

The Effect of Innovative Islamic Profit Rate Benchmark on Pricing Islamic Derivatives Securities

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Abstract

The growth of the Islamic capital market depends on the success in developing and structuring risk management products, in particular financial derivative securities that are Shari'ah compliant. The financial engineering industry succeeded in developing Islamic derivatives that provide the same economic benefits provided by conventional counterparts and that are Shari'ah compliant. The developed securities include: Islamic Profit Rate Swap (IPRS), Islamic Cross Currency Swap (ICCS) and others. The pricing and valuation of Islamic derivatives follows the same mechanisms that are used to price the conventional derivatives. A major input to the pricing is the discount rate or equivalently, the profit rate in Islamic finance. This paper examines the effect of misspecification of the profit rate on the pricing and valuation of Islamic derivatives in the context of Islamic Profit Rate Swap. The paper employs a case of an Islamic profit rate swap contract where two widely accepted benchmark rates are used to price the contract namely LIBOR and Government bond yields. The results which indicate that the variations in benchmark rates lead to very large variations in the cash flow profiles of the contract's counterparties lead to a conclusion that the development of an innovative Islamic benchmark rate that is universally acceptable and applicable is necessary for the continuous development of Islamic capital market.

Keywords

Islamic Derivatives, Islamic Profit Rate Swap, Profit Rate Curve, Islamic Interbank Benchmark Rate

1. Introduction

Financial derivatives play a vital role in modern financial markets. The risk management industry as well as the financial engineering within investment banks rely on those instruments to develop and structure new products. The Islamic financial markets have witnessed a tremendous growth in all its sectors and subsectors including the derivatives market. The advantages provided by financial derivatives of managing and avoiding risks make it necessary to develop Islamic financial derivatives that are equivalent to conventional securities and that comply with Shari'ah principles. Developing Shari'ah compliant derivative securities has been stressed by Islamic scholars, practitioners, and credit ratings agencies such as Moody's and Standard and Poor's. As a result, a number of Islamic derivative securities have been developed including: Islamic Profit Rate Swap (IPRS), Islamic Cross Currency Swap (ICCS), and others.

The importance of the interest rate in conventional finance and the profit rate in Islamic finance to the pricing and valuation of all derivative securities cannot be overemphasized. A number of alternative approaches have been proposed during the past to model the proper Islamic profit rate curve that enables the effective pricing and valuation of those securities (Jallad, 2015), but

none of those models has been acceptable universally on economic and well as Shari'ah basis. This paper aims to measure the effect of the pricing errors caused by the misspecification of the profit rate in the context of Islamic Profit Rate Swap (IPRS).

The IPRS is an OTC product compromised of bilateral agreement between parties to make regular payments to each other at agreed intervals. IPRS is used to hedge against adverse profit rate movements through the exchange of fixed cash flows to floating cash flows (or vice versa) within the same currency. The terms of the swap (the amount, the period of time between the regular payments, and reference rate) are negotiable and can be customized according to the client's and bank's needs. At each settlement date, the commodity transaction is used to facilitate the transfer.

The fixed rate is determined at the start of the contract and remains the same until the end of the tenure and agreed reset date. Whereas, the floating rate is referenced to an index (LIBOR or any other reference rate) and is determined at every settlement date. The notional may or may not be exchanged. Usually, the net-off amount is exchanged at each settlement date.

This paper is organized as follows: the second section provides literature review of swap pricing. This section also discusses the dynamics of the Islamic profit rate swap (IPRS) and provides an overview of its characteristics. The third section discusses data and the methodology used in the paper. The fourth section outlines the results, whereas the fifth section sums up the conclusion.

2. Literature Review

Chance & Rich (1998) study is considered one of the early studies in pricing swaps. Arbitrage-free replicating portfolios argument was used to derive pricing formulas for a number of equity swaps such as plain vanilla equity swaps, variable notional swaps, and cross currency swaps. Kijima & Muromachi (2001) developed a model where a stochastic interest rate is assumed for equity swaps. The model was assumed to follow a Wiener process and the volatilities of the interest rates and of the equity prices were assumed to be deterministic functions of time. Liao & Wang (2003) provided a generalized formula for pricing equity swaps where they assumed a constant notional principal. The results of their study show that foreign equity swap value is dependent on both the dynamics of the equity price process and the exchange price process. The pricing of the Islamic profit rate swap (IPRS) requires the determination of the following three items:

- 1) The cash flows of the floating rate leg.
- 2) The discount factors that are to be applied to the cash flows to determine the present value.
- 3) The amount of default spread of the counterparty.

In Islamic finance, those rates are estimated using Islamic Interbank Benchmark Rate (IIBR) or other interest based benchmark rates such as LIBOR. The general framework of pricing the IPRS requires determination of the present values of the fixed rate leg and floating rate leg. The difference of these two leg has to be paid from one party to another. The fixed rate leg imposes no problem, as the fixed cash flows are discounted using the contractual flat fixed rate. The present value of the floating leg is determined using the following equation:

$$P_0^{IPRS} = \frac{CF_1 + P_N}{(1 + r_1)} \quad (1)$$

Where:

P_0^{IPRS} : market price of floating rate leg.

CF_1 : cash flow of first scheduled payment, this amount equals to the notional principal multiplied by the profit rate available at initiation date.

P_N : notial principal of the contract.

r_1 : profit rate of period one.

The first task requires finding out the expected future forward profit rates. In conventional finance, those rates can be extracted using a number of methods (Ravindran, et al., 2011):

A) Zero Rate Term Structure.

The first task requires finding out the expected future forward profit rates. In conventional finance, those rates can be extracted using a number of methods (Ravindran, et al., 2011):

B) Black Derman Toy (BDT) recombining tree method.

C) Heath Jarrow Morton (HJM) bushy tree method.

2. 1. The Dynamics of IPRS

The dynamics of the IPRS create the mechanism through which the Islamic profit rate swap is Shari'ah compliant is equivalent to the conventional interest rate swap. This transaction is usually performed by a bank (financial institution) and a client. An Islamic profit-rate swap is implemented through the execution of a series of underlying Shari'ah contracts, which combine wa'ad contract (promise) with commodity Murabaha contract. Parties to the IPRS enter into Murabaha contracts to sell Shari'ah-compliant commodities (often London Metal Exchange-traded metals) to each other for immediate delivery but on deferred payment basis. A term Murabaha is used to generate fixed payments and a series of corresponding reverse Murabaha contracts are used to generate the floating rate payments. The wa'ad contract is being used to ensure the swap reaches maturity where one party unilaterally bind itself to perform what is agreed upon. A wa'ad is given by each party before each commodity Murabaha stage and reverse Murabaha stage, respectively. Through the use of commodity Murabaha or Tawarruq or Musawamah, the Islamic bank carries out the IPRS in the following manner:

i. First Murabaha Agreement (“fixed profit rate leg”)

The fixed leg of the IPRS is accomplished through a number of steps as follows:

First Leg: Client buys commodity from Islamic bank

- 1) Client buys commodity through Islamic bank from trader B.
- 2) Islamic bank buys commodity from client at cost plus fixed rate at x% per annum.
- 3) Islamic bank sells off the commodity at cost.

ii. Second Murabaha Agreement (“floating profit rate leg”)

The fixed leg of the IPRS is accomplished through a number of steps as follows:

Second Leg - Islamic bank buys commodity from client

- 4) Islamic bank buys commodity from trader A.
- 5) Islamic bank sells a commodity for a client at cost plus current benchmark (LIBOR/IIBR) plus an agreed spread.
- 6) Islamic bank assist the client to sell the commodity at cost.

On each settlement date, the net result of these trades is the amount of commodities sold under each Murabaha, which will be netted off by way of sales to a third-party broker. The net beneficiary (of the difference between the fixed and floating rate) is dependent on whether the fixed or floating rate was higher.

3. Data and Methodology

To test the hypothesis that changing benchmark rates lead to large variation in IPRS price and the resulting net cash flow profile of the contract parties, we price an IPRS using two profit rates. The first profit rate is the one derived from Malaysian government bond zero curve. The second profit rate is LIBOR benchmark rate. The fixed and floating rate legs payments of the swap are calculated and netted at each settlement date and the net position is determined at the initiation of the contract. The contract is assumed to have the following characteristics:

1. The yield rates of Islamic bonds with semiannual maturities.
2. The notional principal is US\$100,000.

3. The term of the Swap is five years.
4. The fixed rate is 10.9 percent per annum.

The yield rates of government Islamic bonds on the run whose maturity is closer to every semiannual end were obtained from (Ravindran, et al., 2011). As of July 2010 and for each settlement date once in six months for five years commencing from 31st December 2010 until 30th June 2015. The term structure and forward rates are computed through backward and forward iterations. For LIBOR rates that cover the same settlement dates, the rates are obtained from HSH Associates Financial Publishers. It is noted that a large difference exist between the government rates and LIBOR rates, which is partially due to country risk premium. Accordingly for the initial rates of December 31, 2010, we calculated the difference between the government yield and LIBOR rate, which is 3.17% and consider this as a country risk premium. We added this premium to every floating rates.

4. Results

The table below summarizes the calculation of the position of the fixed rate and floating rate payers at each settlement date under the two floating profit rate curves namely, Government yields curve and LIBOR rates curve. Under each curve, the bootstrapping method was used to construct the implied forward rate curve, floating leg. The fixed payment at each settlement period is fixed at \$5,450 ($0.109/2 * \$100,000$). At each settlement date, a netting process is performed where one of the parties need to transfer money to the other party. For instance, the first settlement period in the table is represents a case where the fixed rate payer is obligated to pay \$5,450, whereas the floating rate payer is obligated to pay \$3,630. Accordingly, the fixed rate payer is obligated to settle his obligation of \$1,820. This process is repeated at each settlement date. It is apparent from the table that under the government forward rate curve during the first four semiannual periods the floating rate payer will receive net cash flows, while, the fixed rate payer will receive net cash for the remaining six semiannual periods. On the other hand, under the LIBOR curve, the fixed rate party is a net payer during the whole period of the contract.

The pricing and valuation of the IPRS is performed using the present value of the net cash flows. Therefore, at each settlement date the continuous compounding was used to determine the present value of each net payment. Under the government yield curve, the difference between the total present values is the swap value which is US\$667 is in favor of the fixed payer. The fixed rate payer should be compensated by an upfront payment of US\$667. This amount will equalize both the parties in terms of present values. On the other hand, under the LIBOR forward curve, the net result is that the floating rate payer will be receiving a total of US\$16,595 at the contract initiation.

Table 1. Cash flows of IPRS for contract's counterparties.

Settlement Period	Gov't Yield						LIBOR Rates					
	Implied Zero Rate	Implied FWD Rate	CF (FR)	CF (FR)	Net CF	PV of Diff	Implied Zero Rate	Implied FWD Rate	CF (FR)	CF (FR)	Net CF	PV of Diff
Dec-15	3.63	3.63	\$3,630	\$5,450	(\$1,820)	(\$1,787)	3.63	3.63	3,630.00	5,450.00	(\$1,820)	(\$1,787)
Jun-15	3.75	3.87	\$3,873	\$5,450	(\$1,577)	(\$1,519)	3.57	3.51	3,509.18	5,450.00	(\$1,941)	(\$1,873)
Dec-15	3.95	4.38	\$4,376	\$5,450	(\$1,074)	(\$1,013)	3.95	4.81	4,814.62	5,450.00	(\$635)	(\$599)
Jun-15	4.11	4.62	\$4,622	\$5,450	(\$828)	(\$763)	3.90	3.76	3,760.49	5,450.00	(\$1,690)	(\$1,563)
Dec-15	4.36	5.49	\$5,488	\$5,450	\$38	\$34	3.69	2.91	2,911.98	5,450.00	(\$2,538)	(\$2,315)
Jun-15	4.6	5.97	\$5,971	\$5,450	\$521	\$454	3.59	3.11	3,112.72	5,450.00	(\$2,337)	(\$2,099)
Dec-15	4.78	5.99	\$5,988	\$5,450	\$538	\$455	3.52	3.13	3,132.88	5,450.00	(\$2,317)	(\$2,049)
Jun-15	5.02	7.00	\$7,003	\$5,450	\$1,553	\$1,271	3.50	3.34	3,341.04	5,450.00	(\$2,109)	(\$1,834)
Dec-15	5.2	6.85	\$6,848	\$5,450	\$1,398	\$1,106	3.51	3.67	3,670.63	5,450.00	(\$1,779)	(\$1,519)
Jun-15	5.48	8.64	\$8,643	\$5,450	\$3,193	\$2,428	3.59	4.30	4,303.46	5,450.00	(\$1,147)	(\$958)
Total			\$56,443	\$54,500	\$1,943	\$667			\$36,187	\$54,500	(\$18,313)	(\$16,595)

5. Conclusion

The current practice of pricing and valuation profit rate swap is based on money market benchmark rates (LIBOR, IIBR.KIBOR,..etc). This practice is considered acceptable by practitioners as there is no truly Islamic alternative that is widely acceptable and provides the ability to price and value derivative securities.

The paper shows, without any doubt, that pricing the same IPRS contract with different benchmark rates leads to large variations in pricing and the net position of contract counterparties and their cash flows profiles.

This result enforces a conclusion that a universally accepted and applied Islamic profit rate is a necessity and the innovation in the Islamic asset pricing is needed for the continuous development of Islamic capital market in general and derivatives securities in particular.

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