International Journal of Islamic and Middle Eastern Finance and Management

Rental index rate as an alternative to interest rate in Musharakah Mutanaqisah home financing: A simulation approach

Rosylin Bt Mohd Yusof, Akhmad Affandi Mahfudz, Ahmad Suki Che Mohamed Arif, Nor Hayati Ahmad,

Rental index rate as an alternative to interest rate in Musharakah Mutanaqisah home financing

A simulation approach

Received 20 November 2015
Revised 29 February 2016
Accepted 14 April 2016

Rosylin Bt Mohd Yusof, Akhmad Affandi Mahfudz, Ahmad Suki Che Mohamed Arif and Nor Hayati Ahmad
Islamic Business School, Universiti Utara Malaysia, Sintok, Malaysia

Abstract

Purpose – This paper aims to propose a new pricing alternative called Rental Rate Index (RR-I) that captures the true value of property to be used by Islamic banks in Musharakah Mutanaqisah (MM) contract for home financing.

Design/methodology/approach – By formulating a profit rate based on Rental Index (RI) and House Price Index (HPI), the proposed rate eliminates conventional profit rate benchmarking, and, at the same time, suggests a fair, equitable and sustainable financing. This new RR-I (measured by RPI/HPI) enables computerization of the MM system in home financing to be easily implemented. A financial simulation is developed to demonstrate the feasibility of this newly proposed rate.

Findings – This newly proposed RR-I is found to be more stable, having less fluctuations, resilient to macroeconomic conditions and yet comparable to the conventional interest rates, without depending on them. It can also be regarded as a rate that is fair and sustainable to both the customer and the bank, as it measures the actual rate of return to both parties in MM contract.

Research limitations/implications – The paper confines one contract, namely, MM, as it is claimed to be more Shariah-compliant than others.

Practical implications – The finding also sheds some light on the recommendation by Bank Negara Malaysia, which is to consider RR that is more indicative of the actual rental price while taking into account the competitiveness of the product. (BNM, 2007).

Social implications – This paper wreaks customer patronage in selecting the contract of home financing.

Originality/value – This paper attempts to resolve the issue of benchmarking RR to the conventional interest rate in the MM contract. Studies conducted on this issue via simulation approach are meager.

Keywords Simulation, Interest rate, Islamic home financing, Musharakah Mutanaqisah, Rental rate

Paper type Research paper

The authors wish to express gratitude to the International Research and Training Institute (IRTI), Islamic Development Bank in Jeddah, for funding this project. The authors also thank those who have contributed toward the successful completion of this project.

International Journal of Islamic and Middle Eastern Finance and Management
Vol. 9 No. 3, 2016
pp. 397-416

1753-8394
DOI 10.1108/IMEFM-11-2015-0141

1. Introduction

Islamic financing has been experiencing a steady growth according to Ernst and Young World Competitiveness Report 2014-2015[1]. The compounded annual growth rate (CAGR) of Islamic financing in rapid-growth markets, such as Qatar, Indonesia, Saudi Arabia, Malaysia, United Arab Emirates and Turkey, stands at 11 to 32 per cent (Ernst and Young, 2015).

Among non-Islamic countries, UK is positioning itself as the Western hub for Islamic finance with US$19bn of reported Islamic finance assets (UK Trade & Investment [UKTI], 2014). More than 20 international banks operating in the UK are offering Islamic finance banking and finance products. Six of these are fully *Shariah*-compliant (UKTI, 2014). The growth in Islamic finance in UK is primarily due to supportive government policies, including removal of double-tax on Islamic mortgages and extension of tax reliefs (Belouafi and Chachi, 2014). In particular, the Government of UK has introduced an Islamic mortgage aid scheme which enables *Shariah*-compliant banks to also offer affordable home finance (Islamic Finance News [IFN], 2014). These initiatives have further boosted the growth of Islamic financing in the UK and levels out the playing field for Islamic and conventional banks.

In Malaysia, on the other hand, Islamic banking has long been established since 1983. Malaysia's Islamic banking industry is a global leader with a 16.7 per cent global market share and around 20 per cent of the total domestic banking market share (Ernst and Young, 2015). Islamic financing enjoys a 23 per cent CAGR from 2009 to 2013 as compared to 11 per cent of that of conventional financing.

Home financing is offered both by conventional and Islamic banks in countries such as the UK, Malaysia and Indonesia, as well as the Gulf Cooperation Council countries. The main difference between Islamic and conventional banks is that, the former operates in accordance with the rules of *Shariah*, the legal code of Islam, while the latter is based on secular principles, not religious laws (Shanmugam and Zahari, 2009). Conventional banks are primarily debt- and interest-based, and permit risk transfer. In contrast, Islamic banks are asset-based, prohibit interest (riba), and promote risk-sharing (Hasan and Dridi, 2010).

According to Usmani (2002), it is a formidable task to restructure financing in Islamic bank in an interest environment because people believe that abolishing interest from bank and financial institutions only makes them charitable rather than commercial. Interest-free loans are meant for cooperative and charitable activities. As far as commercial financing is concerned, *Shariah* has a different setup for that purpose. However, the exclusion of interest rate does not mean the bank cannot earn profit. If financing is for commercial purposes, it can be based on profit and loss sharing, although, to some extent, *Musharakah* and *Mudarabah* are not workable and feasible for certain businesses.

The most common structures of Islamic home financing are *al-bay'bithaman ajil* (BBA) and *Musharakah Mutanaqisah* (MM) contracts (Meera and Abdul Razak, 2005). The BBA is basically a sale contract which provides buyers the benefit of a deferred payment, whereby the deferred price of the sale object carries an additional profit. It is an extension of the *murabahah* (cost plus) contract, whereby the commodity exchanged is "delivered" immediately, but the sale price (with profit) is paid in installments, over a long period.

MM is a partnership between the financier and the customer to acquire property under a diminishing *musharakah* arrangement where the customer agrees to rent the bank's portion and pays rental on the bank's share. Subsequently, the customer gradually purchases the bank's share in the partnership. As the customer's ownership in the property grows, the bank's share diminishes until the customer has fully bought the bank's equity in the property. While MM is deemed to be more *Shariah*-compliant and has beneficial potentials to both customers and banks in Islamic home financing.

Meera and Abdul Razak (2005) cite that while the BBA is widely used in Malaysia, Indonesia, Brunei and few other countries, it has been subjected to much controversy among the *fuqaha* worldwide with regard to its permissibility, where most of the Middle East scholars have rejected it. Meera and Abdul Razak (2005) argued that the current BBA home financing is not very much different from the conventional home financing. Instead of charging interest to the customer, financiers in BBA charge a profit derived through a buy-and-sell contract, which is permitted in Islam, but the profit rate is still dependent on the market interest rate. Thus, while the BBA is practiced as *Shariah*-compliant in some countries, it is nonetheless, converging to the conventional mode. This is attributed to the computational formulas that are similar to conventional ones and where the profit rate tracks the market interest rate. The current difference between the fixed-rate BBA and the conventional mode is that once the profit rate is fixed in the BBA, it will remain the same for the entire duration of financing. This even causes more problems for the financiers, as it is difficult to estimate accurately the cost of funds, and hence the appropriate profit rate over long periods like 20 years, because of the volatility of economic conditions. Another issue in BBA is its documentations which show that the bank merely acts as a financier rather than a seller and excludes the bank of all liabilities (Meera and Abdul Razak, 2005). This ignores the *Shariah* principle of "*al-ghorm bil ghonm*" (no reward without risk), "*ikhtiar*" (value-addition or effort) and "*al-kharaj bil daman*" (any benefit must be accompanied with liability), thereby rendering the BBA profit to be implicated with riba.

Asmadi (2011) cites the judgment in Affin Bank's case against Zulkifli in Malaysia in 2006, in which the High Court treated the *al-bay*' BBA transaction as a normal conventional loan, has become a milestone in diverting Islamic banks' concentration from using BBA. The current practice in Islamic financing has particularly attracted many criticisms and is further challenged to become more Shariah-compliant (Rosly, 2005; Khan, 2010). Amidst criticisms on BBA, *MM* is seen as a more *Shariah*-compliant alternative model (Meera and Abdul Razak, 2005; Asmadi, 2011).

The *MM* concepts have been adopted by a number of Islamic financial service providers worldwide. Successful cooperative-type models include the Islamic Housing Cooperative (Canada), Ansar Cooperative Housing (Canada) and the Ansar Housing Limited (UK). *MM* models are also adopted by financial institutions in the USA, Pakistan and the UK (Meera and Abdul Razak, 2005). In Malaysia, *MM* products are among new retail products of Islamic banks. It is implemented by leading local banks with Islamic bank subsidiaries and at least one full-fledged Islamic bank (Asmadi, 2011).

In determining the rental rates (RRs) in *MM*, home financing offered by some Islamic banks all over the world are still tied to the implied or indicative conventional interest rates. Although benchmarking against the conventional interest rates is permissible, an alternative must be sought which is not dependent on the conventional interest rates (Yusof *et al.*, 2011).

Yusof *et al.* (2011) analyze the possibility of relying on the RR to price Islamic home financing product in Malaysia instead of the conventional interest-based lending rate. They find consistent evidence that the RR is a better alternative than the lending rate to price Islamic home financing product. In particular, the RR is found to be resilient to short-term economic volatility, while in the long run, it is truly reflective of the economic fundamentals.

On the other hand, Hasan (2012) compared the *MM* model with Zubair's diminishing balance model. In this paper, he demonstrated the formula to determine the fixed installment payments in home amortization. This paper also proposes an alternative home finance model that is claimed to be cheaper while the margin of return of the bank is not reduced. Interestingly, this paper attracts no juristic doubts.

Our current paper departs from those of existing literature (Meera and Abdul Razak, 2005, 2009; Eroğlu *et al.*, 2010; Yusof *et al.*, 2011; Hassan, 2012) by incorporating the actual values of Rental Price Index (RPI) and House Price Index (HPI) in determining the RR. This rate represents the rate of return to both the customer and the bank associated with owning the property, and thus enables us to make a comparison with the prevailing interest rate via simulation approach.

Section 2, discusses the theoretical underpinnings and literature review. Section 3 presents the RR model for MM, Section 4 highlights the findings for simulation approach, and finally, Section 5 provides conclusion and recommendations for future research.

2. Theoretical underpinnings and literature review

In line with the findings of Hui *et al.* (2007); Marco (2008) and Adegoke (2014), this paper seeks to determine Islamic RR focusing on distinguished simulation approach as it captures comparative true rate of return of owning a house for conventional and Islamic banks, and at the same time, it truly reflects the physical attributes of the property (captured by rental index) and its market price (captured by house price index). It is not within the ambit of this paper to analyze the impact of physical attributes on rental markets across locations or among matured and emerging markets. To capture the rate of return on rental properties in the case of the UK housing market, more precisely the London residential market, the London RR is used. Using the data on London as a proxy for the UK market can be justified, as London is the most active residential market in the UK. Nevertheless, we can expect to fairly generalize the results of this present study to other markets in the UK.

Compared to financial securities, the determination of the accurate market value of a property is more complicated because of the heterogeneous nature of the market with low velocity, decentralized nature of the property and asymmetric and high volume of private information.

Although prices paid for housing are accepted as the best indicator of value by property professionals, economists are more inclined to take a longer-term view of value rather than a shorter-term one, which normally highlights inefficiency in the housing market. The longer-term view acknowledges the tendency of the property markets to overshoot the "fundamental value", which is defined as yields incorporating a function of average price earnings over a long period of time (Shiller, 2005; Hargreaves, 2008).

Based on the discounted cash flow model, the intrinsic value of a real estate asset can thus can be defined in terms of the present value of expected future cash flow associated

with owning the asset (also referred to dividend discount models). Therefore, the future income can be discounted at a rate reflecting the opportunity cost of interest as follows:

$$V = \sum_{t=0}^{T} \frac{(R_t - C_t)}{(1 + i)^t} \quad (1)$$

Where V, value of the asset; t, holding the period; R, rent; C, annual cost; i, discount rate; and

$$V = \frac{R - C}{r} \quad (2)$$

And r is the capitalization rate:

$$V = \frac{R}{r} \quad (3)$$

Heady (1953) elaborated that the discounting formula as in equation (1) is reduced to equation (2) when the income stream is assumed to be in perpetuity. In the rental housing market, where investors are normally unsophisticated, gross income is used instead of net income, and thus, equation (2) is further reduced to equation (3). In addition, according to Wendt (1974), investors normally evade from focusing on annual cost (C) because of difficulties in assessing the repairs and maintenance expenditures.

Expounding further on the capitalization rate is r which is normally defined as net income divided by the price (or value). It is also referred to as a minimum standard to compare investments against bank account or in mutual funds. This is the same as saying that if we bought the property at cash, the value of the property can thus be defined as:

$$V = \frac{R}{HP} \quad (4)$$

where HP is the house price.

In this study, we assume that the actual value of the property is derived from the rental value which normally captures the physical attributes of the property and is divided by the initial investment of owning the property which is the house price (HP). Having a benchmark for the housing market is also imperative to indicate a general market value that captures all property types across all locations and yet can truly reflect the macroeconomic conditions of a country (Adegoke, 2014).

Several factors have potential effects on the value of the property, leading to the determination of HP and rental price. Linz and Behrmann (2004) provide three characteristics of the factors determining house prices, namely, physical, locational and generally price variables' characteristics. Day (2003) categorizes the various attributes of housing into structural, accessibility, neighborhood and environmental characteristics. Meanwhile, Can (1990) highlights the importance of neighborhood characteristics in determining the rental price, which include quality of schooling system, level of noise pollution, air quality, proximity to parks, proximity to bodies of water and quality of transportation system. Other influential characteristics are

physical characteristics, such as number of bedrooms, number of bathrooms, floor area and age of property; demographic characteristics, such as median household incomes, crime rate and cultural attractions; policy-specific characteristics, such as rent regulations and rent subsidies; and amenities/facilities characteristics, such as the availability of indoor pools, gymnasiums and covered parking.

Other studies analyze the relevance of macroeconomic variables in determining the rental values of property, such as economic output (gross domestic product [GDP]), prime interest rate and vacancy rate (Chow *et al.*, 2002); and consumer expenditure, employment and economic output (White *et al.*, 2000). The study by Matysiak and Tsolacos (2003) analyzes rental pricing from a different dimension by examining the role of selected economic and financial series, which are used as leading indicators in explaining the monthly variation in property rents in the UK. The leading indicators comprised five financial variables (Treasury Bill rate, yield of 20-year gilts, narrow money supply, broad money supply and price on Financial Times Stock Exchange (FTSE)), three real economy variables (car registration, volume of retail sales and job vacancies) and two sentiment indicators (consumer confidence and expectations in the property market development). Other economics-related variables are also used to predict the average RR adjusted for inflation like occupancy rate, change in employment and change in population (Hanna *et al.*, 2013). Studies conducted specifically on real estate returns measured in terms of prices and rental values are also conducted by De Wit and Van Djik (2003) on Asia, Europe and US cities. They find that GDP and inflation positively affect office prices and office rentals. For the UK market, Kohlert (2010) also documents evidence that macroeconomic determinants such as GDP, total investment and unemployment affect real estate returns. By using Generalized Method of Moments (GMM) for the data running from 2000 to 2007, Fereidouni and Bazrafshan (2012) find that inflation, population, GDP and unemployment in Iran affect the returns on housing.

In this present study, we focus on a developed and matured housing market, such as in the UK, to study the behavior of the housing and the rental markets. Our main sources of data are UK Office for National Statistics, IMF and Bank of England. As observed in Figure 1, there seems to be an upward trend in the House Price Index (HPI) where the movement exhibits more volatility compared to markets. On the contrary, the RPI

Source: UK Office for National Statistics, IMF and Bank of England

Figure 1.
The trends for HPI and RPI in the UK

suggests a more stable trend during the period of 2005M1 to 2014 M3 even during the periods of 2007-2008 global financial crisis.

According to Islamic Finance News Report (2014), UK has one of the most advanced Islamic financial markets in the western world and has the largest Islamic banking sector outside the Middle East and Asia. The Islamic mortgage market in the UK is gaining ground in catering to the needs of nearly 3 million Muslim minorities, representing around 4.8 per cent of the total population in the UK (Pew Research Centre, 2015) as well as Muslims particularly from the Middle East, who are keen to own properties in the UK as holiday residence, but are reluctant to engage in interest-bearing financing facility (Asutay, 2012). Therefore, the supply of innovative Islamic mortgage products by Islamic banks may boost the housing market.

Islamic banks in UK generally offer three types of mortgage products based on the principles or contracts that are *Shariah*-compliant, namely, *Murabaha* (cost plus sale), *Al-ijarah muntahia biltamleek* or sometimes referred to as *Ijarah wa iqtina* (leasing ending with a sale) or *MM* (diminishing partnership). *Murabaha* is typically a sale contract, whereby the bank purchases the property identified by the customer from the developer and then resells it to the customer at a marked up price. The customer then pays the bank in installments at an agreed financing period with the title of the property being charged to the bank as collateral until all payments are settled. The installments paid by the customer must be fixed as it is a sale contract with an agreed fixed price, and thus, is not dependent on the interest-rate fluctuations. *Ijarah*, on the other hand, is a leasing contract, whereby the customer of the bank undertakes to purchase the usufruct of the asset. In home financing, the bank will purchase the property identified by the customer and rents it to the customer over the financing period. At the end of the financing period, the bank then sells the property to the customer at an agreed price. The monthly installment charged by the bank is normally comparable to the prevailing compounded interest-based loan offered by conventional banks. MM or diminishing partnership is a relatively new innovation in the Islamic home financing products, which is not found in Islamic classical literature. It is one of the most recent modes of mortgage financing offered by the five Islamic banks in UK, namely, Al- Buraq (Arab Banking Corporation), Al- Rayan Bank (formerly Islamic Bank of Britain), United National Bank (Pakistan- based), Ahli United Bank and HSBC Amanah. Unlike the first two products, which to some extent are dependent on interest-rate benchmarks, MM should be based on the actual rental value of the property and as such is deemed more *shariah-compliant*. However, based on scrutiny of the banks' websites, the rental rates imposed by two banks are found to be still tied to LIBOR or the conventional interest rates without referring to the actual rental values of the property.

The relationship between housing prices and mortgage rates has been extensively investigated mainly in the aftermath of the financial crisis in an attempt to shed some light on the factors that fueled the mortgage crisis not only in the USA, but also globally. Several studies have concluded on a negative and significant link between the change in interest rates among other factors and the change in house prices. For instance, one of the main contributions is that by Hubbard and Mayer (2009) who examines the behavior of house prices in an attempt to consider the role of interest rates, the mortgage market and other fundamental factors in explaining the boom-bust cycle of the 2000s. In their paper, Hubbard and Mayer (2009) point out that it is the convexity of the relationship that explains the housing market collapse. When interest rates are very low, a small

increase in interest rates will have a dramatic negative impact on house value and vice versa. The authors, therefore, argue that the lower the level of interest rates, the more sensitive are house price changes to movements in interest rates.

Attempts to construct a mathematical computation for the MM home financing model based on RR has been limited to arbitrarily assigning fixed and variable amount of monthly rent (Meera and Abdul Razak, 2005, 2009). Meera and Abdul Razak (2005) argued that there are challenges in implementing MM home financing product. They argued that theoretically the rate of return to MM is determined by the RR based on the market rental value and not by market interest rates. They propose that some kind of real estate index, like the HPI in the case of Malaysia be used as a benchmark to price MM, as many real-estate studies have shown that the property price is a significant variable in determining the rent.

This present study extends the proposal of Meera and Abdul Razak (2005, 2009) by incorporating the ratio of UK RPI over HPI to compute for the RR which can be used in MM home financing product. This study is also consistent with the recommendation of the Central Bank of Malaysia (Bank Negara Malaysia; BNM) to enhance the MM contracts by considering an RR that is more indicative of the actual rental price while taking into account the competitiveness of the product (BNM, FSPS, 2007).

There are several studies that illustrate computational models for *musharaka hmutanaqisah* (Meera and Abdul Razak, 2005, 2009; Eroğlu *et al*., 2010; Lung, 2014). These studies have highlighted the general acceptability of *MM* as an alternative mode for Islamic home financing. Meera and Abdul Razak (2005) make a straightforward comparative analysis between the *al-Bay* BBA and *MM* based on constant repayments. They show that as long as the annual profit rates are the same, the total interest in the conventional loan equals the total profit in the BBA. They further show that, when customer wants to settle the financing earlier, the loan balance under the BBA is always higher than under the conventional loan. On the other hand, the total payments and loan balances are lowest in the MM as compared to BBA and conventional loan.

A subsequent study discusses practical issues that need to be addressed with the implementation of MMP such as changes in rental rates; revaluation of property; redemption, defaults and termination of contract and proposed solutions in dealing with these situations (Meera and Abdul Razak, 2009). Eroğlu *et al.* (2010) derive a general formula for the case in which repayments occur as a linear-gradient series for the MM model. Lung (2014) investigates how MM works in practice by analyzing an offer letter of a customer of HSBC Amanah Malaysia and conducting further research on home financing packages offered by ten local Islamic banks and six foreign Islamic banks in Malaysia. Lung (2014) finds that HSBC Amanah Malaysia is not using the market RR, but instead uses base financing rate which is the same as base lending rate in the conventional housing loan. In addition, other local and foreign banks are also using similar base financing rate to determine the RR.

The major challenge in the existing computational models of *MM* is the determination of market RR. In previous studies, the amount of rent is assumed for computational purposes. Meera and Abdul Razak (2009) argued that theoretically the rate of return to MMP is determined by the RR based on the market rental value, and not by market interest rates. They further argue that rental is most suited for use in Islamic finance, as it measures the true usufruct of the asset, unlike interest charges that are apparently not tied to the asset's usufruct. Hence, the RR can differ among houses within

a same row of houses or among different floors within a condominium block. But interest rates are generally independent from such factors.

However, estimating the rental can be cumbersome or costly. Some MM operators use the services of independent real estate agents to provide them with the estimates; sometimes using average of as many as three agents' estimates to be more just. These can impose additional costs on bank and the customer (Meera and Abdul Razak, 2009). Meera and Abdul Razak (2009) propose that some kind of real estate index, like the HPI in the case of Malaysia, can be used as a benchmark to price MM as many real estate studies have shown the property price is a significant variable in determining the rent.

This present study attempts to fill this research gap by showing a different computational model of *MM* using actual market RR that is based on the ratio of RPI over HPI. This study is actually the extension of similar studies conducted by Meera and Abdul Razak (2009) and Hasan (2012). Eroglu *et al.* (2010) formulate the general formulae *for MM* contracts, but also makes assumption that the rental amount is assumed to be fixed. The main difference with these studies is the replacement of x as the RR that incorporates different actual monthly redemption amount by customer. In this regard, Meera and Abdul Razak (2009) assumed a monthly rental, while Hasan (2012) did not elaborate further the rate of return on capital. Although Hassan (2012) claimed that the rate is cheaper than conventional mortgage, the issue of rental rate replacing interest remains unresolved. Two main questions arise:

Q1. Why the rate of return on capital, namely, rental is assumed fixed throughout the financing period?

Q2. Why do we still benchmark it against the conventional rate when the RR can in fact be independent of the interest rates?

Therefore, this paper attempts to reconstruct the RR to address this issue and to propose new model of RR that is fair, equitable and sustainable to both customer and the financier.

3. Rental rate model for Musharakah Mutanaqisah and its shortcomings

The computational models of Meera and Abdul Razak (2005, 2009) have been used by other researches (Eroğlu *et al.*, 2010; Lung, 2014) in studying the application of *MM* in Islamic home financing. Meera and Abdul Razak (2005) show that the computational model of MM is based on constant repayments. Their subsequent study provides more illustrations assuming that both rental prices and market value of property change periodically (Meera and Abdul Razak, 2009). Instead of applying the conventional rate in calculating monthly redemption amount, Meera and Abdul Razak (2009) proposed the usage of *RR*, x, as follows:

$$A = \frac{x(P - (1 + x)^n B_0)}{(1 + x)^n - 1} \tag{5}$$

Where A is the monthly redemption amount to the bank. This redemption amount is used to buy certain amount of the bank's share. The other variables in equation (1) are specified as follows:

Where

x = *Rental Rate*, e.g. monthly rental divided by the original asset price.
P = Price of asset, e.g. a home.
B_0 = The initial contribution of the bank in the purchase price.
n = The number of months or periods for the customer to fully own the asset.

As demonstrated in the authors' paper, the monthly redemption amount equation is similar to the conventional calculation. However, here the conventional interest rate is replaced by an *RR*. The rate is calculated based on monthly rental price. Meera and Abdul Razak (2009) further proposed the following equation:

$$x = \frac{RP}{HP} \tag{6}$$

Here *RP* is a monthly rental price and *HP* is the house price. For example, if the house price is RM 300,000 and the monthly RR is RM 1,500 with financing period $n = 240$ months, then the RR (as a replacement to the traditional interest rate) is 0.005. By using equations (5) and (6), the monthly redemption amount can be calculated. With an assumption that the house price and the monthly rental price are as in the previous example and customer pays an initial 20 per cent of the price, it means the customer share is RM 60,000 and the financier share is RM 240,000. Thus, the additional monthly payment to pay for banks' share for 20-years' payment duration is RM 219.43:

$$A = \frac{0.005 * [300000 - (1 + 0.005)^{240} * 60000]}{(1 + 0.005)^{240} - 1}$$

The monthly payment is calculated as equation (3):

$$MP = MRP + A \tag{7}$$

Thus, the monthly payment amount for this example is RM 1,719.43 (RM 1,500 + RM 219.43).

3.1 Shortcomings of rental rate model

In the RR model, the monthly rental price is used in determining the RR as in equation (4). The rental price is also used in calculating monthly payment amount as shown in equation (5). The issue here is how to determine the monthly rental price. In the present practice, most financiers determine monthly rental price by using independent assessors. This practice incurs high overhead costs because of vast areas to be covered and various types or factors that have to be considered. Certain banks might have to deploy more than one assessor to get a fair price. This practice also will delay the financing calculation because the financiers will have to wait for the assessors to complete their valuations, which may indirectly lead to problems of asymmetric information.

In addition to the above issues, the monthly rental price is also at the subjective discretion evaluation of the assessor. The assessors might quote a very high or very low evaluation price, as he/she might tend to not consider quantitative and objective determinants of rental rates that will accurately reflect the true value of the property.

The evaluation of rental price should not be merely based on the market price. The market price tends to be over-estimated as they are also subject to speculative elements, uncertainties and vulnerabilities of the prevailing macroeconomic conditions. In this current study, we posit that the RR should not be susceptible to the macroeconomic vulnerabilities, and thus should be more stable, fair-priced, reflecting the true physical attributes of the property and in the end leads to achieving *maqasid al-shariah*.

To further strengthen the implementation of true rental values in MM financing, this study seeks to propose a simulation approach. This approach will be able to calculate the monthly payment by automating the monthly rental price, rental rate calculation, regardless of how long the payment duration required by customers, etc.

The computerization of the MM supporting automation is difficult to realize with the RR model. To automate the calculation, the monthly rental price needs to be available online or can be generated by using various data. This cannot be done if the determination of the monthly rental price is just based on the subjective discretion of property assessor's input. Our current proposed computerized financial simulation approach, therefore, attempts to address this issue.

For instance, in the case of customers seeking for a reduced monthly payment with extended payment period, a computerized system will automatically calculate the new rental price, the adjustment values and other relevant payments associated with the customer's request. This therefore leads to a more efficient method of calculation by the banks.

3.2 Rental Rate Index model

This current study proposes different ways of calculating RR and determination of the monthly rental price. Both calculations will use published data sources in determining the monthly rental price. It utilizes rental index and HPI. The usage of external assessors is eliminated here, and thus it potentially eliminates all inherent problems of using subjective discretionary evaluations of assessors for the rental price determination. The *RR-I* model utilizes rental index and HPI in calculating the RR and the monthly rental price. The rental rate is calculated as follows:

$$RRI = \frac{\frac{RPI}{HPI}}{n} \tag{8}$$

Where *RPI* is rental index and *HPI* is house price index. *RR-I* (rental rate index) will replace interest rate (rental rate) in equation (4) with period of financing $n = 240$ months. Thus, the equation can be written as follows:

$$A_{RR} = \frac{RRI(P\ (1 + RRI)^n B_0}{(1 + RRI)^n - 1} \tag{9}$$

This equation produces the basic RR to calculate the monthly redemption value and can be a basis to determine the monthly rental price. In the interest of banking sector, to protect business risk, some permissible *Shariah* risk values can be added to this proposed rate RR-I. This will be discussed further in the next section.

In determining the monthly rental price, the following equation is proposed:

$$MRP = RRI * P \tag{10}$$

Here *MRP* is the monthly rental price and *P* is the house price.

Because *MRP* is a function of *RR-I* where *RR-I* is derived from rental index and HPI, it can be regarded as true reflection of the real rental physical attributes. For example, if *RPI* is 94.60 and *HPI* is 131.10 and then divided by $n = 240$, the *RR-I* will be 0.0030 [equation (4)]. By using equation (5), the monthly redemption amount is RM 503.27. Thus, the MRP as in equation (6) is RM 902.

3.2.1 Simulation approach. By using the same data as in the RR model and new equations as in equations (4), (5) and (6), several other calculations can be computed. From the rental amount, which in this case is RM 902, 20 per cent will go to customer and 80 per cent will go to financier. These are translated to amounts of RM 180.40 and 721.60 accordingly.

3.2.1.1 Case 1: Musharakah Mutanaqisah mode based on proposed Rental Rate Index. Usually, the customer portion will be added to the monthly redemption amount; thus, the customer's share will be increased. With the redemption value RM 503.27 and the amount the customer gained from the rental (RM 180.40), the total redemption value is RM 683.66. After the first-month payment, the customer total share payment amount is RM 60,683.66. This amount when translated to customer share over total amount of RM 300,000 is 20.23 per cent (an increment of 0.23 per cent). The calculation is shown in Tables I and II.

By applying the calculation as in Tables I and II, the monthly financier gain is RM 1,405.25. After 240 months of payment duration, the bank will receive a total of RM 337,262.25. As the financier initial payment was RM 240,000, the financier profit is RM 97,262.25. As mentioned previously, this value is calculated by using the basic *RR-I* without incorporating the risk elements such as credit risk, etc. The calculation is almost similar with the RR model by Meera and Abdul Razak (2009) (M&R). The only difference is that ours is derived from the actual RR values of *RPI/HPI*, while

Table I.
Customer share after first- and second-month payments with proposed *RR-I*

	Customer redemption amount	Customer gain from rental	Customer share in amount	Financier share in amount	Customer share in percentage
Month-0			*60,000.00*	*240,000.00*	*0.20000*
Month-1	503.27	180.40	60,683.66	239,316.34	0.20228
Month-2	503.27	182.45	61,369.38	238,630.62	0.20456

Table II.
Total financier gain and financier profit for *RR-I* model

Case 1: Proposed Rental Rate (*RR-I*) model (with *RR-I* = 4%)	
Monthly redemption	503.26
Monthly rental payment (based on RPI/HPI)	902
Total monthly payment	1,405.26
Financier total gain	337,262.25
Financier profit	97,262.75

the monthly rental payment in M&R model is assumed to be determined by the subjective assessment of the assessor.

3.2.1.2 Case 2: Musharakah Mutanaqisah mode based on Meera and Abdul Razak (2009). If the contract is purely based on the *M&R* model, the value of monthly rental is fixed at RM 1,500 and the monthly redemption value remains at RM 219. Thus, the total share for customer becomes RM 60,519. The calculation is shown in Tables III and IV. For the second month, the customer redemption amount remained RM 501.5, and the customer share is increased to 20.34 per cent.

Tables II and IV show calculation values derived from the equations (4)-(6). From the tables, all calculations exhibit the same pattern except that the monthly rental values differ in terms of the derivation methods. For Table II, the value is derived from RR-I, while in Table IV, the rental value is based on an assumption.

3.2.2 Case 3: Conventional banking mode. Juxtaposing Cases 1, 2 and 3, we find that in the case where the actual value of *RR-I* is adopted, the financier gain is not significantly less compared to the conventional interest rate (IR) model. However, the benefits come from the fact that the rental value is based on the actual value of the property in terms of the physical attributes and not dependent on the interest rate or subjective evaluation of the assessor. This, therefore, lends support to our hypothesis that the *RR-I* is fair, equitable and, at the same time, competitive to the interest rate pricing as offered by the conventional banks (Tables V and VI).

4. Simulation with rental index

We further extend our analysis, and to demonstrate the stability (less fluctuated values) with the *RR-I* model, this work has used published real rental index and HPI data from London. These data are selected because of the fact that the UK is a developed and matured housing market and has a complete set of available data besides having prominence in Islamic banking and finance industry.

The data are taken from the first quarter (Q1) of 2005 until the Q1 of 2014. The *RR-I* for each quarter is calculated and compared to all types of interest rates in the UK,

Table III. Customer share after first- and second-month payments with the M&R model

	Customer redemption amount	Customer gain from rental	Customer share in amount	Financier share in amount	Customer share in percentage
Month-0			*60,000.00*	*240,000.00*	*0.20000*
Month-1	219	300	60,519	239,481	0.20170
Month-2	219	301.50	61,039.50	238,960.50	0.20336

Table IV. Total financier gain and financier profit for the M&R model

Case 2: M&R model (rental fixed at RM 1,500)	
Monthly redemption	219
Monthly rental payment (assumed)	1,500
Total monthly payment	1,719
Financier total gain	412,560
Financier profit	172,560

namely, base rate, mortgage rate and LIBOR. As evidenced in the above graphical illustrations (Figure 2), our proposed RR-I seems to be more stable with less fluctuations during the period of analysis from 2005Q1 to 2014Q1. It also exhibits resilience during the periods of 2007-2008 global financial crises.

4.1 Mortgage simulation

We further extend our analysis by using the calculation simulation as being practiced in conventional banking. By replacing the interest rate into RR-I, as calculated in previous equations (4)-(6), Table VII depicts another approach with more technical calculation. This table also uses similar data to give a clearer picture on the calculations, and we also use the online mortgage calculator for UK banks to generate installment amounts for each case, that is, RR-I, M&R and IR models.

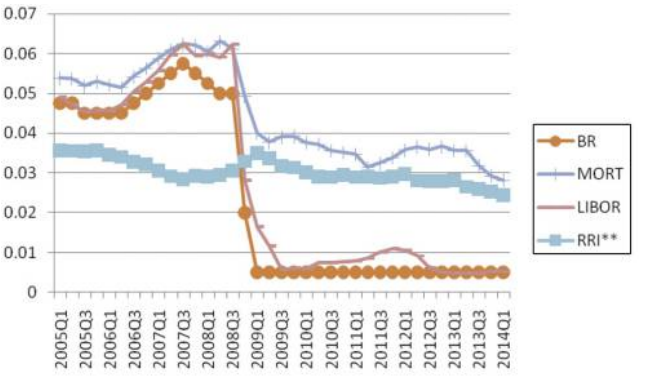
Based on Table VII, for total installments based on RR-I (T-I RR-I), the results suggest that the amount of installments that a customer has to pay varies within narrow

Table V.
Customer share after first- and second-month payments with conventional IR model

	Interest payment	Capital repayment	Monthly payment	Customer share	Financier share
Month-0				*0*	*100*
Month-1	800	654	1,454	0	239,346
Month-2	800	654	1,454	0	238,692

Table VI.
Total financier gain and financier profit for conventional IR model

Case 3: *IR* model (with IR = 4%)	
Monthly capital repayment	654
Monthly payment (interest rate)	800
Total monthly payment	1,454
Financier total gain	348,960
Financier profit	108,960



Source: UK Office for National Statistics, IMF and Bank of England data simulations

Figure 2.
Comparison between the proposed rental rates (RR-I) and interest rates

Obs	TI-RRI	MR-Inst	M&R	*IR*
2005Q1	1,392.03	1,584	1,719	1,454
2005Q2	1,389.71	1,584	1,719	1,454
2005Q3	1,386.10	1,584	1,719	1,454
2005Q4	1,393.37	1,584	1,719	1,454
2006Q1	1,364.63	1,584	1,719	1,454
2006Q2	1,351.30	1,584	1,719	1,454
2006Q3	1,320.11	1,584	1,719	1,454
2006Q4	1,305.25	1,719	1,719	1,454
2007Q1	1,265.37	1,719	1,719	1,454
2007Q2	1,232.33	1,719	1,719	1,454
2007Q3	1,214.40	1,719	1,719	1,454
2007Q4	1,233.85	1,719	1,719	1,454
2008Q1	1,229.41	1,719	1,719	1,454
2008Q2	1,240.17	1,719	1,719	1,454
2008Q3	1,268.87	1,719	1,719	1,454
2008Q4	1,324.80	1,584	1,719	1,454
2009Q1	1,377.88	1,214	1,719	1,454
2009Q2	1,343.38	1,104	1,719	1,454
2009Q3	1,296.08	1,104	1,719	1,454
2009Q4	1,286.39	1,104	1,719	1,454
2010Q1	1,256.20	1,104	1,719	1,454
2010Q2	1,229.54	1,104	1,719	1454
2010Q3	1,226.38	1,104	1,719	1,454
2010Q4	1,240.30	1,104	1,719	1,454
2011Q1	1226.00	1,104	1,719	1,454
2011Q2	1229.92	1,104	1,719	1,454
2011Q3	1221.14	1,104	1,719	1,454
2011Q4	1227.82	1,104	1,719	1,454
2012Q1	1243.72	1,104	1,719	1,454
2012Q2	1205.23	1,104	1,719	1,454
2012Q3	1202.51	1,104	1,719	1,454
2012Q4	1200.99	1,104	1,719	1,454
2013Q1	1207.32	1,025	1,719	1,454
2013Q2	1165.90	1,025	1,719	1,454
2013Q3	1154.58	1,025	1,719	1,454
2013Q4	1134.40	1,104	1,719	1,454
2014Q1	1113.77	1,104	1,719	1,454

Notes: Mortgage details: house price: RM 300,000; customer share: 20% = RM 60,000; financier (bank) share: 80% = RM 240,0000; rental price model (Meera and Abdul Razak, 2009): MRP/HP (M & R); proposed RR-I (current study): RPI/HPI = RRI; interest rate model (conventional); mortgage rate = MR

Table VII.
Comparison between installments based on RR-I, M&R and IR

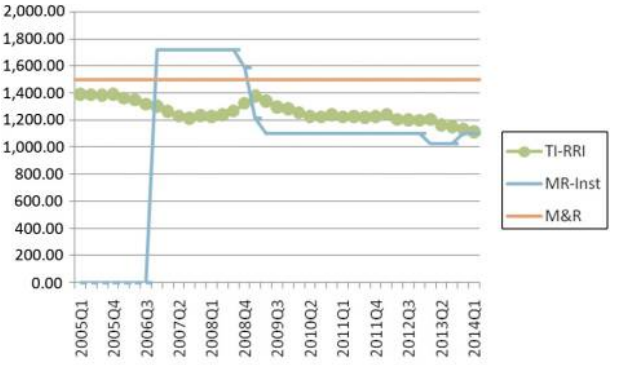
limits on a quarterly basis. This seems to better reflect the macroeconomic conditions without disregarding the physical attributes of the property. For the M&R model , the total installment is assumed fixed throughout the financing period. For the conventional IR model, the total installments paid seem to be more volatile, as they are more susceptible to macroeconomic vulnerabilities as captured by the interest rates. From this, we can also infer that the proposed RR-I provides a more stable financing, fairer as

it also reflects the true value of the property according to the physical attributes, interest free (not depending on interest as a benchmark) and, therefore, more sustainable. Figure 3, depicts the comparisons of installments paid by customers based on RRI, M&R & MR. It shows that the installments paid based on RR-I is more stable and less volatile compared to MR (Mortgage Rate or Interest Rate).

The *RR-I* rate proposed in this work is considered as base rate for alternative Islamic financing tools. From the banks' point of view, they have to take into account several financing risks to mitigate financing lost or to generate more comprehensive calculation. This risk comprises cost of fund and risk premium. The components of the risk premium comprise credit risk, market risk and operational risk. This study recommends that banks have the option to use rental rates as the benchmark compared to the current conventional interest rates and, at the same time, are free to add on the associated risks elements that are deemed necessary.

This paper has elaborated on the possibility of using the rental index and HPI as an alternative method to calculate base rate for *MM* home financing instrument. The present calculation of financing rate is strictly benchmarked against the conventional interest rate. Second, the monthly rental rate is determined by using an independent assessor. All these lead to several shortcomings, such as high overhead costs, vulnerable to the assessor's evaluation and difficulty in computerizing the processes to automate the MM implementation. By incorporating the actual data for RPI and HPI, the previously mentioned shortcomings of subjective, independent assessment on the value of property by assessors can, thus, be resolved and eliminated. This paper has also demonstrated through the simulation that the *RR-I* is much more stable and it is less volatile compared to mortgage rate in London.

As from the *Shariah* perspective, although MM is considered to be more *Shariah*-compliant, yet some elements of non-compliance should be removed and included in future study. For example, simulation approach should also incorporate some unresolved issues in MM, such as default payment, abandoned projects, early settlement, the issue of *wa'ad*, etc.



Source: UK Office for National Statistics, IMF and Bank of England and data simulations

Figure 3.
Comparisons of installments paid by customers for RR-I, M&R and MR

5. Conclusion and recommendation

The *RR-I* proposed in this work is considered as the base rate for alternative Islamic financing tools. From the banks' point of view, they have to take into account several financing risks to mitigate financing lost or to generate more comprehensive calculation. This risk comprises cost of fund and risk premium. The components of the risk premium comprise credit risk, market risk and operational risk. This study recommends that banks have the option to use rental rates as the benchmark compared to the current conventional interest rates and at the same time are free to add on the associated risks elements that are deemed necessary.

Consistent with the recommendation by BNM (2007a2007b) for further enhancements of MM contracts, our study hopes to shed some light that by using the proposed *RR-I*, the pricing of home financing to a certain extent captures the true value of the property. Our study also provides evidence that the proposed rental rate is fair, equitable, sustainable and resilient to economic vulnerabilities and, at the same time, remains competitive with the conventional banking as the rates are comparable, yet without depending on and benchmarked against the interest rates.

References

Adegoke, O.J. (2014), "Critical factors determining rental value of residential property in Ibadan metropolis, Nigeria", *Property Management*, 32 No. 3, pp. 224-240.

Asmadi, M.N. (2011), "Purchase undertaking issues in musharakahMutanaqisahh home financing", *ISRA International Journal of Islamic Finance*, Vol. 3 No. 1.

Asutay, M. (2012), "Conceptualising and locating the social failure of Islamic finance: aspirations of Islamic Moral Economy vs the Realities of Islamic Finance", *Asian and African Area Studies*, Vol. 11 No. 2, pp. 93-113, available at: http://papers.ssrn.com/

Bank Negara Malaysia (2007a), "Development of the financial sector", available at: www.bnm.gov.my/files/publication/fsps/en/2007/cp02.pdf

Bank Negara Malaysia (2007b), "Financial stability and payment systems report", available at: www.bnm.gov.my/files/publication/fsps/en/2007/cp03_002_whitebox.pdf

Belouafi, A. and Chachi, A. (2014), "Islamic finance in the United Kingdom: factors behind its development and growth", *Journal of Islamic Economic Studies*, Vol. 22 No. 1, pp. 37-78.

Can, A. (1990), "The measurement of neighborhood dynamics in urban house prices", *Economic Geography*, Vol. 66 No. 3, pp. 254-272.

Chow, Y.L., Ong, S.E., Thang, D. and Thang, C.L. (2002), "A cointegration approach to understanding Singapore's industrial space supply", *Journal of Property Investment & Finance*, Vol. 20 No. 2, pp. 96-115.

Day, B. (2003), "Submarket identification in property markets: a hedonic price model for Glasgow", CSERGE Working Paper EDM, Norwich, pp. 03-09.

de Wit, I. and van Djik, R. (2003), "The global determinants of direct office real return", *Journal of Real Estate Finance and Economics*, Vol. 26 No. 1, pp. 27-45.

Ernst & Young (2015), "World Islamic banking competitiveness report 2014-2015", Ernst & Young.

Eroğlu, A., Kalaycı, Ş., Özdemir, G., Çetin, A.C. and Usul, H. (2010), "Generalized formulae for Islamic home financing through the musharakahMutanaqisahh contracts", *Afro Eurasian Studies*, Vol. 1 No. 1, pp. 126-133.

Fereidouni, H.G. and Bazrafshan, E. (2012), "Determinants of returns on housing: the Iranian case", *International Journal of Housing Markets and Analysis*, Vol. 5 No. 4, pp. 351-360.

Hanna, M.E., Caples, S.C. and Smith, C.A. (2013), "Economic factors impacting the Houston apartment market", *Journal of Economics and Economic Education Research*, Vol. 14 No. 3, pp. 131-138.

Hargreaves, B. (2008), "What do rents tell us about house prices?", *International Journal of Housing Markets and Analysis*, Vol. 1 No. 1, pp. 7-18.

Hasan, M. and Dridi, J. (2010), "The effects of the global crisis on Islamic and conventional banks: a comparative study", International Monetary Fund.

Hasan, Z. (2012), "Mortgage contracts in Islamic home finance: Musharakah Mutanaqisah program vs Zubair diminishing balance model", MPRA Paper No. 39067, Malaysia, available at: https://mpra.ub.uni-muenchen.de/39067/1/MPRA_paper_39067.pdf

Heady, E.O. (1953), *Economics of Agricultural Production and Resource Use*, Prentice Hall, Englewood Cliffs, N.J.

Hubbard, R.G. and Mayer, C.J. (2009), "The mortgage market meltdown and house prices", *The B.E. Journal of Economic Analysis & Policy*, Vol. 9 No. 3, available at: www.bepress.com/bejeap/vol9/iss3/art8

Hui, E.C.M., Yiu, C.Y. and Yau, Y. (2007), "Retail properties in Hong Kong: a rental analysis", *Property Investment & Finance*, Vol. 25 No. 2, pp. 136-146.

Islamic Finance News (2014), "UK government pushes Islamic finance", *Introduces a Islamic Mortgage Aid Scheme*, Vol. 11 No. 7.

Khan, F. (2010), "How 'Islamic' is Islamic banking?", *Journal of Economic Behavior & Organization*, Vol. 76 No. 3, pp. 805-820.

Kohlert, D.M. (2010), "The determinants of regional real estate returns in the United Kingdom: a vector error correction approach", *Journal of Property Research*, Vol. 27 No. 1, pp. 87-117.

Linz, S. and Behrmann, T. (2004), "Using hedonic pricing for the German house price index", available at: www.ottawagroup.org/Ottawa/ottawagroup.nsf/home/Meeting

Lung, L.C. (2014), "musharakahMutanaqisahh partnership in Malaysia's Islamic bank: a comparison between theory and practice", *American Journal of Economics and Business Administration*, Vol. 5 No. 3, p. 95.

Marco, L. (2008), "Determinants of New York city residential rental prices", *Michigan Journal of Business*, Vol. 1 No. 1, pp. 61-83.

Matysiak, G. and Tsolacos, S. (2003), Identifying short-term leading indicators for real estate rental performance", *Journal of Property Investment & Finance*, Vol. 21 No. 3, pp. 212-232.

Meera, A.K.M. and Abdul Razak, D. (2005), "Islamic home financing through Musharakah Mutanaqisah and Al-Bay'BithamanAjil Contracts: a comparative analysis", *Review of Islamic Economics*, Vol. 9 No. 2, pp. 5-30.

Meera, A.K.M. and Abdul Razak, D. (2009), "Home financing through the musharakahMutanaqisahh contracts: some practical issues", *Islamic Economics*, Vol. 22 No. 1.

Rosly, S.A. (2005), "Critical issues on Islamic banking and financial markets", Author House.

Shanmugam, B. and Zahari, Z.R. (2009), *A Primer on Islamic Finance*, The Research Foundation of CFA Institute, Charlottesville, VA.

Shiller, R.J. (2005), *Irrational Exuberance*, 2nd edition, Princeton University Press, Princeton. NJ.

UK Trade and Investment (2014), "UK excellence in Islamic finance", available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/367154/UKTI_UK_Excellence_in_Islamic_Finance_Reprint_2014_Spread.pdf

Usmani, T. (2002), *An Introduction to Islamic Finance*, Kluwer Law International, London.

Wendt, P.F. (1974), *Real Estate Appraisal- Review and Outlook*, University of Georgia Press, Athens, GA.

White, M., Mackay, D. and Gibb, K. (2000), "A comparative analysis of Scottish property rents", *Journal of Property Investment & Finance*, Vol. 18 No. 3, pp. 332-351.

Yusof, R.M., Kassim, S.H., Majid, M.S.A. and Hamid, Z. (2011), "Determining the viability of rental price to benchmark Islamic home financing products: evidence from Malaysia", *Benchmarking: An International Journal*, Vol. 18 No. 1, pp. 69-85.

Further reading

Al-Zuhayli, W. (1997), "Al-Fiqh al-IslamiwaAdillatuh", Dar al-Fikr, Syria, Vol. 1, p. 100.

Lipka, M. (2016), "Muslims and Islam: Key findings in the US and around the world", available at: www.pewresearch.org/fact-tank/2016/07/22/muslims-and-islam-key-findings-in-the-u-s-and-around-the-world/ (accessed 30 July 2016).

Smolo, E. and Hassan, M.K. (2011), "The potentials of Musharakah Mutanaqisah for Islamic housing finance", *International Journal of Islamic and Middle Eastern Finance and Management*, Vol. 4 No. 3, pp. 237-258.

Usmani, M.T. (2004), *An Introduction To Islamic Finance*, MaktabMaa'rul Quran, Karachi.

Appendix

Period	Payment no.	EQ C(M)	EQR C (%)	RRI (%)	MR	Rental	RS-C (M)	APymt (C)	TI-RRI	EQF (M)	EQR F (%)	RS-F (M)	TI-MR	TI-RRI
0	0	60,000	20	0	0		20	0.00	0.00	240,000	80	80	0	0
2005Q1	1	60,177.81	0.200593	0.04	0.05	889.0343	177.8069	503.00	1,392.03	239,288.8	0.797629	711.2274	1584	1392
2005Q2	2	60,355.15	0.201184	0.04	0.05	886.706	177.3412	503.00	1,389.71	238,579.4	0.795265	709.3648	1584	1390
2005Q3	3	60,531.77	0.201773	0.04	0.05	883.1029	176.6206	503.00	1,386.10	237,872.9	0.79291	706.4823	1584	1386
2005Q4	4	60,709.85	0.202366	0.04	0.05	890.3736	178.0747	503.00	1,393.37	237,160.6	0.790535	712.2988	1584	1393
2006Q1	5	60,882.17	0.202941	0.03	0.05	861.6319	172.3264	503.00	1,364.63	236,471.3	0.788238	689.3055	1584	1365
2006Q2	5	61,051.83	0.203506	0.03	0.05	848.296	169.6592	503.00	1,351.30	235,792.7	0.785976	678.6368	1584	1351
2006Q3	7	61,215.25	0.204051	0.03	0.05	817.1066	163.4213	503.00	1,320.11	235,139	0.783797	653.6852	1584	1320
2006Q4	8	61,375.7	0.204586	0.03	0.06	802.25	160.45	503.00	1,305.25	234,497.2	0.781657	641.8	1719	1305
2007Q1	9	61,528.18	0.205094	0.03	0.06	762.3688	152.4738	503.00	1,265.37	233,887.3	0.779624	609.8951	1719	1265
2007Q2	10	61,674.04	0.20558	0.03	0.06	729.3273	145.8655	503.00	1,232.33	233,303.8	0.777679	583.4619	1719	1232
2007Q3		61,816.32	0.206054	0.03	0.06	711.4	142.28	503.00	1,214.40	232,734.7	0.775782	569.12	1719	1214
2007Q4		61,962.49	0.206542	0.03	0.06	730.8451	146.169	503.00	1,233.85	232,150	0.773833	584.6761	1719	1234
2008Q1		62,107.77	0.207026	0.03	0.06	726.4116	145.2823	503.00	1,229.41	231,568.9	0.771896	581.1293	1719	1229
2008Q2		62,255.21	0.207517	0.03	0.06	737.17	147.434	503.00	1,240.17	230,979.2	0.769931	589.736	1719	1240
2008Q3		62,408.38	0.208028	0.03	0.06	765.8685	153.1737	503.00	1,268.87	230,366.5	0.767888	612.6948	1719	1269
2008Q4		62,572.74	0.208576	0.03	0.05	821.8042	164.3608	503.00	1,324.80	229,709	0.765697	657.4434	1584	1325
2009Q1		62,747.72	0.209159	0.03	0.04	874.8818	174.9764	503.00	1,377.88	229,009.1	0.763364	699.9054	1214	1378
2009Q2		62,915.8	0.209719	0.03	0.04	840.3837	168.0767	503.00	1,343.38	228,336.8	0.761123	672.3069	1104	1343
2009Q3		63,074.41	0.210248	0.03	0.04	793.0781	158.6156	503.00	1,296.08	227,702.4	0.759008	634.4625	1104	1296
2009Q4		63,231.09	0.21077	0.03	0.04	783.3878	156.6776	503.00	1,286.39	227,075.7	0.756919	626.7102	1104	1286
2010Q1		63,381.73	0.211272	0.03	0.04	753.1992	150.6398	503.00	1,256.20	226,473.1	0.75491	602.5593	1104	1256
2010Q2		63,527.04	0.211757	0.03	0.04	726.5414	145.3083	503.00	1,229.54	225,891.9	0.752973	581.2331	1104	1230
2010Q3		63,671.71	0.212239	0.03	0.04	723.3847	144.6769	503.00	1,226.38	225,313.2	0.751044	578.7078	1104	1226
2010Q4		63,819.17	0.212731	0.03	0.04	737.3047	147.4609	503.00	1,240.30	224,723.3	0.749078	589.8438	1104	1240
2011Q1		63,963.77	0.213213	0.03	0.03	722.9989	144.5998	503.00	1,226.00	224,144.9	0.74715	578.3992	1104	1226
2011Q2		64,109.16	0.213697	0.03	0.03	726.9174	145.3835	503.00	1,229.92	223,563.4	0.745211	581.5339	1104	1230
2011Q3		64,252.79	0.214176	0.03	0.03	718.1448	143.629	503.00	1,221.14	222,988.9	0.743296	574.5158	1104	1221
2011Q4		64,397.75	0.214659	0.03	0.03	724.8168	144.9634	503.00	1,227.82	222,409	0.741363	579.8534	1104	1228
2012Q1		64,545.89	0.215153	0.03	0.04	740.717	148.1434	503.00	1,243.72	221,816.4	0.739388	592.5736	1104	1244
2012Q2		64,686.34	0.215621	0.03	0.04	702.2269	140.4454	503.00	1,205.23	221,254.7	0.737516	561.7816	1104	1205
2012Q3		64,826.24	0.216087	0.03	0.04	699.5138	139.9028	503.00	1,202.51	220,695	0.73565	559.611	1104	1203
2012Q4		64,965.84	0.216553	0.03	0.04	697.9911	139.5982	503.00	1,200.99	220,136.7	0.733789	558.3929	1104	1201
2013Q1		65,106.7	0.217022	0.03	0.04	704.3194	140.8639	503.00	1,207.32	219,573.2	0.731911	563.4555	1025	1207
2013Q2		65,239.28	0.217464	0.03	0.04	662.8993	132.5799	503.00	1,165.90	219,042.9	0.730143	530.3194	1025	1166
2013Q3		65,369.6	0.217899	0.03	0.03	651.5755	130.3151	503.00	1,154.58	218,521.6	0.728405	521.2604	1025	1155
2013Q4		65,495.88	0.21832	0.03	0.03	631.3976	126.2795	503.00	1,134.40	218,016.5	0.726722	505.1181	1104	1134
2014Q1		65,618.03	0.218727	0.02	0.03	610.7721	122.1544	503.00	1,113.77	217,527.9	0.725093	488.6177	1104	1114

Table AI.

Corresponding author
Akhmad Affandi Mahfudz can be contacted at: ahaffdesty@gmail.com