An optimal risk – return portfolio of Islamic banks

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Abstract

Purpose – The purpose of this paper is to analyze individual financing instruments and portfolios of instruments, and find the location of the most efficient portfolio financing. The Indonesian Islamic banking industry is very promising with four dominant financing instruments, namely, Mudarabah, Musharakah, Murabahah and Istishna. Each instrument has unique pattern of return, expected return and risk. Moreover, the variances of two, three and four financing instruments suggest the importance of identifying the most prospective financing instruments. Further, the most efficient portion of the most prospective financing is determined by constructing an efficient portfolio financing frontier.

Design/methodology/approach – Technically, it uses risk and return theory to compute risk, return and variance of an instrument and set of financing instruments. In addition, it uses an efficient portfolio frontier curve to locate all combination of the most progressive portfolio financing and finds the most efficient portfolio financing.

Findings – It finds some interesting finding with regard to the pattern of return, characteristics of a financing instrument and groups of financing instruments. The most essential finding of the paper is the location of the most efficient portfolio financing.

Research limitations/implications – The information and finding of this paper benefit the Indonesian Islamic banking industry to optimize the performance of an individual and groups of financing instruments. Particularly, for the most progressive financing instruments, it proposes the combinations of portfolio financing which give optimum output.

Originality/value – To the best of author’s knowledge, this is the first paper trying to analyze and construct an efficient portfolio financing frontier of the Indonesian Islamic banking industry.

Keywords Islamic banking, Indonesia, Istishna, Mudarabah, Murabahah, Musharakah

Paper type Research paper

1. Introduction

The Indonesian Islamic banking industry[1] grows promisingly with an annual average growth of 35-50 per cent. Until October 2011, there were 11 Islamic Commercial Banks, 23 Islamic Banking Units and 154 Islamic Rural Banks with 2,054 offices in all provinces in Indonesia (see Table I). The operations of Islamic banks are also quite robust shown by a well-financial intermediary function and prudential operations. The Financing to Deposit Ratio, one of the financial intermediary indicators, has stood at 101 per cent in the past two decades with 77 per cent of financing go to the small- and micro-enterprises (SMEs). The non-performing financing was under controlled in between 2 and 3 per cent per year.

Others banking indicators such as total assets, financing and deposits have shown similar figures. Until December 2011, total assets have reached Rp127.2 billion, total deposits was Rp101.8 billion and total financing was Rp96.8 billion (Bank Indonesia, 2000/2011). It means that almost all of the deposits were utilized to finance various projects in the real sector. In addition, capital adequacy ratio was maintained well above
8 per cent which was 15.3 per cent and the market share of the industry has increased to 3.66 per cent of the total banking industry.

To maintain this sustainable performance, the Islamic banks need to have robust portfolio financing. Particularly, they find an optimal risk–return portfolio financing, which generates maximum return and tolerable risk. The paper attempts to find such an optimal risk–return portfolio financing by constructing an efficient portfolio frontier curve and identifies the optimal risk-return area with high return and acceptable risk.

The construction of the paper follows some parts. First, it identifies the dominant financing instruments of the Indonesian Islamic banking industry. Secondly, based on the risk and return theory, it finds out expected return and variance of each of Islamic financing instrument and groups of two, three and four of financing instruments (portfolio of financing). Thirdly, with correlation analysis among instruments, it finds out risk and return of two, three and four financing portfolio. Finally, an efficient portfolio is constructed and the optimal area (optimal return and minimal risk) is determined within the monthly period from 2004 to 2011.

2. The dominant Islamic financing instruments

Islamic finance has at least three types of financing, namely:

(1) equity-based financing;
(2) debt-based financing; and
(3) service-based financing (Obaidullah, 2005, p. 17).

The former is composed of Mudarabah (trustee partnership), Musharakah (joint venture), Muzaraah (harvest yield profit sharing) and Musaqah (plantation management fee based on certain portion of yield) (Antonio, 1999, pp. 143-155). Meanwhile, the Islamic debt-based financing consists of Murabahah (mark-up sale), Ijarah (leasing), Salam (deferred delivery sale), Istishna (manufacture-sale), Istijrar (recurring sale) and Qardh (benevolent loan). The latter has combination of various services such as Wakalah (opening of letter of credit), Kafalah (letter of guarantee) and Hiwalah (Obaidullah, 2005, pp. 113-115).

However, amongst all of the Islamic financing instruments above, the Indonesian Islamic banking industry only uses limited financing instruments. In particular, Musharakah and Mudarabah (for equity-based financing) are the dominant equity-based financing followed by Murabahah, Salam, Istisna and Qardh for the

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<tr>
<td>Islamic banks (unit)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>11</td>
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<td>Islamic banking units (unit)</td>
<td>3</td>
<td>8</td>
<td>20</td>
<td>25</td>
<td>27</td>
<td>25</td>
<td>23</td>
<td>23</td>
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<tr>
<td>Islamic rural banks (unit)</td>
<td>79</td>
<td>84</td>
<td>105</td>
<td>114</td>
<td>131</td>
<td>138</td>
<td>150</td>
<td>154</td>
</tr>
<tr>
<td>Total offices (unit)</td>
<td>146</td>
<td>337</td>
<td>567</td>
<td>683</td>
<td>951</td>
<td>1223</td>
<td>1763</td>
<td>2054</td>
</tr>
<tr>
<td>Total asset (trillion Rp)</td>
<td>1.79</td>
<td>7.86</td>
<td>26.72</td>
<td>36.53</td>
<td>49.55</td>
<td>66.09</td>
<td>97.51</td>
<td>127.15</td>
</tr>
<tr>
<td>Total financing (trillion Rp)</td>
<td>1.27</td>
<td>5.53</td>
<td>19.53</td>
<td>27.94</td>
<td>38.19</td>
<td>46.88</td>
<td>68.18</td>
<td>96.8</td>
</tr>
<tr>
<td>Total deposit (trillion Rp)</td>
<td>1.03</td>
<td>5.72</td>
<td>20.67</td>
<td>25.65</td>
<td>36.85</td>
<td>52.27</td>
<td>76.03</td>
<td>101.81</td>
</tr>
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debt-based financing and *Wakalah*, *Kafalah* and *Hiwalah* for the service-based instruments. However, the sources of funds to finance such financing are three, namely:

1. *Wadiah* demand deposits.

For the monthly period of 2004-2011, *Murabahah* is recorded as the most favorite and usable financing instruments in the industry. On average, it dominates 63.5 per cent of the total financing followed by *Mudarabah* (21 per cent), *Musharakah* (14 per cent) and *Istisna* (1.6 per cent) as shown in Table II below. Meanwhile, other financing instruments such as *Salam*, *Ijarah*, *Qard* and *Wakalah* are less dominant and even have less than 1 per cent share of financing. Hence, the paper focuses on four financing instruments (*Murabahah*, *Musharakah*, *Mudarabah*, and *Istishna*) to be elaborated further and determine which instruments have the most optimal return and minimum risk.

The next part explains the risk–return portfolio formulas to compute the rate of return (RoR), variance and other related exercises of each and groups of financing. As the paper limits its analysis on four financing instruments, such formulas are derived up to four instruments even tough they can be derived for more than four instruments.

### 3. Risk–return portfolio theory

Risk–return portfolio theory is commonly used in finance to analyze the RoR and the expected return of one instrument and set of instruments; in this case, the instruments are the Indonesian Islamic bank financing. Moreover, it may also inform the probability of occurrence of an instrument and coefficient of correlation as two of the pre-requisite elements to calculate risk and return of one and group of financing instrument(s). Particularly, the paper uses the theory to identify risk of a financing instrument from the variance of actual and expected return. Following it, risk of more than one financing instrument up to four financing instruments are also identified from the variance of actual and expected return of a group financing instruments.

The RoR of a financing instrument is calculated based on actual data, while the expected return of one financing instrument is simply formulated as a function of the probability and RoR (see equation 1 below):

$$
\text{RoR} = \frac{\text{Actual Return}}{\text{Expected Return}}
$$

<table>
<thead>
<tr>
<th>Year</th>
<th>Musharakah</th>
<th>Mudarabah</th>
<th>Murabahah</th>
<th>Istishna</th>
</tr>
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<tbody>
<tr>
<td>2004</td>
<td>9.97</td>
<td>17.74</td>
<td>68.57</td>
<td>3.73</td>
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<tr>
<td>2005</td>
<td>12.44</td>
<td>19.85</td>
<td>65.50</td>
<td>2.20</td>
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<td>2006</td>
<td>12.32</td>
<td>20.56</td>
<td>65.38</td>
<td>1.75</td>
</tr>
<tr>
<td>2007</td>
<td>14.48</td>
<td>21.03</td>
<td>62.98</td>
<td>1.51</td>
</tr>
<tr>
<td>2008</td>
<td>18.77</td>
<td>19.37</td>
<td>60.70</td>
<td>1.16</td>
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<tr>
<td>2009</td>
<td>15.53</td>
<td>22.89</td>
<td>60.54</td>
<td>1.04</td>
</tr>
<tr>
<td>2010</td>
<td>14.67</td>
<td>24.01</td>
<td>60.56</td>
<td>0.76</td>
</tr>
<tr>
<td>2011</td>
<td>13.26</td>
<td>22.67</td>
<td>63.60</td>
<td>0.47</td>
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**Table II.**
Share of every financing instrument (%)

**Source:** Bank Indonesia (2000/2011)
In equation (1), $p_i$ and $p_j$ represent the probability of an event (return) occurs while $r_i$ and $r_j$ are the RoR of a financing instrument. Although the future returns of equity financing (Mudarabah and Musharakah) are uncertain (not known) in advance, but the historical data is occupied in the paper for an estimator of the probability of occurrence ($p_i$). For more than one financing instrument, every instrument is weighted ($w_i$) based on its market value (share in the industry) to produce expected return of a group of financing instruments and is formulated in equation 2.

Then, the difference between expected return and actual return ($\sigma$) shows the variance (risk) of financing instrument(s). The high variance of an instrument shows high risk as it comes from inconsistency of the return over its indicative pattern (expected RoR) and the same case applies to low variance of an instrument. The generic variance formula is given in equations 3, whilst the variance formula for one financing instrument is written in equation (4) below:

$$Var (R_p) = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_{ij} \quad \text{(generic formula)}$$

(3)

$$Var (R) = \sum_{i=1}^{1} \sum_{j=1}^{1} w_i w_j \sigma_{ij} = p_1 [r_1 - E(R)]^2 + \ldots$$

$$= \sum_{i=1}^{N} p_i [(r_i - E(R))^2] \quad \text{(one instrument)}$$

(4)

$$Var (R_p) = \sum_{i=1}^{2} \sum_{j=1}^{2} w_i w_j \sigma_{ij} = w_1 \sigma^2 + w_2 \sigma^2 + 2w_1 w_2 \text{Cov} (r_1, r_2) \quad \text{(two instruments)}$$

(5)

$$Var (R_p) = \sum_{i=1}^{3} \sum_{j=1}^{3} w_i w_j \sigma_{ij} = w_1 \sigma^2 + w_2 \sigma^2 + w_3 \sigma^2 + 2w_1 w_2 \text{Cov} (r_1, r_2)$$

$$+ 2w_1 w_3 \text{Cov} (r_1, r_3) + 2w_2 w_3 \text{Cov} (r_2, r_3) \quad \text{(three instruments)}$$

(6)

$$Var (R_p) = \sum_{i=1}^{4} \sum_{j=1}^{4} w_i w_j \sigma_{ij} = w_1 \sigma^2 + w_2 \sigma^2 + w_3 \sigma^2 + w_4 \sigma^2 + 2w_1 w_2 \text{Cov} (r_1, r_2)$$

$$+ 2w_1 w_3 \text{Cov} (r_1, r_3) + 2w_1 w_4 \text{Cov} (r_1, r_4) + 2w_2 w_3 \text{Cov} (r_2, r_3)$$

$$+ 2w_2 w_4 \text{Cov} (r_2, r_4) + 2w_3 w_4 \text{Cov} (r_3, r_4) \quad \text{(four instruments)}$$

(7)

However, the variance formula of two financing instruments is derived in equation 5 and the same derivation also applies for variance formula of three and four financing.
instruments (see Appendix for proving). In fact, variance formulas of more than one financing instruments explain that variance of a portfolio financing depends on variance and weight of individual instrument and correlation values among instruments as well. As such, analyzing individual instrument and a group of instruments is very essential to find a robust portfolio combination with low risk and high return.

Then, formulas above are complemented by the formula of coefficient of correlation or $\rho$ to measure the degree of correlation, as written in equation 8 below:

$$\rho_{1,2} = \frac{Cov(r_1, r_2)}{\sigma_1 \sigma_2}$$

The formula explains that correlation between two financing instruments is influenced by both covariance and variance of such instruments. If the covariance of two financing instruments is high, the correlation of both instruments is up and this condition increases variance or risk of the two instruments (portfolio financing).

4. Efficient portfolio theory

An efficient portfolio is the portfolio of risky assets that gives the lowest variance of return of all portfolios having the same expected return (Benninga, 2000, p. 141). Having some results from the previous equations, an efficient portfolio of $n$ financing instruments can be constructed, which is based on formula below:

$$Min = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_{ij} = Var(R_n)$$  \hspace{1cm} (9)

subject to:

$$\sum_{i=1}^{n} w_i r_i = \mu = E(R_p) \text{ and } \sum_{i=1}^{n} w_i = 1 \hspace{1cm} (10)$$

Then, an efficient portfolio frontier is actually the locus of all convex combination of any two efficient portfolios. If for example, two financing instruments (instrument x and y), such that $x = (x_1 [...], x_n)$ and $y = (y_1 [...], y_n)$ are determined and by assuming proportion variable or $\gamma$ is a constant, a set of efficient portfolio $Z$ is defined as follows:

$$Z = \gamma x + (1 - \gamma) y = \begin{bmatrix} \gamma x_1 + (1 - \gamma) y_1 \\ \gamma x_2 + (1 - \gamma) y_2 \\ \vdots \\ \gamma x_n + (1 - \gamma) y_n \end{bmatrix}$$ \hspace{1cm} (11)

By solving the equation (11), a combination of financing instruments $x$ and $y$ that has low variance and high return is found. Particularly, if the efficient portfolio frontier of $x$ and $y$ as $\{E(R_x), \sigma_x^2\}$ and $\{E(R_y), \sigma_y^2\}$ and if $Z = \gamma x + (1 - \gamma) y$, the variance and standard deviation of this efficient portfolio frontier are computed as:
\[ E(R_z) = \gamma E(R_x) + (1 - \gamma) E(R_y) \]  \hfill (12)

\[ \sigma_z^2 = \gamma^2 \sigma_x^2 + (1 - \gamma)^2 \sigma_y^2 + 2\gamma(1 - \gamma) \text{Cov}(x, y) \]  \hfill (13)

The following part exercises the Indonesian Islamic banking financing instruments to find the efficient portfolio frontier which gives low variance and high return.

5. Risk–return analysis

5.1 An individual financing instrument

Actual RoR and probability of occurrence. Graph 1 illustrates actual RoR of an individual financing instrument of Murabahah, Mudarabah, Musharakah and Istishna from March 2004 to October 2011. The figure informs interesting facts related to the pattern and productivity of each instrument (Figure 1).

Murabahah, as the most favorite financing instrument, shows a modest return and relatively constant return from time to time compared to Mudarabah and Musharakah. The maximum and minimum returns of Murabahah are recorded to be 16.5 and 12.1 per cent, respectively, within the observed period. The same pattern as Murabahah is found in Istishna, even the RoR of Istishna is more stable than Murabahah with the maximum return of 15 and 10.7 per cent.

However, the equity-based financing (Mudarabah and Musharakah) shows volatile RoR, which is in fact in line with the nature its contract. The return of Mudarabah has an increasing pattern from 2005 to early 2008 as the Indonesian economy grew progressively and was less impacted by the two times world oil price hikes. The first one was in 2005-2006 and the second one happened in 2008-2009 followed by the global financial crisis. Nonetheless, such return went down from the middle of 2008 until 2009.

![Figure 1. Actual RoR (%)](image)

Source: Bank Indonesia
recently. The maximum and minimum returns of Mudarabah are noted 20.3 and 12.3 per cent, respectively.

Similar to Mudarabah, return of Musharakah follows the same pattern with small dissimilarities. It went up from 2005 to early 2008 and was relatively stable during the global financial crisis (2008-2009). Even, starting from early 2011, the return of Musharakah has been increasing with the maximum and minimum returns of 17.3 and 8.4 per cent, respectively. Indeed, the maximum return of both Mudarabah and Musharakah stand in a higher position than Murabahah even though such equity-based financing are less dominant, have uncertain business return and rely on the performance of the business.

Meanwhile, Islamic banking operations rely on the probability of success in the real sector. As such, it is important to map the probability distribution of RoR per instrument and know the probability of occurrence of each financing instrument. Based on Table III, the probability of occurrence of each financing instrument shows interesting finding with regard to the highest probability of occurrence. For Murabahah and Istishna financing, the highest probability of occurrences are between 15 and 16 per cent and more than 14 per cent, respectively, with a probability of 43.48 per cent (Murabahah) and 54.35 per cent (Istishna). It means that even though both financing face modest actual return compared to Mudarabah and Musharakah, the probability of high RoR to occur is very likely.

Meanwhile, in Mudarabah and Musharakah financing, the highest probability of occurrences are between 13 and 15 per cent and between 10 and 12 per cent, respectively, with probability of 27.17 per cent (Mudarabah) and 47.83 per cent (Musharakah). Even though Musharakah tends to have a higher actual RoR than both Murabahah and Istishna, the probability of low RoR to occur is very likely. Similarly, the actual RoR of Mudarabah tends to go up in the last two years, nevertheless the probability of low RoR to occur is very likely. These facts confirm the tendency of Islamic banks to concentrate most of their financing on Murabahah followed by Mudarabah and Musharakah (Ismal, 2008, pp. 5-10, 2006). Much effort should be given to develop Istishna financing to contribute more in the whole business activities of Islamic banks.

Expected RoR. Both actual RoR and probability of occurrence determine the financing instrument’s expected RoR. By applying equation 1 above, the expected RoR of each financing instrument is given in Figures 2-5, with some information with regard to robustness of each financing instrument to match the expectation and actual RoR.

Among the four financing instruments, the highest spread between expected and actual RoR is found in Mudarabah financing, which has an average spread of 12.36 per

<table>
<thead>
<tr>
<th>Probability of occurrence (%)</th>
<th>Rate of return interval</th>
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<tr>
<td></td>
<td>&lt;10</td>
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<tr>
<td>Musharakah</td>
<td>19.57</td>
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<td></td>
<td>&lt;13</td>
</tr>
<tr>
<td>Mudarabah</td>
<td>13.04</td>
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<tr>
<td></td>
<td>&lt;13</td>
</tr>
<tr>
<td>Murabahah</td>
<td>14.13</td>
</tr>
<tr>
<td></td>
<td>&lt;11</td>
</tr>
<tr>
<td>Istishna</td>
<td>7.61</td>
</tr>
</tbody>
</table>

Table III. Probability of occurrence (%)

Downloaded by BANK INDONESIA At 16:23 12 November 2014 (PT)
cent (see Figure 3). As previously argued, this fact is reasonable and *Mudarabah* financing deals with uncertainty. However, another equity-based financing, namely, *Musharakah* financing, does not show high spread between its actual and expected RoR (see Figure 1). It has an average spread of 8.10 per cent much lower than *Mudarabah* financing. The involvement of bank’s funds in the *Musharakah* contract might be considered as one of the factors which decreases such *Musharakah* spread. It is because Islamic bank gives much effort to minimize risk of the projects whenever it participates in the financing.

Interestingly, when *Murabahah* financing is classified as the most riskless financing instrument, its spread is relatively high (see Figure 4). With an average spread of 10.33
Murabahah financing reveals that its expected RoR is still uncertain. Some risks related to Murabahah assets such as commodity risk, default risk, price risk, etc. might be considered as factors explaining the high spread in Murabahah financing. Meanwhile, in Istishna financing, it has the lowest spread between actual and expected RoR. This happens because of the minimum Istishna financing compared to the other three financing instruments (see Figure 5).

Variance of financing instruments. Following analyses of the actual RoR, expected RoR, probability of occurrence and spread of both actual and expected RoR, this
sub-section exercises risk of every financing instrument based on its individual variance. By applying equation 4, variance of an individual instrument reveals some interesting finding with respected to risk of financing. First, during 2008-2010, Musharakah financing had the lowest variance compared to the other three financing. Even though it is equity-based financing with uncertain return, the involvement of Islamic banks in Musharakah contributes to reduce the risk of financing (see Figures 6-9).

Following Musharakah financing is Istishna financing. Considering that Musharakah and Istishna financing are the least allocated financing among four financing instruments, these facts express the potential of both Musharakah and Istishna financing to lead the Indonesian Islamic banking financing in the future (see Figure 9). However, Murabahah and Mudarabah financing, as the favorite financing instruments, faced high variance during the observed period. This is quite interesting because Murabahah is debt-based financing with the certain payment of debt. However, despite such a high-risk profile, the return of Mudarabah and Murabahah is still the highest among the four Islamic financing instruments.

Recently, after 2008-2010, all of the financing show high risk because Islamic bank financing to SMEs is more or less impacted by the less demand for SMEs’ products from abroad due to the European financial crisis. Related to the bank financing policy, they need to keep maintaining the robust performance of Murabahah and Mudarabah financing to generate high return and try to reduce their risk (Bank Indonesia, 2006/2010, p. 24). For the other two instruments, the banks had better increased their financing allocation and improved the monitoring and coordination with the entrepreneurs.

5.2 Portfolio of financing
After analyzing an individual financing instrument, this sub section analyzes variance (risk) of a combination of two financing instruments. However, referring to equation 5, the weight of each instrument is determined based on its monthly share in the combination of two financing portfolio. The covariance of two financing instruments is
computed based on equation 8. As such, there are six variances of the portfolio of two financing instruments, namely, variance of:

1. *Istishna* and *Musharakah*.
2. *Mudarabah* and *Istishna*.
3. *Mudarabah* and *Musharakah*.
4. *Murabahah* and *Istishna*. 
Those variances are figured in Figure 10 below. Among six variances, there are three variances of portfolios which show high risk during the period of 2007-2011, namely:

1. variance of Mudarabah and Istishna;
2. variance of Mudarabah and Musharakah; and
3. variance of Mudarabah and Murabahah.

Meanwhile, the other three portfolios have relatively a stable variance (risk) during the observed period. Based on the individual instrument in the risky portfolios, it seems that the high risk of Mudarabah financing influences the other financing and dominates the variance of the two financing portfolio. As identified before, even though Mudarabah has high return, mitigating its risk is very crucial for Islamic banks to reach an optimum output of portfolio financing (Figure 10).

Similar finding is found in the analysis of variances of three portfolios financing by using equation 6 above. In this case there are four combinations of portfolio financing which are:

1. variance of Murabahah, Istishna and Musharakah;
2. variance of Murabahah, Istishna and Mudarabah;
3. variance of Murabahah, Mudarabah and Musharakah; and
4. variance of Istishna, Mudarabah and Musharakah.

The same as Figure 10, Figure 11 shows three variances which have high risk, namely, variance of Murabahah, Istishna and Mudarabah; variance of Murabahah, Mudarabah and Musharakah; and variance of Istishna, Mudarabah and Musharakah.
This result confirms the result of two portfolios financing that whenever Mudarabah financing includes in a portfolio, its risk dominates the whole portfolio. The risk of a portfolio might even be riskier when Murabahah joins a portfolio together with Mudarabah. This is because the most risky portfolios financing are variance of Murabahah, Istishna and Mudarabah and variance of Murabahah, Mudarabah and Musharakah.
Finally, an analysis of all four financing instruments by using equation 7 completes the analysis of the paper. Together with total return, Figure 12 delivers some important findings with respect to the performance of the Indonesian Islamic bank financing, which are:

- the bank financing faces two patterns during 2004-2011;
- the global financial crisis 2008-2009 more or less impacts the performance of financing; and
- after the global financial crisis (2011), the financing goes normal and performs even better.

The first pattern occurred within 2004-2006, where the financing performance was not fully satisfactory. It could not maintain the risk successfully as shown by the higher position of risk than return during the period of 2005-2006. However, the second pattern was found within 2007-2011, where the financing performed robustly with the higher position of return than risk. Secondly, the global financial crisis gave an indirect impact to the performance of bank financing within the period of 2008-2009, as it also generally affected the Indonesian economy. Nonetheless, even though risk was up, Islamic banks still could manage its performance with the higher return than before the crisis period.

Lastly, after 2010, the economic and business conditions were getting better and the return of financing went well above the risk. This is, in fact, the finding that was confirmed by the analysis of variances of an individual financing instrument and portfolios of financing as well. In addition, it informs that the performance of Islamic bank financing depends on the economic and business conditions. As such, the most essential actions for Islamic banks are to maintain the performance of the prospective financing to lower their risk and to anticipate unfavorable economic and business conditions.

6. An efficient portfolio financing frontier

The final step of the paper is to construct an efficient portfolio financing frontier referring to the finding from the previous analyses. Particularly, it is investigated that:
Murabahah and Mudarabah have the highest return among others.

Mudarabah tends to dominate risk of the portfolio financing in which Mudarabah is one of the combinations.

If Mudarabah and Murabahah are in the same portfolio, the risk of it is the highest among others.

Considering these finding, both Mudarabah and Murabahah financing are chosen to be analyzed further. Particularly, an efficient portfolio financing frontier is constructed to find the location where the combinations of both financing reach the optimal output (low risk and high return).

Murabahah financing is named as instrument x and Mudarabah as instrument y in the portfolio frontier with certain set of portfolio portion (γ). By solving the previous equations 9-13 and assuming γ lies between 0 and 1.05 with 0.075 different interval value, Z is determined as below:

\[ Z = γx + (1 - γ)y = \begin{bmatrix} 0x_1 + (1 - 0)y_1 \\ 0.075x_2 + (1 - 0.075)y_2 \\ \vdots \\ 1.05x_n + (1 - 1.05)y_n \end{bmatrix} \]  (14)

Standard deviation of the variance of Murabahah and Mudarabah is 4.091, while its average return is 15.35 per cent. Then, given the range of Z, the value of standard deviation and average return, the portfolio frontier of Mudarabah and Murabahah financing starts from point A into point C with a turning point in B.

As an efficient portfolio frontier curve illustrates the location of all combination of Mudarabah and Murabahah financing, the most efficient one is located in the line with low risk and high return. Such location is from point B into C or a thick line in Figure 13. Point B is the one with moderate return but high risk and it goes along to point C with high return and low risk. However, the location within point A and B is not the efficient one. Point A is the one with low return and low risk and it goes along to point B.

Just for an illustration, point B has return of 15.17 per cent and standard deviation of 4.15 per cent from γ = 0.525. Whilst point C, as the highest possible outcome of the Mudarabah and Murabahah combination, has the value of return of 15.35 per cent and standard deviation of 4.09 per cent by setting γ = 0. Therefore, the efficient combination of Mudarabah and Murabahah financing instruments is ranging in this interval value (point B to point C).

7. Conclusion
The Indonesian Islamic banking allocates most of the funds to both Murabahah and Mudarabah financing followed by Mudarabah, Musharakah and Istishna. Both Murabahah and Mudarabah have the highest return among four instruments while the most risky instruments is Mudarabah financing. Considering those facts, an efficient portfolio frontier curve is constructed to find the most efficient location of the combination of Mudarabah and Murabahah financing. The location informs market players and related parties with regard to the most optimum share of Mudarabah and Murabahah financing in a portfolio.
Glossary of arabic words

Mudarabah: A form of partnership where one party provides the funds while the other provides expertise and management. The latter is referred to as the Mudarib. Any profits accrued are shared between the two parties on a pre-agreed basis, while loss is borne by the provider(s) of the capital.

Murabahah: Literally, it means a sale on mutually agreed profit. Technically, it is a contract of sale in which the seller declares his cost and the profit. As a financing technique, it can involve a request by the client to the bank to purchase a certain item for him. The bank does that for a definite profit over the cost which is stipulated in advance.

Musharakah: Musharakah means a relationship established under a contract by the mutual consent of the parties for sharing of profits and losses in the joint business. It is an agreement under which the Islamic bank provides funds which are mixed with the funds of the business enterprise and others. All providers of capital are entitled to participate in management, but not necessarily required to do so. The profit is distributed among the partners in pre-agreed ratios, while the loss is borne by every partner strictly in proportion to respective capital contributions.

Qard (loan of fungible objects): The literal meaning of Qard is “to cut”. It is so called because the property is really cut-off when it is given to the borrower. Legally, Qard means to give anything having value in the ownership of the other by way of virtue so that the latter could avail of the same for his benefit with the condition that same or similar amount of that thing would be paid back on demand or at the settled time. It is that loan which a person gives to another as a help, charity or advance for a certain time. The repayment of loan is obligatory.

Bay Salam: Salam means a contract in which advance payment is made for goods to be delivered later on. The seller undertakes to supply some specific goods to the buyer at a future date in exchange of an advance price fully paid at the time of contract. It is necessary that the quality of the commodity intended to be purchased is fully specified leaving no
ambiguity leading to dispute. Bay Salam covers almost everything which is capable of being definitely described as to quantity, quality and workmanship.

Bay Istishna: It is a contractual agreement for manufacturing goods and commodities, allowing cash payment in advance and future delivery or a future payment and future delivery. A manufacturer or builder agrees to produce or build a well-described good or building at a given price on a given date in the future. Price can be paid in installments, step by step, as agreed between the parties. Istishna can be used for providing the facility of financing the manufacture or construction of houses, plants, projects and building of bridges, roads and highways.

Ijarah: Ijarah is letting on lease or a sale of a definite usufruct of any asset in exchange of definite reward. It refers to a contract of land leased at a fixed rent payable in cash and also to a mode of financing adopted by Islamic banks. It is an arrangement under which the Islamic banks lease equipments, buildings or other facilities to a client, against an agreed rental.

Kafalah (Suretyship): Literally, Kafalah means responsibility, amenability or suretyship. Legally in Kafalah a third party becomes surety for the payment of debt. It is a pledge given to a creditor that the debtor will pay the debt, fine etc. Suretyship in Islamic law is the creation of an additional liability with regard to the claim, not to the debt or the assumption only of a liability and not of the debt.

Hiwalah: Literally, it means transfer; legally, it is an agreement by which a debtor is freed from a debt by another becoming responsible for it, or the transfer of a claim of a debt by shifting the responsibility from one person to another – contract of assignment of debt. It also refers to the document by which the transfer takes place.

Ijarah Muntahia Bittamleek: A mode of financing, by way of hire-purchase, adopted by Islamic banks. It is a contract under which the Islamic bank finances equipment, building or other facilities for the client against an agreed rental together with a unilateral undertaking by the bank or the client that at the end of the lease period, the ownership in the asset would be transferred to the lessee.

Wakalah: A contract of agency in which one person appoints someone else to perform a certain task on his behalf, usually against a certain fee.

Note
1. Islamic banking industry consists of Islamic Commercial Banks, Islamic Banking Unit and Islamic Rural Banks. Islamic Banking Unit is a special Sharia banking unit in conventional bank (windows system or dual banking system) while Islamic Rural Banks names Islamic banks operated in suburb/rural areas.

References

**Appendix**

Below is the derivation process of one, two, three and four variances. It starts from the general formula:

\[
\text{Var}(R_p) = \sum_{i=1}^{N} \sum_{j=1}^{N} w_i w_j \sigma_{ij}
\]

For the variance of two financing instruments:

\[
\text{Var}(R_p) = w_1 w_1 \sigma_{11} + w_2 w_2 \sigma_{22} + 2 \sum_{j=1}^{N} w_j w_j \sigma_{1j} + w_i \sum_{j=1}^{N} w_j w_j \sigma_{2j} + 2 \sum_{i=1}^{N} w_i w_i \sigma_{ij} + 2 \sum_{i=1}^{N} \sum_{j=1}^{N} w_i w_j \sigma_{ij}
\]

For the variance of three financing instruments:

\[
\text{Var}(R_p) = w_1 w_1 \sigma_{11} + w_2 w_2 \sigma_{22} + w_3 w_3 \sigma_{33} + 2 \sum_{j=1}^{N} w_j w_j \sigma_{1j} + 2 \sum_{j=1}^{N} w_j w_j \sigma_{2j} + w_i \sum_{j=1}^{N} w_j w_j \sigma_{3j} + 2 \sum_{i=1}^{N} w_i w_i \sigma_{ij} + 2 \sum_{i=1}^{N} \sum_{j=1}^{N} w_i w_j \sigma_{ij} + 2 \sum_{i=1}^{N} \sum_{j=1}^{N} \sum_{l=1}^{N} w_i w_j w_l \sigma_{ijk}
\]

For the variance of four financing instruments:

\[
\text{Var}(R_p) = w_1 w_1 \sigma_{11} + w_2 w_2 \sigma_{22} + w_3 w_3 \sigma_{33} + w_4 w_4 \sigma_{44} + 2 \sum_{j=1}^{N} w_j w_j \sigma_{1j} + 2 \sum_{j=1}^{N} w_j w_j \sigma_{2j} + 2 \sum_{j=1}^{N} w_j w_j \sigma_{3j} + 2 \sum_{i=1}^{N} \sum_{j=1}^{N} \sum_{l=1}^{N} w_i w_j w_l \sigma_{ijk} + 2 \sum_{i=1}^{N} \sum_{j=1}^{N} \sum_{l=1}^{N} \sum_{m=1}^{N} w_i w_j w_l w_m \sigma_{ijkl}
\]

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