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Improved structural pricing model for the fair market price of Sukuk Ijarah in Indonesia

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Abstract. Shariah financial products are currently developing in Indonesia financial market. One of the most important products is called as Sukuk which is commonly referred to as "sharia compliant" bonds. The type of Sukuk that have been widely traded in Indonesia until now are Sukuk Ijarah and Sukuk Mudharabah. In [1], we discuss various models for the price of the fixed-non-callable Sukuk Ijarah and provide the empirical studies using data from Indonesia Bonds market. We found that the structural model considered in [1] cannot model the market price empirically well. In this paper, we consider the improved model and show that it performs well for modelling the fair market price of Sukuk Ijarah.

1. Introduction

Shariah financial products are currently developing in sharia financial market, including in Indonesia bond market. One of the most important products is called as Sukuk which is commonly referred to as "sharia compliant" bonds. The types of Sukuk that have been widely traded in Indonesia until now are Sukuk Ijarah and Sukuk Mudharabah. Sukuk *Ijarah* is an Islamic bond using *Ijarah* contract. *Ijarah* is "essentially" a rental or lease contract to use the benefits of a good or service with a reward. This means that the lessor would entitle the other party to use the objects, but the tenant has the obligation to provide compensation in accordance with the agreement. In *Ijarah* contract basically there is a transfer of temporary benefits, but without any transfer of ownership. *Ijarah* object used as the underlying in the issuance of sukuk is fixed assets (e.g. ships, electrical networks, land, machinery, buildings, circuits, vehicles, business spaces, engine power plants,) or services (contract/ purchase agreement, transport services). The differences between Sukuk Ijarah and the conventional bonds are described in the Table 1.

In [1], we discuss various models for the price of the fixed-non-callable Sukuk Ijarah and provide the empirical studies using data from Indonesia Bonds market. We found that the structural model considered in [1] cannot model the market price empirically well. Here we propose the new method to improve the accuracy of the model.

The rest of this paper is organized as follows. In Section 2 of this paper, we consider an approach for modeling the price of the fixed - non callable Sukuk Ijarah using a structural method as described in [2]. Here we also present our proposal to improve the accuracy of [2] model. In Section 3 we provide empirical study using data from Indonesia market. In Section 4 we conclude our presentation.



Table 1. Comparison between Sukuk Ijarah and the Conventional Bonds

	Sukuk Ijarah	Conventional Bonds
Contract	Ijarah/lease	No
Type of transaction	Certainty Contract	-
Nature of instrument	Ownership certificate of an asset	Acknowledgement of Debt Instruments
Coupons/Income	Remuneration/Fee	Interest/Usury
Returns	Predetermined	Float/fixed
Underlying asset object agreement	Important	No need

2. Modeling the price of Sukuk Ijarah using structural model

2.1. Structural model

The structural method for modelling the price of Sukuk Ijarah was described in [2]. From [2], we can see the cash flow of Sukuk Ijarah as follows

1. At time zero, the sukuk holders give the proceeds (Q_0) of Sukuk Ijarah to the issuing “special purpose vehicle” (SPV), an independent board of management between issuer and sukuk holder.
2. During the contract the sukuk holders receive periodic distribution amounts (L) from the SPV which are equal to the leasing payment received from the borrower.
3. Finally, at the end of the contract, the SPV sell back the asset to borrower and borrower pays the repurchase price of the asset (P_t) to the SPV. The SPV distributes the dissolution distribution amount to sukuk holders.

From the cash flows above, we can see that the Sukuk Ijarah cash flows are similar to conventional bond cash flows. The periodic distribution amounts in Sukuk Ijarah replace the coupon payments in conventional bonds, and the repurchase price or the dissolution distribution amount substitutes for the principal.

It is also known in the literature (see e.g. [2]) that the sale and lease transaction in Sukuk Ijarah is not real, and the core of the Sukuk Ijarah structure is a conventional bond. In other words, Sukuk Ijarah is an expensive version of the conventional bond. It is said to be an expensive version because the transaction cost in this instrument is considered significant. The Sukuk Ijarah transaction costs are: the fees of the SPV or the investment bank, lawyers' and Shari'ah Boards' fees, maintenance expenses and insurance expenses in the leasing transaction.

The transaction involved in Sukuk Ijarah can be separated as the following parts:

Part 1. Periodic distribution amounts

1. From time 1 to time T (maturity) the SPV makes regular payments or periodic distribution amounts (L) to sukuk holders which are equal to the lease payment received by the SPV from the borrower.
2. Present value of the lease payments or the periodic distribution amounts are:

$$PV = \frac{L}{(1+r)^1} + \frac{L}{(1+r)^2} + \frac{L}{(1+r)^3} + \dots + \frac{L}{(1+r)^T} \quad (1)$$

The discount rate used in this transaction cost is the cost of capital in a non-interest economy as discussed by [3]. Therefore, the discount rate is:

$$r = \rho = \frac{Y}{V}(1-d+dq) \quad (2)$$

where

Y = Expected value of firm's accounting earnings

V = Market value of firm

b = expected value from retention rate of the company

s = expected value of rate stock financing

$d=b+s$

C = cost of replacement (current asset, saving, security of the company, cost of property, ground and tools)

$q=V/C$

Part 2. Repurchase price

1. If the asset follows geometric Brownian motion (gBm), the percentage in asset price is independent and identically distributed. The asset price changes independently from the movement of past price.

Therefore the monthly expected asset price at time t is: $P_t = P_0.e^{st}$, where P_0 is the asset price at time 0.

The repurchase price held at maturity is: $P_T = P_0.e^{stT}$

2. In some agreements, the repurchase price is predetermined, so the repurchase price is simply "PT", which is equal to the price agreed at the beginning of the contract transaction

We obtain the Present Value of repurchase price as

a. Asset repurchase with certainty:

If the asset will be repurchased with certainty at maturity, the present value of the repurchase price is:

$$\text{- Geometric Brownian motion (gBm) } PV = \frac{P_0.e^{stT}}{(1+r)^T} \quad (3)$$

$$\text{- Predetermined price } PV = \frac{P_T}{(1+r)^T} \quad (4)$$

b. Asset repurchase with call option given to the borrower is not discussed here; we may use the Black Scholes formula

Part 3. Transaction cost

1. Fee of the SPV or investment bank at the beginning of the contract (time 0). The SPV or investment bank's fee is based on the annual asset price given by the borrower (P_0).

The SPV fee is:

$$Fee = P_0.a \quad (5)$$

a is the proportion of the annual asset price.

2. Fee of the Legal and Shari'ah Board at the beginning of the contract (time 0)

This is the dollar amount fee charged by the Legal and Shari'ah Board for this transaction, expressed by "S".

3. Operating expense, such as maintenance and insurance fee from time 1 to maturity (T):

$$PV = \frac{O_1}{(1+r)^1} + \frac{O_2}{(1+r)^2} + \frac{O_3}{(1+r)^3} + \dots + \frac{O_T}{(1+r)^T} \quad (6)$$

The price of Sukuk Ijarah is the net present value from all cash flow of this instrument. Combining all of the transaction parts, after simplification in the equation (1) - (6), we obtain

1. Repurchase transaction with certainty and with predetermined price:

$$Q_0 = \frac{L+O_t}{r} + P_0.a + S + \left(P_T - \frac{L+O_t}{r} \right) + (1+r)^{-T} \quad (7)$$

2. Repurchase transaction with certainty and the asset price follows geometric Brownian motion (gBm):

$$Q_0 = \frac{L + Ot}{r} + Po.a + S + \left(Po.e^{\mu T} - \frac{L + Ot}{r} \right) + (1+r)^{-T} \quad (8)$$

2.2. Improved Structural model

Based on empirical study in [1], we found that when the structural model (7) and (8) are applied to the real data, they tend to be extremely over price. For instance, in reality we found that the real price is slightly higher than 100 percent, but the model found that the predictive price is somewhere like 300 percent. One of the possible problems that causes this inaccuracy is the quality of the financial reporting of the company, which makes the estimate of the discount rate values calculated by [3] method above, see equation (2), will be too far from their possibly reasonable values. In this paper, we propose to replace the value of discount rate based on [3] into the value of expected yields kd. The values of kd depend on the various factors, such as the premium to maturity, the default premium, inflation rate, liquidity rate, etc. For simplification, we estimate the value of kd as the average of yields of bond (corporate) with the same rating with the Sukuk Ijarah that we consider. The future values of kd can be assumed to be fixed or it can be predicted using monte carlo simulation.

3. Empirical study

For empirical example, we consider using the Sukuk Ijarah SIKISAT04B with transaction date June 14, 2010, the summary of input parameters is given in Table 2. For this Sukuk Ijarah, unfortunately the structural model performs poorly; we cannot obtain the price of Sukuk Ijarah with reasonable values. When we assumed that the values of $r=kd=16\%$ and using the model with the predetermined values, we obtain the value of Q_0 is Rp. 258.241.284.575,66.

Table 2. Summary of the input parameters for SIKISAT04B

Parameters	Value	Parameters	Value
Po	Rp172,000,000,000.00	V	Rp543,393,000,000.00
Pt	Rp172,000,000,000.00	C	Rp51,568,856,000,000.00
L	Rp20,210,000,000.00	Y	Rp1,648,069,500,000.00
a	5.00%	B	2.72%
S	Rp8,600,000,000.00	S	275.72%
Ot	Rp15,303,029,258.08	Q	0.010537232
T	6.48	σIy	0
D	10.00%	d	278.44%
σ^2	8.57%	m	24.8%

4. Conclusions

In this paper we consider the structural models for modeling the price of Sukuk Ijarah. We found that the standard model in equation (7) and (8) can not perform well in practice, but the new improved model gives more reasonable values of the fair market price for Sukuk Ijarah.

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