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ISTIJRAR CONTRACTS – AN UNTAPPED GEM IN HEDGING PRICE RISK IN COMMODITY ACCUMULATORS

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ABSTRACT

Derivatives continue to play an integral role in hedging several types of risk in conventional as well as Islamic finance. While there has been a lack of consensus from Islamic scholars regarding the complete permissibility of the usage of derivatives in risk management. Efforts have been made in order to develop and innovate for Shariah-compliant equivalents to conventional contracts. This to ensure that Islamic Financial Institutions (IFIs) and Shariah-compliant clients have prudent risk management tools to minimize their risk exposure on several fronts. This study proposes a Shariah-compliant Istijrar Accumulator model to hedge against price and commodity risk by using Murabaha-based Istijrar contracts as a way to set a price mechanism for the supply of commodities during a long time period. A binomial option pricing model (BOPM) is used to determine the intrinsic value of the contract, adjusted for the Ribawi factor (interest factor) by replacing risk-free rate with the AAA sukuk return. The proposed Shariah-compliant model is also compared with the conventional KODA structures model as a test for fairness between each party involved in the contract. The results of the model show that the proposed Islamic Istijrar Accumulator limits the downside risk that is observed in the conventional commodity accumulators. Risk is shared rather than transferred between both counterparties in the Istijrar accumulator model which confirms that the payoffs to each party is fair and therefore, a better alternative as an accumulator structure than the conventional model.

INTRODUCTION

Derivatives are a term for legally binding agreements whose values are derived from the value of an underlying commodity, financial instrument or reference rate. Derivatives are essentially an instrument of transferring risk arising from a variable factor, such as the price of a commodity or the exchange rate of a currency, from one party to another who is willing or able to accept the risk [1]. Wa'ad is defined by as the expression of willingness and a commitment by one party to perform a certain action in the future. It's a unilateral promise binding the promisor only, without any obligation on the promise to accept the offer [2]. Istijrar is not a specific financing model, but merely a repeat purchase supply agreement of an ordinary sale. In the Istijrar agreement, the seller agrees to sell an item in various quantities or units repeated over time but there is no bargain [3].

Knock out discount accumulator equity linked investments (KODA ELI), are a complex option that recently came upon the world market [4]. Conventionally, accumulator contracts can come in two forms, a producer accumulator and a consumer accumulator, with consumer accumulators allowing for the accumulation of the underlying asset while the producer contracts essentially allow for the decumulation of the underlying asset.

Kwong et al. [4] in their study determined the profitability and risk associated with the consumer accumulator on two metrics, namely the discount percentage, which specifies the distance from the strike price and the underlying asset's price at origination; and the knock-out percentage, which indicates the distance between the out barrier located above the underlying asset's price at origination. They compared consumer accumulators with differing knock-out percentages (2-7%) and discount percentages (4-15%), and concluded their findings showing that higher knock-out percentages combined with higher discount percentages yielded the greatest cumulative profits. Alternatively, when a high knock-out percentage is united with a low discount percentage, significant cumulative losses occurred [4]. Consequently, for the discrete barrier accumulator, correction term is used to modify the valuation used for the continuous accumulator [5]. Kou [6] states that in the market, most of the barrier options contain a discretely monitored barrier, due to the fact that if the barrier is continuously monitored, illiquid markets may present arbitrage opportunities since markets around the world support inconsistent trading hours.

Cheng [7] reviewed pricing and simulation under the Black-Scholes and Heston frameworks for three structurally unique accumulators: suspension feature, knock-out feature, and double-commitment with knock-out feature. Accumulating GBP/USD, the FX-linked accumulator with suspension feature attains a positive simulated contract price and positively skewed payoffs. The equity accumulator with knock-out feature, accrues HSBC shares, has a negative contract price under simulation and Black-Scholes, but a positive simulated contract price under the Heston framework. Payoffs are unbalanced and skewed toward negative profit, and concluding findings demonstrate that volatility is the most powerful parameter in accumulator pricing. When volatility is low, simulated accumulator prices are slightly positive; however, when volatility is high, simulated accumulator prices are heavily negative. The Heston model is found to produce inconsistent results with simulation and the Black-Scholes model illustrating that the Heston framework inefficiently prices accumulator contracts [7].

As with other financial institutions, Islamic Financial Institutions (IFIs) are exposed to different categories of financial risk and with the exponential growth that the Islamic finance sector has seen over the past decade [8]. Therefore, this study proposes a Shariah-compliant Istijrar Accumulator model to hedge against price and commodity risk by using Murabaha-based Istijrar contracts as a way to set a price mechanism for the supply of commodities during a long time period.

METHODOLOGY

This study aims to apply the theory of istijrar accumulator using real Gold commodity prices and showcasing the hedging effect by structuring 2 barrier options (Wa'ad contracts) into a portfolio based on a Murabaha contract, as well as showcasing the symmetry of risk sharing in the structure as compared to the conventional accumulators.

Istijrar Accumulator Model Structure

The Istijrar Accumulator model is complex in that it is a cumulation of options, average prices and Murabaha Agreements. According to Bacha [9] a master Istijrar structure contract is initiated by signing an agreement between the Islamic financial institution and its client under which various stipulations would be extended. There are 2 parties involved in the transaction. Party 1, the Islamic Financial Institution (IFI) as the seller of the underlying commodity/asset, and holds a long position in the knock-in seller Wa'ad, written by the Client. Party 2, the client is the buyer of the underlying commodity/asset, and holds a long position in the knock-in buyer Wa'ad, and a short position in the knock-in seller Wa'ad.

Pricing model – Cox, Ross, Rubenstein (CRR) Model

The assumptions of a binomial model are followed as the synthetic Istijrar accumulator contracts are constructed from barrier options priced using the binomial model. These assumptions include: no transaction costs, no taxes, no margin requirements, no arbitrage, the investor is risk neutral, binomial distribution of returns, constant return rate for the Wa'ad's lifetime, and volatility is constant [10].

Cox, Ross and Rubenstein [10] proposed the binomial options pricing model (BOPM) to value American and European options in discrete time. The CRR binomial model assumes that there only two potential prices for the underlying asset S at the end of each time interval $t + 1$, either an up price Su with probability p or a down price Sd with probability $1 - p$ [10]. The CRR binomial tree consists of nodes at each time interval between option valuation and expiration. Each node represents a potential future price of the underlying asset at a specific point in time. Options are valued through the numerical method in a three-step process for American options. The binomial price tree is established by working forward, calculating the underlying asset's price at each node from the valuation date to expiration date. Underlying price can either branch up or down by a fixed value at each node, which is calculated based on volatility σ and time t, following the random walk theory. Node positions for the binomial tree are established by the following equations:

$$u = e\sigma\sqrt{\delta t}$$
$$d = e - \sigma\sqrt{\delta t}$$
$$p = \frac{eR\delta t - d}{u - d}$$

Where R is the risk-free rate of return and δt is the time interval between t and $t + 1$. At the option's expiration, intrinsic values are calculated at each final node. For a call option, the option value at the final node is defined as,

$$V_n = [(S_n - X), 0]$$

For a put option, the option value at the final node is defined as,

$$V_n = [X - (S_n), 0]$$

Where Vn is the value of the node at expiration, Sn is the price of the underlying asset and X is the option's strike price. The option's theoretical value is calculated by backward induction or discounting the option's payoffs backward from expiration to the valuation date. Through backward induction, a value is consecutively calculated at each node in the tree by the following for an American-style call option that is expressed as,

$$V_n = [S_n - X_e - (pVu + (1 - p)Vd)]$$

An American-style put option as shown below,

$$V_n = [X - S_{ne} - (pVu + (1 - p)Vd)]$$

Where Vu is the value of the option from an upper node in the next time period t + 1 and Vd is the value of the option from the lower node in the next time period t + 1. Discounted payoff value and early exercise value or intrinsic value is calculated at each node between the expiration date and the valuation date. Due to the no arbitrage rule, the greater of the discounted payoff value or early exercise value is taken for the option's value at each node. European options have a similar process, although they only consider the discounted payoff value at each node and not the early exercise value. This difference in valuation process ensues since early exercise is a feature of American options, not European options [10].

Shariah- Compliant CRR model:

In order to ensure that the CRR model complies with the Shariah requirements, a few assumptions are included in line with the assumptions already put in place as adapted by Omarana et al. [11] when modelling the pricing of Bai Al-Orboun, where the compliance requirements to allow the usage of the model include that the underlying asset must be Shariah compliant. The underlying asset must be tangible, identifiable and owned by the owner of the asset at the time of conclusion of the contract (asset backing principle). The R is the low risk return rate of a riskless asset whose issuer is characterized by a higher level of solvency (for example, Sovereign AAA Sukuk returns).

RESULT AND DISCUSSION

This study aims to model and price an Islamic hedging instrument to protect the buyer or accumulator of a commodity from adverse movements in the commodity prices, especially if said buyer is required to source raw materials/commodities used in the operations of his business throughout the year. Therefore, this study tests the effectiveness and accuracy of the proposed model as a hedging technique against price movements in Gold as an underlying asset to evaluate its ability to shield the buyer and seller from price risk.

The intrinsic value of the proposed model was calculated and priced it with a modified version of the CRR model [10] on a discrete basis by substituting the risk-free rate with the AAA sukuk return as adapted by several research papers, Omarana et al. [11] when pricing Bai Al-Arboun structures as well as Hakim et al. [12] when using the Islamic asset pricing model, ICAPM.

Data Description

Given the importance of ensuring the quality of the data tested in terms of normality and to check for outliers, a descriptive statistics report was generated using EViews, with the results shown in Table 1.

Table 1: Descriptive Statistics

Data	Gold Prices	AAA Suk.Ret.
Obs	259	259
Mean	1258.34	0.25
Median	1366.33	0.2
Min	1128.38	-4.28
Max	1366.33	4.41
SD	57.67	0.61
Skewness	-0.11	0.4
Kurtosis	-1.33	3

The average price and returns of the data displayed shows that the mean Gold price during the studied period was $1258.3 per ounce of gold, while the average AAA sukuk return was 0.25. The standard deviation, which measures the volatility and spread around the mean was 57.7 and 0.613 for Gold and the AAA sukuk return, respectively, which leads to the conclusion that there are no significant outliers in the data, and that the data provides a symmetrical distribution around the mean, as evidenced by the low levels of skewness (-.11 and 0.4) for each data set. Additionally, the kurtosis level for a normally distributed data set is within the -3 to 3 range, and therefore concludes that the data is normally distributed around the mean.

Fairness Testing – A comparison between KODA and Istijrar Accumulators:

The Istijrar accumulator contracts were characterize using Monte Carlo simulation in a historical context in order to determine whether the model is considered a fair risk-sharing instrument between the IFI and the client. This was done by simulating whether there was a probability of making profits off of the structure, or whether it was a zero-sum game that led to unfair profit distribution among the parties. By tracking the price movements of Gold as the underlying commodity, this study attained a trend model and volatility figures to input into the Monte Carlo Simulation, and running the simulation and calculating the payoffs multiple times. This study makes generalizations about the Istijrar structure under those circumstances. Additionally, by changing the market conditions (such as volatility) or the contract assumptions (such as the knock-in percentage or discount percentage) used in the model, which were able to determine under which circumstances the structure would be considered a fair investment for both parties. The reason for choosing the Monte Carlo method is the ideal for pricing options where the payoff is path dependent (such as Asian options and spread options). As such, in order to test for fairness between the Istijrar accumulator structure and the conventional KODA structure, actual data were used from an Knock-Out Discount Accumulator with a Gold underlying issued by UBS bank in June 2016 for a full year tenor till June 2017. According to the term sheet, the strike price was 5% below the underlying's price at the origination of the structure, while the knock-out price was set above 6% of the underlying spot price at initiation. When testing the structure, the KODA model struck out after 80 trading sessions, and the cumulative profit was found to be approximately USD$152,000, which is an average daily profit of $1900, with a standard deviation of $435.

A simple linear regression was conducted for the Gold prices 30 days prior to the KODA initiation date to determine a trend line, and the standard error and mean were applied after which a random number generator simulated hypothetical stock prices based on a negative trend and normal distribution. Four separate tests were run under the same circumstances, while only changing the seed investment, which resulted in losses ranging from $150,000 to $181,000, which is an average of $875 per trading session and the standard deviation increased to $1,675. Similarly, the regression equation for the data only 15 days prior to the opening date of the contract also showed a negative trend with losses at a much higher magnitude than that of the 30 days prior, causing the simulation model to show the losses to be much greater, reaching c. $400,000, as displayed in Table 2.

Table 2: Result of simple linear regression

Scenario	Knock-out Date	Cumulative Profit/Loss (USD)	Average Daily Profit/Loss (USD)	Standard Deviation of Profit/Loss (USD)
Actual Data (5% KO)	Session 80	152,000.00	1,900.00	435.00
Actual Data (10% KO)	None	1,564,000.00	6,256.00	10,984.00
Simulated Data (5% KO)				
15-sessions before	None	400,000.00	1,600.00	2,196
30-sessions before (First trial)	None	150,756.00	603.02	1,722
30-sessions before (Second trial)	None	181,432.00	725.73	1,774
30-sessions before (Third trial)	None	164,565.00	658.26	1,783
30-sessions before (Fourth trial)	None	163,503.00	654.01	1,779
30-sessions before (Fifth trial)	None	150,470.00	601.88	1,720
45-sessions before	None	51,280.00	205.12	478
60-sessions before	Session 23	39,584.00	2,399	231
90-sessions before	Session 94	84,234.00	2,106	243

Based on Table 2, the regressions for the 60th and 90th session prior to the initiation of the KODA contract showed some profits, but very limited compared to the significant losses that have been simulated in negative trend environments.

To measure the risk sharing characteristics of the Istijrar accumulator, the same modelling was applied on historical data. However, there is no presence of an Istijrar accumulator in the market, the actual KODA profit/loss cannot be compared based on a practical model in the market. Therefore, hypothetical of Istijrar contracts were created with different combinations of knock-in percentages and simulated the profit that the investor would have received had he entered into an Istijrar accumulator on that day (June 2016) for a full year a head (June 2017). Table 3 shows the results for both the buyer and the seller of the knock-in Wa’ad.

Table 3: Results for both the buyer and the seller of the knock-in Wa’ad

Scenario	Buyer of Istijrar Accumulator		Seller of Istijrar Accumulator	
Simulated Data	Buyer Knock-in Date	Cumulative Profit/Loss (USD)	Seller Knock-in Date	Cumulative Profit/Loss (USD)
5% KI & Disc.	Session 24	64,534.00	Session 30	43,250.00
10% KI & Disc.	Session 50	23,423.00	None	28,323.00
15% KI & Disc.	None	35,485.00	None	49,234.00

The results showcase risk sharing in terms of the symmetry of profits and losses when the knock in and discount percentages are determined at the reasonable rates of (5 – 10%), which are close to the return on the AAA Sukuk contracts. However, it can be seen that with the increase in the knock-in and discount percentages, the cumulative profits for each party decreases, and the buyer actually incurs losses of $35,485, which are still considerably smaller than the losses that could be incurred in a conventional KODA structure.

CONCLUSION

The obtained results show the efficiency of the Istijrar accumulator structure in sharing the risk of price movements among Islamic Financial Institutions and their clients while giving each party the exposure to upside price movements in the underlying commodity. This ensure the fairness of payoffs between each party, which complies with the Shariah standards of not fixing returns and avoiding Gharar whereby each party knows the mechanism through which the price of the underlying commodity will be determined at each fixing date.

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