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Is the Long Term Profit Rate of Malaysian *Sukuk* a Good Predictor of Short Term Profit Rate?

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Abstract: Decomposition of yield curves is important for pricing of fixed income instruments, inflation management, and modeling term structure of interest rates. Therefore, this study investigates whether the long term profit rate of different classes of *Sukuk* (Islamic Bond) is a viable predictor of future spot profit rates. Data on Malaysian *Sukuk* from 2001-2010 was used to estimate yield curves and forward rates. Regression findings suggest that the forward rate is a weak predictor of future spot profit rate, implying long term profit rates are not the average of future spot rates on long term *Sukuk*. The findings do not support the expectation hypothesis. However, comparison with securities of the same default risk, but with different maturities, reveals the presence of an in-built support for term premium in the yield curves of corporate *Sukuk*. This finding is consistent with the Liquidity Preference Theory. We also find further support for Market Segmentation Theory as we find a humped shaped yield curve in the *Sukuk* market.

Key words: Long profit rates,short profit rate, profit rate yield curve, *Sukuk* (Islamic bonds), *Sukuk* investors, term structure
JEL classification: C12, C53, G12

1. Introduction

Maturity mismatch is an important issue for bank failure as well as corporate long term financing. It is considered as one of the causes of the 1997 Asian financial crisis which resulted in a large number of bank and corporate failures in East Asian countries. The Asian financial crisis triggered the rapid development of the bond markets, specifically the corporate bond and Islamic bond market in East Asian countries. As a result, private

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corporations and banks were able to access multiple sources of long term funding at competitive terms. In this manner, banks reduced their dependence on their depositor base, increased the number of tools available to balance their maturity mismatch, and reduced their vulnerability during the economic downturn. However, although, corporate bond markets substantially developed in East Asian countries, the Islamic bond (popularly known as a *Sukuk*) market is still developing in East Asian countries.

Following Japan and Korea, Malaysia is not only a leading country in Asia to develop the corporate bond market, but a global hub for Islamic bond issues, as about 48 per cent of all global *Sukuk* issues are issued in Malaysia. Table 1 shows a gradual increase in Islamic bond (*Sukuk*) issues in Malaysia during the 2001-10 period. Figure 1 depicts both the Islamic and conventional issues for the same period.

Since the introduction of Islamic bonds in 2001, there has been no documented evidence on the predictable power of the profit based yield curve of *Sukuk.* Similar to the yield curves on conventional issues, the profit based yield curve serves to assist both lenders and borrowers in making right investment decisions, to help investors plot various rates of returns on investments in the future, and to track the trends and direction of the future profit rates.

There is substantial documentation on the predictive power of a yield curve of corporate bonds in developed countries (US, UK, Japan etc). In Malaysia, there is some documented evidence on term structure of interest rates on conventional bonds. However, due to the absence of any formal pricing model for Islamic bonds (*Sukuk*) and in the absence of time series data for profit rates, there is not much evidence on *Sukuk* bonds. This study investigates whether the long term profit rate (which is available since 2005) on different classes of *Sukuk* is a good predictor of future spot profit rate and ascertains the usefulness of the *Sukuk* yield curve in forecasting, considering the fact that forward profit rates also contain the reward for risk or term premium. Hence, the findings will contribute to the developing *Sukuk* literature.

Table 1. Outstanding Islamic corporate bond (LCY) 2001-2011

Year	IABS/ABS-IMTN	IBONDS	ICP	IMTN	Total
2001	-	18.33	4.48	1.12	23.93
2002	-	33.29	4.46	1.75	39.5
2003	-	46.11	4.69	2.57	53.37
2004	0.99	52.09	6.21	5.43	64.72
2005	0.60	55.09	3.62	9.97	69.28
2006	3.25	62.88	4.49	16.75	87.37
2007	3.21	65.05	5.89	26.96	101.11
2008	5.55	70.99	6.46	55.07	138.07
2009	6.17	71.95	5.89	67.67	151.68
2010	5.12	68.79	5.28	101.45	180.64
2011	5.10	67.05	3.18	130.82	206.15

Notes: ABS–IMTN = Asset-backed securities–Islamic medium term; IABS = Islamic asset-backed securities; IBONDS = Islamic bonds ; ICP = Islamic corporate paper; IMTN = Islamic medium-term notes.
Source: Bank Negara Malaysia

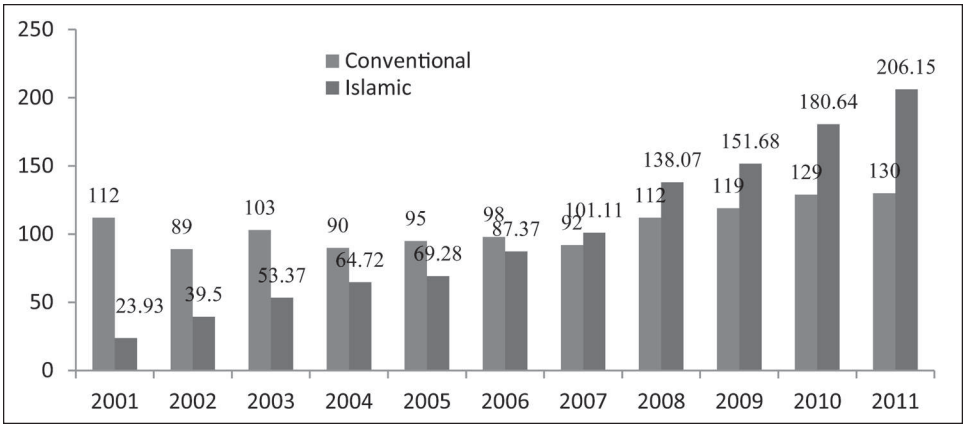

Figure 1. Outstanding Islamic and conventional corporate bond (LCY) 2001-2011

The rest of the paper is structured as follows. Section 2 presents the background of conventional and Islamic (*Sukuk*) bonds rates and the extant empirical literature. Section 3 presents the literature on yield curves. Section 4 explains the methodology and data, Section 5 presents the findings, and Section 6 concludes the paper.

2. Conventional Bond Yield Curve and *Sukuk* Profit Curve: Concept and Empirics

For conventional bonds, the yield curves are constructed using interest rates (fixed or floating). However, for *Sukuk*, there are no established models to measure the term structure of profit rate. The matter is further complicated by the fact that *the Sukuk* has different structures (like *murabahah*, *mudarabah*, *musharakah*, *bai bithaman ajil* (BBA), *istisna*, *salam*, *ijarah* etc) with a different range of profit rates that could be fixed or floating. For example, *murabahah* is a mark-up transaction that does not involve profit/loss sharing. However, as *mudarabah* applies proft/risk sharing between the issuer and investors, fixed and floating profit rates apply respectively. This paper focuses on fixed income *Sukuk* like *musharakah* and *ijarah* since it allows the construction of the profit yield curves using the same measures that are applied in estimating yield curves for conventional bonds.

The term structure of interest rates or a yield curve is employed in pricing fixed income instruments, inflation management, and modeling term structure of interest rates to ascertain the relationship between long- and short-term spread. Meanwhile, the returns to *Sukuk* investors are based on profit and loss sharing principle as dictated by the *Shari'ah.* A major principle underlining the *Shari'ah* transactions is that the investors assume a certain degree of risk before a legitimate profit could be earned on such investments. By implication, investors must assume ownership risk of the assets before it can be used as an underlying asset. [1] Where there is an underlying asset in a transaction, *Shari'ah* has provided for different types of contracts that are flexible in nature and are such that can be applied both

[1] See Bukhari Vol 3, Hadith 334

at the Islamic money and capital markets; hence, application of these contracts in the two markets depends on the term structure.[2] Table 2 presents different types of *Sukuk* bonds and their definitions.

Market forces of demand and supply, which adjust to changes in market conditions, determine profit or loss. Though the profit rates on *Sukuk* can be negotiated between investors and borrowers, the rate and the actual profits earned by investors cannot be predetermined but are subjected to market conditions. The protection for investors in *Sukuk* is the underlying asset that they own, and investors are entitled to the proceeds from its disposal. Theoretically, we may state *a priori* that *Sukuk* should have stronger/weaker predictability power since the profit rates fluctuate in accordance with the business cycle and economic environment.

Furthermore, the profit curve (yield curve in conventional bond) on *Sukuk* is expected to give an insight into whether the market has allocated a fair value to the bond as changes in the profit rate will drive a change in the bond price. Since the curve is shaped by the spread between the yields, market players are mostly concerned with the yield spread at which a bond is trading rather than its price. This paper focuses on the issue of whether

Table 2. Types of investment *Sukuk* approved by AAOIFI

1.	Certificates of ownership in leased assets
2.	Certificates of ownership of usufructs. These certificates are of various types and include the following from 2.1 to 2.4:
2.1	Certificates of ownership of usufructs of existing assets
2.2	Certificates of ownership of usufructs to be made available in the future as per description
2.3	Certificates of ownership of services of a specified supplier
2.4	Certificates of ownership of services to be made available in the future as per description
3.	*Salam* certificates
4.	*Istisna'a* certificates
5.	*Murabahah* certificates
6.	Participation certificates
6.1	Participation certificates managed on the basis of *Musharakah* contract
6.2	Participation certificates managed on the basis of *Mudarabah* contract
6.3	Participation certificates managed on the basis of investment agency
7	*Muzara'a* (sharecropping) certificates
8	*Musaqah* (irrigation) certificates
9.	*Mugarasa* (agricultural) certificates

Source: AAOIFI Exposure Draft *Shari'ah* Standard No.18, 2002

[2] *Sukuk* income or stream of profit could be fixed or floating depending (as we have in the conventional bonds) on the type and terms of contract. If, for instance, the type of contract is *ijarah*-leasing contract, there should be a fixed flow of rentals at specified periods in the contract agreements. If the contract is based on *mudarabah* which applies the principle of profit and loss sharing, then the stream of flow should be floating and should not be predetermined (Usmani 2008). That said, it means that the profit rate of Islamic *Sukuk* is based on changes in the economy.

investors are able to obtain term premium (compensation for lending long) to compensate for the risk involved in long term lending.

Malaysia operates a dual financial system (i.e. both conventional and Islamic) and is strictly subjected to the regulations and guidelines by the Central Bank (Bank Negara Malaysia). A notable feature of Malaysian *Sukuk* is that the issuances are mostly in Malaysian Ringgit. Since *Shari'ah* scholars have yet to come up with an Islamic benchmark of profitability, currently, the indexing of the profit rate is based on London Inter-Bank Offer Rates (LIBOR). The Islamic Financial Institutions (IFIs) are compelled to benchmark their profit rates on the available interest rate for better competition. This benchmarking is not only a non-compliance issue practice, but also distorts true market value of underlying assets and, hence, their returns (Muhammad Al-Bashir 2008). Out of the 111 sovereign issuances in Malaysia as of 2008, only 10 were indexed to LIBOR. In addition, the Malaysian government issued the first sovereign *Sukuk* in 2002 with the application of the *ijara* contract, after which many other countries followed. This research is done on Malaysian *Sukuks* because of its leading role in the issuance of *Sukuk*.

Existing literature on *Sukuk* discusses the development of financial instruments in compliance with the Islamic legal framework and requires synchronisation of *Sukuk* within the conventional financial framework without losing focus of the underlying *Shari'ah* principles. The dynamics of the *Sukuk* market and conventional bonds are based on the same variables such as economic atmosphere and business cycle. It has been documented that *Sukuk* is similar in many aspects to the Eurobond (Selim and Faezeh 2007), and there is increasing convergence between conventional bonds and *Sukuk* (Mirakhor 2007).

Hassan and Oseni (2014) argue that there is no doubt that the rate at which *Sukuk* financing has been accepted in different jurisdictions outside the usual Muslim-majority countries is encouraging. This seemingly considerable feat comes with much responsibility and proactive role on the part of the *Shari'ah* scholars and regulators. They examined prevailing practices in the market and the need to enhance the *Shari'ah* -compliance of the processes through proper regulation and a follow-up supervision of *Sukuk* transactions, particularly the underlying contracts. To this end, law and *Shari'ah* should complement each other with a view to ensuring compliance with the laid down rules. A number of fundamental legal issues that are important in the Islamic Capital Market (ICM) and consequently, applicable to *Sukuk* transactions have been raised in the literature. Some of these legal issues are either taken for granted during the drafting stage or assumed to be effective even though the philosophy underlying such issues differs from the original value proposition of Islamic economics. Therefore, it is incumbent on the stakeholders to promote not only a commercially viable industry but also to ensure that *Sharî'ah* principles are observed at all stages of the *Sukuk* transactions. This is where regulation and supervision intercept in the general framework of Islamic finance.

Hassan and Oseni (2014) argue that as part of Islamic finance documentation involved in the process of structuring a *Sukuk* transaction, one important aspect that the parties must get right from the beginning is the governing law clause. With the increasing provision of English law as the governing law, a question that readily comes to one's mind is whether it is possible to have an alternative governing law while retaining the choice of jurisdiction clause. In order to create a regulatory environment that is conducive to the prevailing trends in the modern world, this study critically ploughs through the governing law clauses

of 10 selected *Sukuk* prospectuses and makes interesting findings regarding the attitude of draftsmen and their clients. A preliminary finding of this study is the paradigm shift to arbitration as an alternative or precondition to litigation in some of the *Sukuk* prospectuses reviewed. Since there are regional and international arbitral institutions set up exclusively for Islamic finance disputes, it may be more appropriate for experts in Islamic law to supervise and resolve any dispute arising from *Sukuk* transactions based on *Shari'ah*-compliant rules. The interviews conducted for this research with ten prominent *Shari'ah* scholars who have been involved in the certification of *Sukuk* structures proves this hypothesis and the qualitative data are consistent with it.

Alam *et al.*(2013) investigated the impact of conventional bonds and Sukuk announcements on shareholder wealth and their determinants using 79 *Sukuk* and 87 conventional bonds over the period of 2004-2012 in six developed Islamic financial markets. The overall time frame was divided into three parts: (i) 2004-2006 (before crisis); (ii) 2007-2009 (during crisis); and (iii) 2010-2012 (after crisis). The market reaction was found to be negative for the announcements of *Sukuk* before and during the 2007 global financial crisis. On the other hand, the market reaction was positive for the announcement of the conventional bond before the crisis period and negative during and after the crisis periods. The size of bond offerings appears to have a negative impact on the cumulative abnormal return in case of *Sukuk* and positive in the case of the conventional bond.

Safari *et al.*(2013) examined the market prices of both conventional and sukuk bonds similarly by using Granger causality tests. They found that the *Sukuk* yield is higher than that of the conventional bond yield even after controlling for issuer, rating quality and maturity. The authors allude that the *Sukuk* may be considered as a new asset class.

Furthermore, the *Sukuk* term structure is based on two assumptions: (1) the forward rate on the *Sukuk* are closely related to expectation of market players about the future short-term profit rates; and (2) the investors' expectations about excess return is constant over time irrespective of their maturity strategy due to their strong affliction to a segmented market that is *Shari'ah* compliant. Meanwhile, in the application of any form of Expectation hypothesis in term structure of profit rates of *Sukuk*, there is a need to consider the principle underlining the issuance, pricing, risk, and returns on the subject. Hence, the specification of fixed income market was considered while taking cognizance of the *Shari'ah* principles that delineate Islamic and conventional bonds - fixed income *Sukuk* based on *musharakah*, *ijarah*, *mudarabah* and the likes were selected from tradable Malaysian *Sukuk*.

3. Data and Model Based Calculations

This research focuses on term structure of the profit rate of *Sukuk* bonds in Malaysia, specifically the default-free Malaysian Islamic Treasury Bills (MITB); *Sukuk* data was sourced from Bond Pricing Agency (BPA) Malaysia. Since trading on *Sukuk* bonds started in 2002 with the first global *Sukuk*, monthly data was collected from 2002-2010.

Labuan Data sheet information of listed sovereign *Sukuk* revealed the following: the issuer, type of issues; Islamic instrument applied and the due dates; listing class; listing dates; settle date, amount in US dollars and the listing sponsors. An issuer's total rate of return was calculated based on the percentage change in its total value over a period of time, following the Citigroup *Sukuk* index procedure as follows:

If ending price = *a*, ending accrued = *b,* principal payment= *P,* coupon payment = *c* and Re-investment income = *d,* then
end-of-period value = *(a+b) z-P+c+P+d*

Total rate of returns =[(end-of-period value/ eginning-of-period value) – 1] x 100
= [{*(a+b) z-P+c+P+d/(x +y)z*}-1]100

In this section, the one-factor HJM term structure model was introduced followed by the extended two-factor HJM term structure. The proposed two-factor HJM model was extended with the addition of another state variable, volatility, which is one of the most important factors that can be used to explain the term structure of profit rate movement. Using interest rate volatility as the second state variable has an intuitive appeal since volatility is a key variable in pricing contingent claims (Bali 2003). Then, a MATLAB program was written for the spot curve to forward curve. Rate-times syntax was used to calculate forward rates at the beginning of all periods implied in the data with the addition of the compounding value.

Assuming the spot rate *r(t)* to be equal to the instantaneous forward rate *f(t,T)*, then we have *f(t,T)* in Equation (1)

$$f(t,T) = \frac{\partial \ln[P(t,T)]}{\partial T} \tag{1}$$

Intuitively, if the forward rate follows this process

$$f(t,T) = f(0,T) + \int_0^t \alpha(s,T)ds + \sum_{i=1}^{n} \int_0^t \sigma_i(s,T)dW_i(s) \tag{2}$$

where $\{W_i\}_{i=1}$ …..*n* are independent Brownian motions, then the spot rate process is

$$r(t) = f(t,T) = f(0,T) + \int_0^t \alpha(s,T)ds + \sum_{i=1}^{n} \int_0^t \sigma_i(s,T)dW_i(s) \tag{3}$$

The bond price fluctuates as a result of the interest rate, with variation in spot rate; Let *P(t,T)* denote the price of a *Sukuk* bond at time *t* maturing at time *T* where $t \leq T$, with the boundary P(t,T) =1, we have

$$[P(t,T)] = 1 \tag{4}$$

Then to determine the movement on the price *P* of a bond at time *t* maturing at time *T,*

$$P[t,T] = \exp\left(-\int_t^T f(t,s)ds\right) \tag{5}$$

And the logarithm of *P* is

$$\ln P[t,T] = \exp\left(-\int_t^T f(t,s)ds\right) \tag{6}$$

With mathematical derivations as detailed in HJM appendix and combined with Equations 3 and 5, we have the following equation:

$$\ln P[t,T] = \ln(P(0,T)) + \int_0^t [r(t) + b(t,T)]dt - \frac{1}{2}\sum_{i=1}^{n}\int_0^t a_i(t,T)^2\,dt + \sum_{i=1}^{n}\int_0^t a_i(t,T)dW_i(t) \tag{7}$$

Wherein

$$a_i(t,T) = -\int_t^T \sigma_{i(t,T)}dt \tag{8}$$

also

$$b(t,T) = -\int_0^t \alpha(t,T)dt + \frac{1}{2}\sum_{i=1}^{n} a_i(t,T)^2 \tag{9}$$

Ito lemma differential equation was used to transform the dynamics of bond price into a stochastic process:

$$dP(t,T) = [r(t) + b(t,T)]P(t,T)dt + \sum_{i=1}^{n} a_i(t,T)P(t,T)dW_i(t) \tag{10}$$

HJM proposes that if *Q*, the risk neutral probability, is an equivalent martingale, and $B(t)$ is a discount factor, it follows that a zero-coupon bond with maturity time *T* will have this price:

$$\frac{P(t,T)}{B(t)} \tag{11}$$

When Ito lemma is applied to the logarithm of Equation 11

$$\ln\frac{P(t,T)}{B(t)} = \ln\frac{P(0,T)}{B(t)} + \int_0^t b(t,T)dt - \tfrac{1}{2}\sum_{i=1}^{n}\int_0^t a_i(t,T)^2\,dt + \sum_{i=1}^{n}\int_0^t a_i(t,T)dW_i(t) \tag{12}$$

In the context of two-factor model, if the above condition holds and a further proposition of no-arbitrage condition and restriction on the forward rate process drift are given in Equation (13):

$$\alpha(t,T) = -\sigma_1 q_1(t) - \sigma_2 e^{-\frac{\lambda}{2}(T-t)} q_2(t) + \sigma_1^2(T-t) - 2\frac{\sigma_2^2}{\lambda}e^{-\frac{\lambda}{2}(T-t)}\left(e^{-\frac{\lambda}{2}(T-t)} - 1\right) \tag{13}$$

where

$\alpha(t,T)$, is the drift on the forward rate process, which is equal to

$$\alpha(t,T) = -\sum_{i=1}^{n}\sigma_i[t,T]\left(q_i(t) - \int_t^T \sigma_i(t,T)dt\right) \tag{14}$$

And $q_1(t)$ is the arbitrage-free condition with

$$q_i(t) = q_i(t,...,T_n) \quad i = 1,\ldots,n \tag{15}$$

The forward rate process with long and short term factors is

(16)

The terms

$\sigma_1 e^{-\frac{\lambda}{2}[T-t]} dW_1(t)$ is the short term profit rate factor and

$\sigma_2 dW_2(t)$ is the long term profit rate factor and

and W_2 are Brownian motion for short and long term factors respectively.

With risk-neutral probability (a link between Equations (13) and (16)), the forward rate dynamics will take this process:

$$f(t,T) = f(0,T) + \sigma_1^2 t\left(T - \frac{t}{2}\right) - 2\left[\frac{\sigma_2}{\lambda}\right]^2\left[e^{\lambda T}\left(e^{\lambda t} - 1\right) - 2e^{-\frac{\lambda}{2}T}\left(e^{\frac{\lambda}{2}t} - 1\right)\right] +$$

$$\sigma_1 \overline{W}(t) + \sigma_2 \int_0^t e^{-\frac{\lambda}{2}(T-t)} d\overline{W_2}(t) \quad (17)$$

While the spot rate dynamic process will be:

$$r(t) = f(0,T) + \sigma_1^2 t \frac{t^2}{2} - 2\left(\frac{\sigma_2}{\lambda}\right)^2\left[\left(1 - e^{-\lambda t}\right) - 2\left(1 - e^{-\frac{\lambda}{2}t}\right)\right] +$$

$$\sigma_1 \overline{W_1}(t) + \sigma_2 \int_0^t e^{-\frac{\lambda}{2}(T-t)} d\overline{W_2}(t) \quad (18))^3$$

By extension, the variables generated from the model shall be used to predict the ability of the forward rates to forecast the spot rates employing simple linear regression to regress the forward rate on the actual spot profit rates at time *t* with *n* years to maturity using the following equation:

$${}_t sr_n = \alpha + \beta_t fr + \varepsilon_t \quad (18)$$

where ${}_t sr_n$ is the actual spot profit rate of an *n* year bond at time *t*; β_t is the slope coefficient of the forward rate; *fr* is the implied forward rate of 1 year bond at time *t*; while ε_t is the disturbance error term.

We tested the validity of Expectation theory. If α which is the intercept, has a zero value or very close to zero and the co-efficient of the forward rate has a value of 1 or a value close to 1, then the forward rate has a strong predictive power to forecast the future spot profit rate. The closer these values are to zero and 1 respectively, the stronger the predictive power. Otherwise, if the intercept presents a value not equal to zero and the co-efficient value is zero, then the theory is rejected on *Sukuk* bonds.

4. Analysis of Empirical Results

The HJM model (Heath *et al.*1992) allows us to incorporate multiple factors to specify different types of shift in the shape and location of the profit rate structure. Government

[3] The Partial Derivate Equations (PDE) were according to Heath *et al.* (1992) and the revised version by Huu *et al.* (2008).

and corporate *Sukuks* with the least maturity of 3 years and longest maturity of 50 years were used in the calculation because of availability of a long period of continuous data. Prices and YTM were sourced from the *Sukuk* two-factor model, and each category of corporate *Sukuk* in the sample was classified according to the credit or default risk. Yield curves were generated for the government *Sukuk* **(**GII) because they have no credit risk while the yield curves for non-GII or the corporate *Sukuk* are typically referred to as corporate curves. These types of *Sukuk* are expected to offer additional yield to compensate investors for additional risk and makes them relatively attractive for bond investors. Hence corporate curves plot the available yields on investment grade *Sukuk* with different default qualities. There are eight risk classes: AAA, guaranteed A1, AA1, AA2, AA3, A1, A2, and A3.

The bonds in Table 3 employed the first comparison and are arranged according to their issue dates. The obtained prices and YTM for 2010 were compared with the mark-to-market prices and YTM of the same year for each bond to see if the market offered a fair yield and price on these *Sukuk*. We found that 83 per cent of the active Malaysian government *Sukuks* had higher YTM when compared to the mark-to-market and, hence, lower price than the market price. Seventeen per cent had lower yield than the market-to-market yield and, hence a slight drop in their prices as compared to the market-to-market prices as well. Interestingly, one out of the three bonds with a lower yield than the mark-to-market yield had a higher fair price than the price offered by the market. Investors are usually concerned with the yield on bonds rather than its price. There is the likelihood that the market has not allocated a fair yield to these *Sukuk*. By implication, and sequel to the prices obtained in the

Table 3. Fair prices and yield for Malaysian government *Sukuk*

Bonds	Profit rate	Issue date	Maturity date	Price (2010 M2M)	Fair price (2010)	Current yield (2010)	Fair YTM (Two factor HJM)
3Y	3.57	15-Mar-07	15-Mar-10	100.19	99.97	1.86	3.58
3Y	4.36	30-Jun-08	30-Jun-11	102.77	99.91	2.34	4.41
3Y	3.08	15-Apr-09	15-Apr-12	100.7	99.95	2.74	3.15
3Y	3.29	15-Jan-10	15-Jul-13	99.7	100.00	3.38	3.40
4Y	3.28	15-Sep-09	15-Mar-13	100.16	99.89	3.22	3.39
5Y	4.63	14-Jul-06	14-Jul-11	103.21	99.90	2.36	4.66
5Y	3.69	8-Dec-05	8-Dec-10	101.36	99.97	2.06	3.70
5Y	3.58	14-Sep-07	14-Sep-12	101.53	99.91	2.96	3.61
5Y	3.60	31-Mar-08	29-Mar-13	101.08	99.88	3.24	3.67
5Y	3.90	30-Jun-09	30-Dec-14	100.15	99.80	3.87	4.04
5Y	3.91	31-Jul-09	31-Jul-14	100.6	99.83	3.76	4.08
6Y	4.27	14-Aug-08	14-Feb-14	102.48	99.81	3.61	4.41
10Y	4.42	16-Mar-05	16-Mar-15	102.37	99.75	3.90	4.48
10Y	3.82	15-Nov-06	15-Nov-16	98.49	99.78	4.08	3.88
10Y	3.94	15-Jun-07	15-Jun-17	98.88	99.74	4.12	4.03
10Y	4.29	31-Oct-08	31-Oct-18	100.32	99.66	4.25	4.47
10Y	3.91	13-Feb-09	13-Aug-19	96.68	99.64	4.34	4.16
11Y	4.49	30-Oct-09	30-Apr-20	100.8	99.54	4.39	5.43

model, there is the probability that almost 89 per cent of the government *Sukuk* are overpriced and the remaining are underpriced or not likely to be fairly priced.

On the other hand, the AAA corporate *Sukuks* are classified as best quality *Sukuk* (Investment grade) and Table 4 shows that all the AAA bonds in the sample have higher YTM than mark-to-market yields and lower prices compared to the market pices. Each of the bonds in this sample show increasing yields towards long-term spectrum. This was observed on both the market allocated yields and the calculated fair yields.

Lower prices are observed for long term *Sukuk* while short term AAA *Sukuk* prices are relatively higher. However, there is an irregular pattern in the market prices for each maturity. This implies that each *Sukuk* in different maturity stages behaves differently from one another. This behaviour can be attributed to many factors, among which include the absence of a unifying trading exchange, poor trading activities in the market, few market participants and expertise in the market.

For the corporate guranteed A1 rated *Sukuk*, 100 per cent of the sample had higher YTM than mark-to-market yields (Table 5). Hence lower prices were seen compared to the market prices. The yield follows an increasing pattern similar to yields for Malaysian government *Sukuk*. Guaranteed A1 are government guaranteed corporate *Sukuk*, and behave in a way similar to Malaysian government *Sukuk*. More so, risk-averse investors that usually dominate the bond market sometimes behave differently in expectation of credit crises. Such behaviour may increase the demand for government bonds, which are deemed safer than other types of *Sukuk*. Thus, Malaysian government *Sukuk* and guaranteed A1 yield's performance may be attributed to their lower risk and good hedge for investors who expect sudden market reversals.

Similarly, for the AA3 rated category, *Sukuk* yields showed similar characteristics to GII *Sukuk*. The results in Table 6 show that 55 per cent of the sample *Sukuk* have higher yields with yields increasing with maturity. About 45 per cent have lower fair yields compared to market yields. The key parameter driving trading behaviour of *Sukuk* investors, which has an effect on the yield pattern, may be the degree of risk aversion and the investors' expectation of future returns. Safety of timely payment of profit and principal under this class is an indication of good performance and how this default class regards their fair yields. This study also analysed all classes of corporate *Sukuk* (AA1, AA2, AA3, A1, A2

Table 4. Fair prices and yield for corporate AAA rated active *Sukuk*

Bonds	Profit rate	Issue date	Maturity date	Price (2010 M2M)	Fair price (2010)	Current yield (2010)	Fair YTM (Two factor HJM)
5Y	6.3	26-Aug-05	26-Aug-10	101.51	101.01	2.59	5.32
6Y	5.6	26-Aug-05	26-Aug-11	103.82	101.85	3.08	5.63
7Y	6.1	26-Aug-05	26-Aug-12	106.48	100.75	3.44	6.16
8Y	5.3	26-Aug-05	26-Aug-13	108.23	101.66	3.81	6.38
9Y	6.4	26-Aug-05	26-Aug-14	109.23	100.57	4.16	6.50
10Y	5.85	4-Dec-02	4-Dec-12	104.75	99.77	3.97	5.86
10Y	6.5	26-Aug-05	26-Aug-15	110.27	99.49	4.40	6.62
11Y	5.25	20-Jul-07	28-Dec-18	98.25	99.47	5.50	6.44
12Y	6.3	4-Dec-02	4-Dec-14	108.19	99.09	4.35	6.33

Table 5. Fair prices and yield for corporate guaranteed A1 rated active *Sukuk*

Bonds	Profit rate	Issue date	Maturity date	Price (2010 M2M)	Fair price (2010)	Current yield (2010)	Fair YTM (Two factor HJM)
6Y	6.5	25-Aug-06	24-Feb-12	101.1	99.74	5.92	6.58
6Y	6.5	25-Aug-06	24-Aug-12	100.91	99.72	6.11	6.58
7Y	7	25-Aug-06	25-Feb-13	101.64	99.60	6.4	7.37
7Y	7	25-Aug-06	23-Aug-13	101.09	101.01	6.65	7.12
8Y	7.2	25-Aug-06	25-Feb-14	101.22	99.48	6.85	7.37
8Y	7.2	25-Aug-06	25-Feb-14	100.76	99.48	7.0	7.37
9Y	7.5	25-Aug-06	25-Feb-15	101.58	100.35	7.12	7.72
9Y	7.5	25-Aug-06	25-Aug-15	101.39	99.10	7.24	7.82

Table 6. Fair prices and yield for corporate AA3 rated active *Sukuk*

Bonds	Profit rate	Issue date	Maturity date	Price (2010 M2M)	Fair price (2010)	Current yield (2010)	Fair YTM (Two factor HJM)
8Y	5.20	12-Jun-07	12-Jun-15	94.58	99.66	6.41	5.32
10Y	5.60	12-Jun-07	12-Jun-17	92.48	99.51	6.92	5.78
11Y	5.85	12-Jun-07	12-Jun-18	91.68	99.42	7.19	6.03
12Y	2.00	12-Jun-07	12-Jun-19	63.70	99.91	7.46	6.13
13Y	2.00	12-Jun-07	12-Jun-20	59.72	99.90	7.72	6.45
11Y	6.63	12-Jun-08	23-Dec-19	101.51	99.15	6.42	7.01
12Y	6.83	12-Jun-08	24-Dec-20	101.37	99.05	6.65	7.25
13Y	7.03	12-Jun-08	23-Dec-21	101.27	98.95	6.87	7.50
14Y	7.23	12-Jun-08	23-Dec-22	101.16	97.18	7.09	8.51
16Y	7.95	12-Jun-08	23-Dec-24	103.62	98.57	7.54	8.60
17Y	8.35	12-Jun-08	23-Dec-25	105.32	98.41	7.76	9.08

Notes: M2M indicate mark-to-market

…). Each profit rate curve for each corporate class shows different yields.[4] Overall results (in Table 7) show that approximately 89 per cent of the Malaysian *Sukuk* can be seen as having higher yield-to maturity than that assigned by the market while almost 90 per cent of Malaysian active *Sukuk* are overpriced.

Spot and forward rates generated for GII *Sukuk* using cubic spline interpolate method and curves were ploted using MATLAB. GII Spot and forward rates based on settlement date from 30 August 2004 to 31 December 2008 are presented in Figures 2 and 3.[5] We find that all of the spot and forward rates obtained present a humped shaped curve, which is a likely indication of a segmented maturity in the Malaysian *Sukuk* market. It implies that *Sukuk* holders prefer their investment habitat and hold on to their maturity spectrum where

[4] All results are not presented in the paper due to space constraints but are available upon request.
[5] All figures are not reported in the text due to space constraints but are available upon request.

Table 7. Credit risk classes and their percentage of higher and lower YTM and price

Credit risk class	Higher YTM (%)	Lower YTM (%)	Higher price (%)	Lower price (%)
GII	83.30	16.70	88.89	11.11
Corporate AAA	100	0	0	100
Corporate guaranteed A1	100	0	0	100
Corporate AA1	100	0	0	100
Corporate AA2	100	0	0	100
Corporate AA3	54.55	45.45	36.36	63.64
Corporate A1	70	30	10	90
Corporate A2	81.82	27.27	36.36	63.64
Corporate A3	50	50	0	100

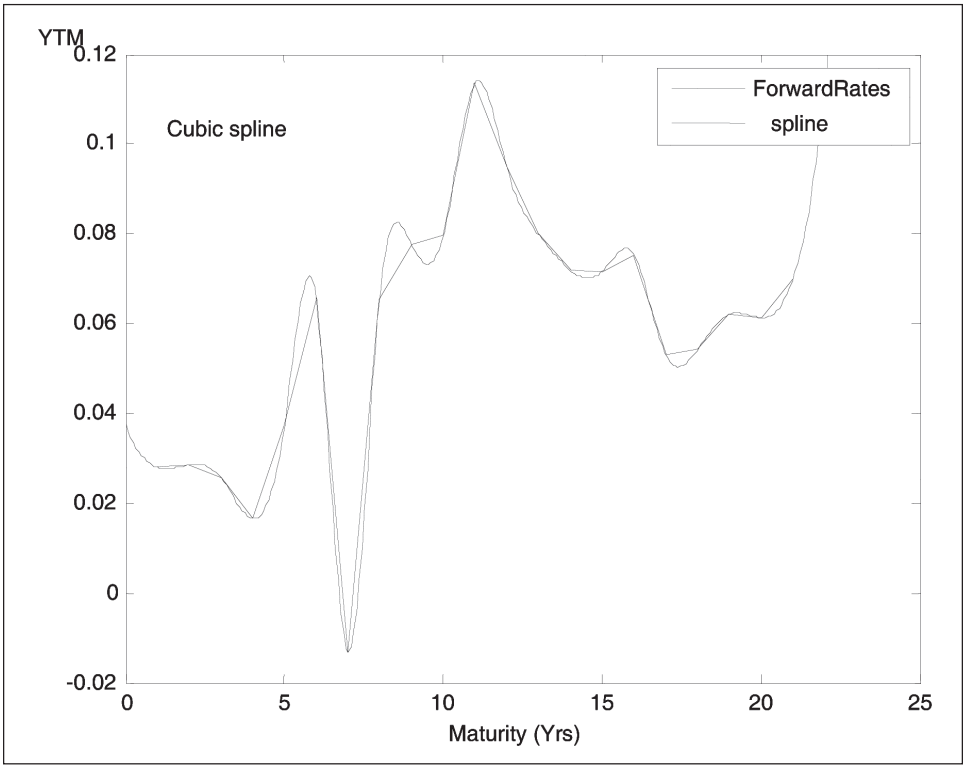

Figure 2. GII forward curves based on settlement date of 30 August 2004

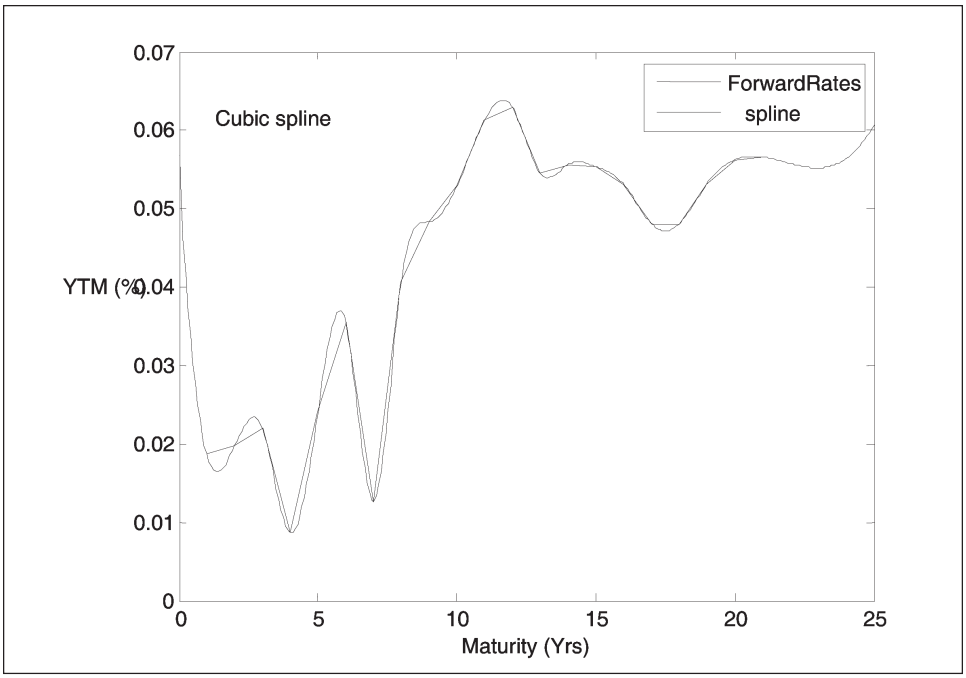

Figure 3. GII forward curves based on settlement date of 31 December 2008

they are safe while holding different bonds with differing maturity spectrums. It is expected that profit rates, which change with economic uncertainty, are not easily predictable. The spot and forward rates from the above figures were used to observe evidence on predictability of forward rates. The ability of the forward rates to forecast the future spot rates was ascertained by employing a simple linear regression to regress the forward rate on the actual spot profit rates at time *t* with *n* years to maturity using the following equation:

$$_{t}sr_{n} = \alpha + \beta_{t} fr + \varepsilon_{t}$$

where $_{t}sr_{n}$ is the actual spot profit rate of an *n* year bond at time *t*, β_{t} is the slope coefficient of the forward rate; *fr* is the implied forward rate of 1 year bond at time *t*; and ε_{t} is the disturbance error term. Tables 8 and 9 shows the regression results.

$$_{t}sr_{n} = 0.03411 + 0.018021\ fr + 0.0098$$
$$se = (0.001) \quad (0.0069)$$
$$t = (66.974) \quad (2.610)$$

The results show that *á* (0.03411) is statistically different from zero and significant at 5 per cent significant level and *â* (0.018021), which indicates forward rates, is statistically different from 1 and significant at the 5 per cent level. Given the 56 per cent correlation coefficient, a high degree of linear relationship is indicated between the two variables, that is, spot and forward rates. These results imply that forward profit rates have weak

Table 8. Simple variable correlation output results

Single variable correlation output report	Spot and forward rates
Correlation coefficient R	0.559
R-Square	31.2%
Adjusted R square	29.2%
Observations	
	v757
Level of significance	0.05
t-score	18.524
P(value) two-tail	0.000
Decision:	Reject Null

Table 9. Spot and forward rates regression output results

Variable decision	α	βfr	Standard error	*t*-statistic	*p*-value
Spot rates	0.034		0.001	66.97	0.0000
Reject null					
Forward rates		0.018	0.007	2.61	0.0000
Reject null					
R-square=89%					
Adjusted R-square=76%					

Table 10. Malaysian government *Sukuk* (GII) versus corporate AAA, AA1 and A2

Maturity	GII (%)	Corporate AAA (%)	AA1 (%)	A2 (%)	Corporate AAA (%)	Spread AA1 (%)	Spread A2 (%)
4-Y	3.33	-	-	9.29	-	-	5.97
5-Y	3.33	5.41	-	8.29	2.09	-	4.96
6-Y	4.39	5.73	6.84	4.54	1.34	2.44	0.15
10-Y	4.33	6.69	7.63	-	2.37	3.31	-
11-Y	4.57	5.39	7.81	-	0.83	3.24	-

Note: Y-Year

predictability power to forecast future spot rate. Hence, the pure form of the Expectation hypothesis is not supported.

5. Further Discussion

5.1 *Comparing Government Sukuk Profit Curves with Corporate Profit Curves*

Comparison of different types of profit curves can assist investors in determining the relative value of their bonds and extra profit accruable to them for investing in non-governmental bonds. An attempt is made here to compare the GII curves of five different maturities with two high investment grades and one low investment grade corporate *Sukuk*. Table 10 shows that lower quality corporate *Sukuk* A2 (4 years maturity) have a high yield

with 5.97 per cent spread over yield offer by GII. The results clearly show that the 5-year corporate A2 also outperforms 5-year AAA by offering an extra 2.86 per cent yield over the extra yield AAA investors earn as additional yields for taking additional risk. For 6-year maturity class, AA1 risk class outperforms AAA risk class while A2 investors were worse-off with a very little positive spread of 0.155. However, in the 10- and 11- year maturity class, AA1 outperforms AAA *Sukuk*.

5.2 Comparing the Relationship between Maturities within Malaysian Sukuk

Comparing the yields on 3-year *Sukuk* with 10- and 11-year government *Sukuk* shows that the mean YTM on 3-year Malaysian government *Sukuk* was 3.625 per cent while 10- and 11-year *Sukuk* had 4.325 per cent and 5.43 per cent respectively (Table 11). It implies that 10-year government *Sukuk* offers compensation for extra risk taken for investing in an additional 7 and 8 years with 0.7 per cent and 1.81 per cent extra returns. The results imply that there is the probability of increasing extra returns (liquidity or risk premium) towards the longer maturity spectrum as depicted in Figure 4.

Comparison between 5-, 10- and 12-year AAA corporate active *Sukuk* shows an upward slope curve. This curvature is an indication of inbuilt liquidity premium to compensate investors on long term basis for taking extra risk (Table 12 and Figure 5).

As the security moves toward maturity, liquidity premium is built into the return to *Sukuk* holders to compensate them for holding longer term bonds and for the additional risk

Table 11. Fair yield for Malaysian government *Sukuk* (Different maturity)

Bonds	Profit rate	Fair YTM	(2 Factor HJM)
3-Y	3.57	3.58	
3-Y	4.363	4.41	
3-Y	3.077	3.15	
3-Y	3.288	3.4	3.625
10-Y	4.419	4.48	
10-Y	3.82	3.88	
10-Y	3.941	4.03	4.325
10-Y	4.295	4.47	
10-Y	3.91	4.16	
11-Y	4.492	5.43	5.43

Note: Y-Year

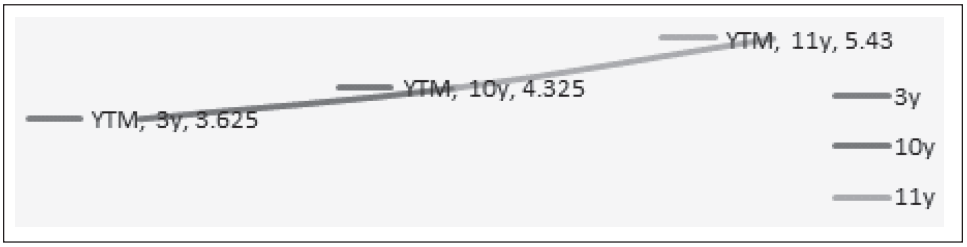

Figure 4. YTM comparison within Malaysian government *Sukuk*

Table 12. Fair yield for corporate AAA rated active *Sukuk*

Bond	Profit rate	Fair YTM (Two factor HJM)	YTM
5-Y	6.3	5.32	5.32
10-Y	5.85	5.86	5.87
10-Y	6.5	6.62	6.24
12-Y	6.3	6.32	6.33

Note: Y-Year

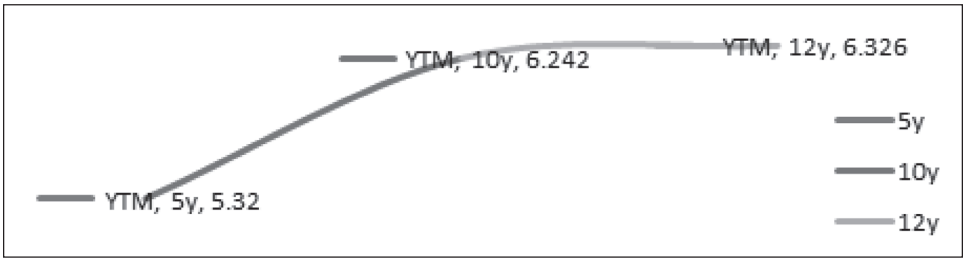

Figure 5. YTM comparison within AAA *Sukuk*

Table 13. Fair yield for corporate AA3 rated active *Sukuk*

Bond	Profit rate	Fair YTM (Two factor HJM)
8-Y	5.2	5.32
16-Y	7.95	8.6
17-Y	8.35	9.08

Note: Y-Year

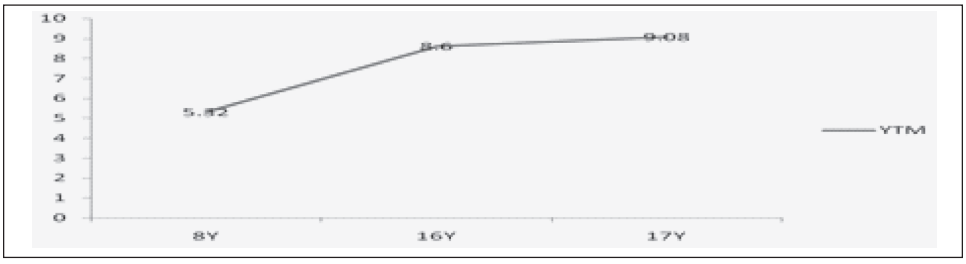

Figure 6. YTM comparison within AA3 *Sukuk*

of credit default as applied to rated corporate bonds. A relatively large extra return to investors on 16- and 17- year *Sukuk* is observed. A 3.28 per cent and 3.76 per cent risk premium is observed for 16- and 17- year *Sukuk* respectively when compared with the yield on a 8-year investment horizon. This default class shows a better liquidity premium than the

Malaysian sovereign *Sukuk* and other corporate classes examined. By implication, the behaviour of corporate AA3 *Sukuk* (Table 13 and Figure 6) conforms to the bond market convention. There is the likelihood of higher extra returns above the risk-free rates on these *Sukuk*.[6]

6. Conclusions

Our findings suggest that the forward rate has very weak predictive power to forecast the spot profit rate. This implies that the long term rates are not the average of future spot rates on long term bonds. Hence, on the term structure of profit rates of *Sukuk*, the Expectation hypothesis is not supported. Fama and Bliss (1987) find little evidence that forward rates can forecast near term changes in interest. Humped shaped yield curves imply uncertainty in the *Sukuk* market due to the investors' expectation about the future spot profit rates. It also implies that there may be uncertain expectations about Malaysian government economic policies, especially on future inflation by *Sukuk* holders. Therefore, each of the maturities are not a good substitute for one another.

The non-existence of good market valuation, few experts on Islamic financial instruments in the market, and less trade on *Sukuk* may explain these findings. Benchmarking the profit rate to the available interest rate for better competition practice (Muhammad Al-Bashir (2008) can distort the true market value of underlying assets. Hence, their returns are reflected by the pricing pattern observed between the market prices and the fundamental values estimated in this paper.

Corporate *Sukuk* holders are compensated through additional yields for holding risky bonds and for investing on a long-term basis as revealed by the performance of different classes of default risk *Sukuk.* A comparison between the same security and different credit class reveals an upward sloping YTM in support of the Liquidity Preference theory. As such, investors prefer liquidity, and, therefore, the longer the maturity, the higher the yield investors expect from the investment.

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[6] Other classes of corporate *Sukuk* were also analysed and are consistent with the results reported in the main text, but are not reported due to space constraints.

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Appendix

Malaysian Government *Sukuk* yield curves by years from *Sukuk* two-factor HJM Model data

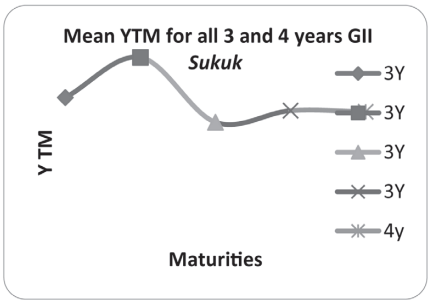

Figure A.1. Mean YTM for all 5- and 6-year GII *Sukuk*

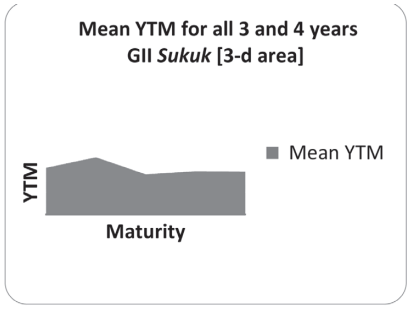

Figure A.2. Mean YTM for all 3- and 4- yearsGII *Sukuk* [3-D area]

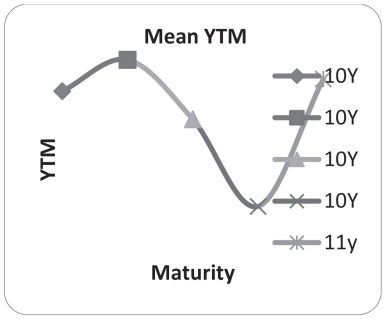

Figure A.3. Mean YTM for all 10- and 11-year GII *Sukuk*

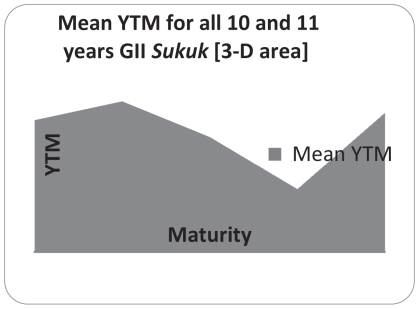

Figure A.4. Mean YTM for all 10- and 11-year GII *Sukuk* [3-D area]

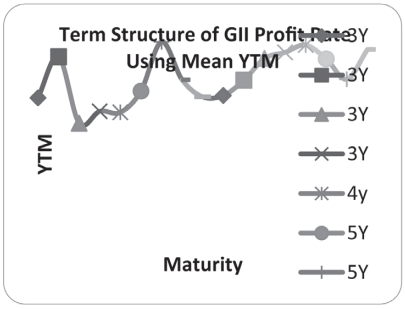

Figure A.5. Term structure of GII *Sukuk* profit rates

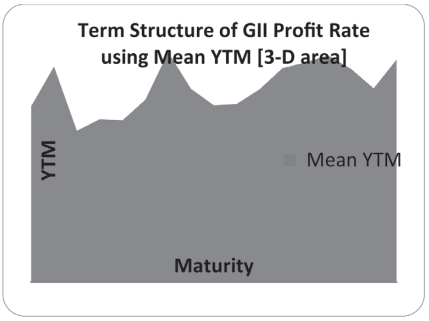

Figure A.6. Term structure of GII profit rates using mean YTM *Sukuk* [3-D area]

Corporate *Sukuk c*redit curves from data generated from *Sukuk* two-factor HJM

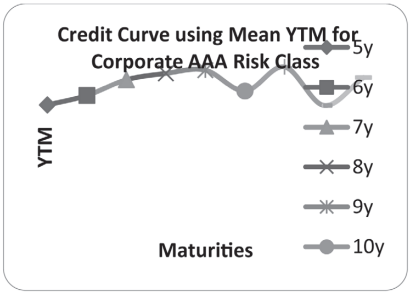

Figure A.7. Credit curve for corporate AAA risk class

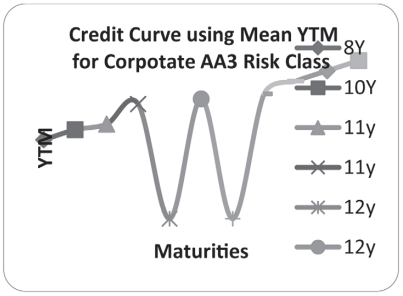

Figure A.8. Credit curve for corporate AA3