.

Increasing the growth and development of sharia insurance industry, automatically have an impact on increasing business competition, so this industry is vying interests of insurance as many participants. One of the strategies that must be considered in the interest of the insurance participants is an insurance product innovation that offers many benefits, and packaged in an attractive marketing and right on target.

Example of product innovation, including the use of sharia insurance mutual policy, this means that the premium payment to an insurance participant policy can be used by other family members so that the payment becomes lighter [2, 3]. The next innovation was the benefits offered insurance



products, for example on hajj travel insurance. The benefits that are offered not only compensation for the death, but compensation 40 critical illnesses, hospital bills and cash value.

Hajj travel insurance is a product that is intended for participants who have plans to travel on pilgrimage to the Holy Land of Mecca. These insurance products not only help set aside funds on a regular basis, but also offers for results (*mudharabah*) investments and benefits in the form of insurance protection [4]. However, generally the benefits provided are only valid for one person only, that is insurance participants who also prospective worshippers.

Study of mathematical model about Sharia insurance, first time researchers convey on IORA International Conference on Operation Research 2016, then discussed on the first paper with the title: *A Design of Mathematical Modelling for The Mudharabah Scheme in Shariah Insurance* and it has been published [1]. Next, the second paper written with the title: *The Hybrid Model Algorithm on Sharia Insurance* and it has been presented on International Conference on the Science and Engineering Computation in 2017, in the process of review for publication. In this second paper the researchers discuss on algorithm *hybrid* model as a mathematical model schemes of insurance fund management from hajj travel of Mitra Mabur Plus Bumiputera company, where the funds are paid in premiums by insurance participants will be divided into three accounts by the company, namely personal account, *tabbaru'* account and *ujrah*. The granting of the benefits derived from *tabbaru'* account already invested, and the benefits provided not only compensation for the death, there's also a compensation for 40 critical illnesses and compensation for the hospital bills.

Based on the discussion, it can be concluded that the *hybrid* model is used by hajj travel insurance of Mitra Mabur Plus Bumiputera have already good enough in terms of fund management as seen from the proportion of personal accounts that increases and decreases of *ujrah* year to year. But there is still a bit short in the management if it is to continue to compete in the future, that is some of the benefits provided by the company are only valid for attendees only. Therefore it is interesting to do further research, by designing optimization model of *hybrid* travel insurance of Mitra Mabur Plus through the partition of benefits from *tabbaru'* accounts so few benefits do not apply only to participants, but applies also to his heir.

2. Methodology

Stages of research conducted, including the following:

- Visit and interview with actuary of Bumiputera insurance company about the data and the scheme of *hybrid* model from Mitra Mabur Plus insurance.
- Translate *hybrid* model scheme into a mathematical equation by entering some preliminary values that have been set by the company.
- Present a *hybrid* model with substitution the value of the specified company's premiums to the mathematical equations on stage 2.
- Perform the optimization with the benefits of partitioned *tabbaru'* account so that some benefits are more optimally, that apply to participants and his heir.

There are below is the data of hajj travel insurance of Mitra Mabur Plus company with policy limited for 5 years and some initial values are set, among them:

<i>Age of the Policyholder</i>	: 38 Years
<i>Death Coverage</i>	: 6.000.000
<i>Hospitall Bills</i>	: 600.000
<i>40 Critical illness</i>	: 3.000.000
<i>Monthly profit in first year</i>	: 201

Table 1. Mitra Mabrur Plus's Insurance Data

		Year				
	Year of Policy	1	2	3	4	5
1	Contributions per year	1,200,000.00				
	Contributions per month (P)	100,000				
2	% Basis of <i>Tabarru'</i>	7.47	7.47	7.47	7.47	7.47
3	% <i>Ujrah</i>	19.35	11.84	9.34	9.34	9.34
4	% <i>Personal Account</i>	73.18	80.69	83.19	83.19	83.19

Table 2. Mathematical equations for *hybrid* model scheme of Mitra Mabrur Plus Insurance

1	2	3	4	5	6	7	8	9	10
Month	age	contribution	Tabarru' account	Ujrah	Personal Account	accumulation	monthly profit	Yearly Profit	Surrender value
1	38	P	$0.0747 * P$	$0.1935 * P$	$0.7318 * P$	73,180	201		73,381
2-11	38	P	$0.0747 * P$	$0.1935 * P$	$0.7318 * P$	X_1	Y_1		$X_1 + Y_1$
12	38	P	$0.0747 * P$	$0.1935 * P$	$0.7318 * P$	X_1	Y_1	$0.05 * (0.7318 * P)$	$(X_1 + Y_1) + (0.05 * (0.7318 * P))$
13	39	P	$0.0747 * P$	$0.1184 * P$	$0.8069 * P$	$(0.7318 * P) + (0.8069 * P)$	Y_2		$((0.7318 * P) + (0.8069 * P)) + Y_2$
14-23	39	P	$0.0747 * P$	$0.1184 * P$	$0.8069 * P$	X_2	Y_2		$X_2 + Y_2$
24	39	P	$0.0747 * P$	$0.1184 * P$	$0.8069 * P$	X_2	Y_2	$0.05 * (0.8069 * P)$	$(X_2 + Y_2) + (0.05 * (0.8069 * P))$
25	40	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	$(0.8069 * P) + (0.8319 * P)$	Y_3		$((0.8069 * P) + (0.8319 * P)) + Y_3$
26-35	40	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	X_3	Y_3		$X_3 + Y_3$
36	40	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	X_3	Y_3	$0.05 * (0.8319 * P)$	$(X_3 + Y_3) + (0.05 * (0.8319 * P))$
37-47	41	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	X_4	Y_4		$X_4 + Y_4$
48	41	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	X_4	Y_4	$0.05 * (0.8319 * P)$	$(X_4 + Y_4) + (0.05 * (0.8319 * P))$
49-59	42	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	X_5	Y_5		$X_5 + Y_5$
60	42	P	$0.0747 * P$	$0.0934 * P$	$0.8319 * P$	X_5	Y_5	$0.05 * (0.8319 * P)$	$(X_5 + Y_5) + (0.05 * (0.8319 * P))$

Table 3. Mathematical equations for *hybrid* model scheme of Mitra Mabrur Plus Insurance (continued)

1	2	11	12	13	14
Month	age	40 critical illness	death coverage	Hospital Bills	Death Benefit
1	38	$0.5 * ((P * 12) * 5)$	$(P * 12) * 5$	$0.1 * ((P * 12) * 5)$	$((P * 12) * 5) + 73,381$
2-11	38	$0.5 * ((P * 12) * 5)$	$(P * 12) * 5$	$0.1 * ((P * 12) * 5)$	$((P * 12) * 5) + (X_1 + Y_1)$
12	38	$0.5 * ((P * 12) * 5)$	$(P * 12) * 5$	$0.1 * ((P * 12) * 5)$	$((P * 12) * 5) + ((X_1 + Y_1) + (0.05 * (0.7318 * P)))$
13	39	$0.5 * ((P * 12) * 5)$	$(P * 12) * 5$	$0.1 * ((P * 12) * 5)$	$((P * 12) * 5) + (((0.7318 * P) + (0.8069 * P)) + Y_2)$
14-23	39	$0.5 * ((P * 12) * 5)$	$(P * 12) * 5$	$0.1 * ((P * 12) * 5)$	$((P * 12) * 5) + (X_2 + Y_2)$

1	2	11	12	13	14
Month	age	40 critical illness	death coverage	Hospital Bills	Death Benefit
24	39	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + ((X_2+Y_2) + (0.05*(0.8069*P)))$
25	40	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + (((0.8069*P)+(0.8319*P)) + Y_3)$
26-35	40	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + (X_3+Y_3)$
36	40	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + ((X_3+Y_3) + (0.05*(0.8319*P)))$
37-47	41	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + (X_4+Y_4)$
48	41	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + ((X_4+Y_4) + (0.05*(0.8319*P)))$
49-59	42	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + (X_5+Y_5)$
60	42	$0.5*((P*12)*5)$	$(P*12)*5$	$0.1*((P*12)*5)$	$((P*12)*5) + ((X_5+Y_5)+(0.05*(0.8319*P)))$

There are several terms that are often used in insurance, including:

1. Policy : The insurance agreement between the insurer and the policyholder.
2. Premium : An amount of money that is listed in the policy that approved by the policyholder, for paid to insurance companies according the agreement so that the policy remains active.
3. Personal Account : Collection of funds that belong to policyholders and payable if the agreement ends, the participant resigns, or dies.
4. *Tabarru'* Account : The collection of funds that intended by the policyholder as alms with the purpose to help each other and will be paid in the event of claims.
5. Surrender Value : The amount of money that have to be paid to policyholders, if the insurance agreement is terminated before the expiry of the agreement.
6. Rider : Conditions that attached to the insurance policy which gives additional benefits or restrictions.
7. *Ujrah* : Wages or rewards.
8. Hospital Bills : Rider (benefits) in the form of reimbursement of the cost of hospital.
9. Critical Illness : Rider (benefits) in the form of sum assured in case of critical illness.
10. Death Coverage : An amount of money that are prepared by the insurance company as compensation if the policyholder dies.
11. Death Benefit : An amount of money that will be paid if the policyholder dies before and or after the period of the insurance agreement terminates.

3. Result

Using the data of Mitra Mabur Plus Insurance, the value of premium is Rp. 100.000 was substituted into the Table 3, then retrieved the table of *hybrid* model bellows:

Tabel 4. *Hybrid* Model Table of Mitra Mabur Plus Insurance

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Month	age	layout payment	Tabarru' account	<i>Ujrah</i>	personal account	accumulation	monthly profit	yearly profit	surrender value	40 critical illness	death coverage	hospital bills	Death Benefit
1	38	100,000	7,470	19,350	73,180	73,180	201		73,381	3,000,000	6,000,000	600,000	6,073,381
2	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
3	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
4	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
5	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Month	age	layout payment	Tabarru' account	<i>Ujrah</i>	personal account	accumulation	monthly profit	yearly profit	surrender value	40 critical illness	death coverage	hospital bills	Death Benefit
6	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
7	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
8	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
9	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
10	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
11	38	100,000	7,470	19,350	73,180	146,360	201		146,561	3,000,000	6,000,000	600,000	6,146,561
12	38	100,000	7,470	19,350	73,180	146,360	201	3,659	150,220	3,000,000	6,000,000	600,000	6,150,220
13	39	100,000	7,470	11,840	80,690	153,870	38,372		192,242	3,000,000	6,000,000	600,000	6,192,242
14	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
15	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
16	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
17	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
18	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
19	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
20	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
21	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
22	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
23	39	100,000	7,470	11,840	80,690	161,380	38,372		199,752	3,000,000	6,000,000	600,000	6,199,752
24	39	100,000	7,470	11,840	80,690	161,380	38,372	4,035	203,787	3,000,000	6,000,000	600,000	6,203,787
25	40	100,000	7,470	9,340	83,190	163,880	51,983		215,863	3,000,000	6,000,000	600,000	6,215,863
26	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
27	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
28	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
29	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
30	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
31	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
32	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
33	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
34	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
35	40	100,000	7,470	9,340	83,190	166,380	51,983		218,363	3,000,000	6,000,000	600,000	6,218,363
36	40	100,000	7,470	9,340	83,190	166,380	51,983	4,160	222,523	3,000,000	6,000,000	600,000	6,222,523
37	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
38	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Month	age	layout payment	Tabarru' account	<i>Ujrah</i>	personal account	accumulation	monthly profit	yearly profit	surrender value	40 critical illness	death coverage	hospital bills	Death Benefit
39	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
40	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
41	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
42	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
43	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
44	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
45	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
46	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
47	41	100,000	7,470	9,340	83,190	166,380	56,744		223,124	3,000,000	6,000,000	600,000	6,223,124
48	41	100,000	7,470	9,340	83,190	166,380	56,744	4,160	227,284	3,000,000	6,000,000	600,000	6,227,284
49	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
50	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
51	42	100,000	7,470	9,340	83,190	166,380	57,963		224,333	3,000,000	6,000,000	600,000	6,224,333
52	42	100,000	7,470	9,340	83,190	166,190	57,963		224,333	3,000,000	6,000,000	600,000	6,224,333
53	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
54	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
55	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
56	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
57	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
58	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
59	42	100,000	7,470	9,340	83,190	166,380	57,953		224,333	3,000,000	6,000,000	600,000	6,224,333
60	42	100,000	7,470	9,340	83,190	166,380	57,953	4,160	228,493	3,000,000	6,000,000	600,000	6,228,493

In the Table 4, it is showed the details of the management of the fund contribution to policyholders during a five-year contract. Through this table could be seen nominal amount each account, made per month or per year, and the benefits that become accrues of policyholders in case of claims during the year of policy runs or if the contract is stopped in the middle for some reason. The benefits of 40 critical illness, hospital bills, and the death benefit is offered in table 3 are only intended for insurance participants, so with a quantity *tabbaru'* account that fixed will be do an optimization of *hybrid* model of through partition its benefits.

Quantity of *tabbaru'* account is Rp. 7.470 (fixed) and will be divided for the provision of compensation for 40 critical illness as much as two people (participants and his heir), compensation for hospital bills by as much as two people (participants and his heir), and a death benefit as much as one person (if the participant died).

Table 5. *Hybrid Model's Benefit Partition of Mitra Mabur Plus Insurance*

Benefit	40 Critical Illness (5X)	Death benefit (20X)	Hospital Bills (1X)
Benefits of partition ratio	5X (2 people) = 10X	20X (1 people) = 20X	1X (2 people) = 2X
Total compensation for each of the benefits	233.44 (10) = 2,334.4	233.44 (20) = 4,668.8	233.44 (2) = 466.88

Based on Table 5 above, a total of partition benefits equal to 32 with the value $X = \text{Rp. } 300,000$ (per unit), and if the fund's total compensation for each of the aggregated benefit then retrieved: $\text{Rp. } 2,334.4 + \text{Rp. } 4,668.8 + \text{Rp. } 466.88 = 7,470.08 \cong 7.470$ (*tabbaru'* account). This means that with a quantity *tabbaru'* account were fixed, the travel hajj insurance of Mitra Mabur Plus company can offer the benefits of 40 critical illness and hospital bills for participants and his heir. While the benefits of a death benefit only to heirs if the participant died.

4. Summary

Optimization of the *hybrid* model of hajj travel insurance of Mitra Mabur Plus can be a design innovation of sharia insurance product, because this optimization can be done on other sharia insurance product, which becomes more value in order of competition the business interests of insurance participant. The *hybrid* model of hajj travel insurance of Mitra Mabur Plus after optimization, the mechanisms to manage them is getting better due to the amount of increasing personal account and a decreasing *ujrah* quantities each year. These conditions will be profitable for the insurance participants. Meanwhile the amount of *tabarru'* accounts that fixed during the contract year of policy is profitable to the insurance company due to minimize loss that caused by fluctuations in investment performance and profitable also for participants because of two insurance benefits that applies to participants and his heir.

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