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PREDICTING SUKUK DEFAULT PROBABILITY AND ITS RELATIONSHIP WITH SYSTEMATIC AND UNSYSTEMATIC RISKS: CASE STUDY OF SUKUK IN INDONESIA

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ABSTRACT

*Objective-*The objective of this research is to analyse comprehensively the default risk of sukuk in Indonesia. It discusses the analysis of default probability of sukuk in Indonesia bond market, and, to find the relationship of default probability of sukuk with the systematic and unsystematic risks. *Design/Methodology/Approach-* Merton model is used to identify the default probability of Sukuk in Indonesia. In addition, to find the systematic risk and unsystematic risk which have impact on sukuk default this research will use Panel data analysis will be used as a main tool analysis. *Finding-* analysis on sukuk default probability using Merton Model shows that there are two companies issuing sukuk with very high default risk, namely, PT Berlian Laju Tanker with average default probability of 74.456% and PT Pembangkit Listrik Negara which has a default risk by 61.339%. Comparatively, other sukuk has quite low default probability which is around 20% on average. Systematic and unsystematic variables are able to explain sukuk default. Money supply and the exchange rate are two systematic variables that could explain sukuk default. In addition, the unsystematic variables show that the solvency ratio (debt to equity ratio) and the profitability ratio (Return on Assets) have significant implications on default probability of sukuk. *Originality-* This paper provides an original insight into understanding sukuk default in Indonesia and its determinant. It also contributes to the literature on Islamic finance especially in term of sukuk default.

KEYWORDS

Sukuk Default, Default Risk, Default Probability, Merton Model, Systematic Risk and Unsystematic Risk.

1. BACKGROUND

 *sukuk* is an interesting instrument in Islamic finance. This instrument has a specific form in the structure of Islamic finance based on several reasons. First, *sukuk* embarked as a benchmark for bond in the conventional system where bond market was increasing rapidly in the last several years. Therefore, the appearance of *sukuk* in Islamic finance can attract the economic world. Second, *sukuk* rose significantly, when the condition of financial industries was in a serious crisis and the debt (interest base) was recognized as the main factor causing the financial crisis. Therefore, *sukuk* as an alternative to conventional bonds can help in stabilizing financial market (Qoyum and Ardiansyah 2010).

Nevertheless, in case of default risk the number of *sukuk* facing default increases significantly. A default occurs due to the breach of any binding obligations under the original terms of the agreement between the issuer and the *sukuk*holders. Apparently, both contractual parties must fulfill their obligations under the contract or agreement. The complexity of structure and several legal issues may be significant on rating process, but from a rating perspective, assessing the risk of the issuer's inherent credit strength is fundamental to the final rating outcome. In other words, performance of the *sukuk* issuer highly affects the final rating on the *sukuk* itself (Majid, Sahimi, Abdullah, 2011).

In Indonesia, recently, on the 28th February 2012 Indonesia's Islamic capital market was at shocked as the PEFINDO (rating agency) lowered the ratings of *sukuk* Ijarah II/2009 of PT BerlianLaju Tanker Tbk (BLTA or the Company) from "idCCC" to "idD" as BLTA failed to fulfill payment and Ijarah Benefit Installment on those notes. The increase of *sukuk* market naturally will be accompanied with the rise of company that tends to default. Therefore, in this point of view, the existence of some tools for predicting the default risk is very crucial in order to reduce the potency of default in *sukuk* market (KFH 2012).

In the context of business, default is caused by many factors both in macro and micro. Macro means that factors that could affect the performance of any companies. In portfolio theory, this factor cannot be eliminated by diversification. This factor is popularly known as systematic risk. On the other hand, micro level can be diversified to eliminate the risk, or well known as unsystematic risk. However, there are means to determine the important factors (systematic risk or unsystematic risk) that could cause the default of a company.

To detect the probability of default of *sukuk* in Indonesia, Merton model (1974) will be applied. Merton model is one of the most popular methods for predicting default. From this analysis, probability of default of *sukuk* will give general overview on the condition of *sukuk* market Indonesia especially in recent time after BerlianLaju Tanker (BLTA) was reported default by Pefindo rating agency. Furthermore, this research also can provide prediction on other *sukuk* in Indonesia on the chances for such *sukuk* to default. Finally, panel regression will be used to analyze the relationship between systematic risk and unsystematic risk. Financial ratio will be used as proxy of Systematic, while macroeconomic variable represents the unsystematic risk.

2. WHAT IS SUKUK

Sukuk (plural of *sakk*) had been extensively used by Muslim in the Middle Ages, as papers representing financial obligations originating from trade and other commercial activities. However, *sukuk* as applied in the capital markets pertaining to the process of securitisation. According to AAOIFI, *sukuk* is a certificate of equal value that represents an undivided interest in the ownership of an underlying asset¹, usufruct and services or assets of particular projects or special investment activity.

Based on the recourse over underlying asset, currently issued *sukuk* can be classified into Asset-based and Asset-backed, which are semantically similar descriptions but mask significant differences in credit risk.

ASSET BASED SUKUK

Sukuk is structured such that investors have a beneficial interest only in the cash flow generated by the underlying asset. Assets are usually sold by the originator to SPV (Special Purpose Vehicle) in the form of trust. The trustee issues certificates representing the investor’s ownership interest, while the proceeds are used to purchase the assets. The investors receive a distribution income representing a proportion of the returns generated by the assets.

In an asset-based Sukuk, it is clearly determined that the credit of *sukuk* reflects that of the originator rather than the underlying assets. This is because the investors do not have any recourse to the underlying assets in the event of default. The *sukuk* holders will ordinarily rank as senior unsecured creditors of the originator. They would rank paripassu with other senior unsecured creditors of the originator company.

ASSET BACKED SUKUK

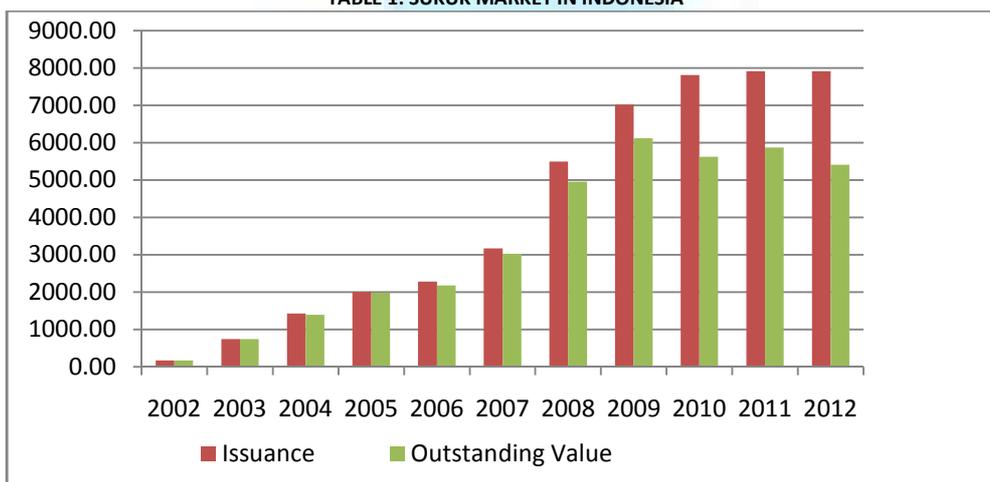
Asset backed *sukuk* represent a true sale. The underlying asset has been validly transferred to the SPV on behalf of the investors. However, the underlying asset should generate income so the profit solely comes from the asset. In the event of insolvency of the originator, the underlying assets will remain completely separate from the originator. In addition, the risk of any insolvency proceedings being brought against SPV should be remote, while the investors has the full claim over the underlying asset, without any risk of the sale subsequently being overturned by the local or *Shariah* courts.

3. DEVELOPMENT OF SUKUK IN INDONESIA

The present of sukuk pioneered by PT Indosat in early September 2002 issued Islamic bonds worth Rp. 175 Billion. This step was then followed by Indosat, Muammalat and Bank Syariah Mandiri (BSM), PT Berlian Laju Tangker with *sukuk* issuance worth Rp. 175 billion on May 28,2003. PT Bank Syariah Bukopin issued Mudharabah bonds on July 10, 2003 with the issuance Rp.45 billion.

Sukuk that use *Ijarah* contract was first published in 2004 by Matahari Putra Prima with a nominal value of Rp.150 billion with 13.80% return. Prior to 2004 all Islamic bonds issued by companies in Indonesia were using *mudaraba aqad*. Based on the Decree of the Chairman of the Capital Market and Financial Institutions (Bapepam-LK) Number: KEP-194/BL/2008 About Islamic Securities Code and Decree of Chairman of Bapepam Number Determination KEP-222/BL/2008 About *Sukuk Ijarah* I Summarecon Great Year Then in 2008 there were 21 Bonds Indonesia *Shariah* With Total Value Reached Rp. 4.697 trillion.

TABLE 1: SUKUK MARKET IN INDONESIA



Since its first appearance in 2002, Islamic bonds in Indonesia is experiencing amazing growth, especially in the year 2003 which grew 423% from 175 billion in 2002 to 740 billion in 2003. The second largest growth is recorded in 2004, approximately 125%. Islamic bonds nevertheless grew at a slower rate in 2005 and 2006. Market however rebounded in 2007 and 2008. In 2009, the issuance of Islamic bond grew significantly around 62.05% from 1,690 trillion in 2008 to more than 2,486 trillion in 2009.

Islamic bonds growing phenomenon occur between the period 2002 to 2008 is very interesting to be observed. In the initial period of 3 years of Islamic bonds as the new financial instruments much ogled by both market issuers and investors. However, the next period is between 2005 and 2006, the growth of Islamic bonds so rapidly experience a correction, it is very reasonable because at this stage Islamic bonds are ideally looking for form. However, in the period 2007 and 2008 re-grown Islamic bonds significantly, this is because the market has been able to see the real prospect of Islamic bonds either from the aspect of yield and risk.

4. DEFAULT IN SUKUK MARKET

The table below shows the evidence that the case for *sukuk* default increased significantly. In 20 months only, the number of *sukuk* default was around 21 *sukuk* defaulted. In 2009, Malaysia took the lead by 9 cases, Pakistan (2) and one default event in Saudi Arabia, Kuwait. In 2010 a continuation of the previous one, the 6 cases were divided equally between Malaysia, Pakistan (Khafir, 2010).

In Malaysian case of *sukuk* default, so far, among all the available structures, *sukuk BBA* and *sukuk murabahah* are the two *sukuk* with the highest default cases in Malaysia. In fact, *sukuk BBA* was the *sukuk* with the most issuance in Malaysia in 2004, before the Malaysian *sukuk* market got dominated by *musyarakah sukuk* beginning 2006. *Sukuk BBA* is a financial certificate based on *BBA* contract as evidence of ownership right of the investors on the underlying assets (AbGhani, 2006). This *sukuk* is not similar to bond because the latter represents debt obligation of the issuer. It is created to service the need for working capital or to re-finance existing debt, normally to be used in the transportation sector, especially in the shipping and aircraft sectors, real estate, construction, and also in the petrochemical projects.

¹ According to AAOIFI Definition of Sukuk, Sharia Standard no.17, the asset should be tangible. However, SC Malaysia permitted both tangible and intangible.

TABLE 2: SUKUK DEFAULT

Company	Year Default	Outstanding
SaadGroup'S Golden	2010	\$165.5 Million
East Cameron Gas	2010	\$165.6 Million
The Investment Dar	2010	\$100 Million
New Allied Electronics	2010	\$16.4 Million
Maple Leaf	2010	Rs 8 Billion
Oxbridge Height	2010	\$ 2.82 Million
Hartaplus	2010	
Ingress	2010	\$7.2 Million
OilcorpBhd	2010	\$ 20.6 Million
PSSB Ship Management	2010	RM 40 Million
Tracoma Holdings	2010	RM 100 Million
M-Trex Corporation	2010	RM 60 Million
Englotechs Holding	2010	RM 50 Million
Straight A's Portfolio	2010	RM 200 Million
Malaysia ITP	2010	RM 240 Million
Merchant Marine	2011	RM 120 Million
Nam Fatt	2011	RM 250 Million
Eden Housing Sukuk	2011	Rs 1.63 Billion
Eden Housing Sukuk	2011	Rs 730 Million
Tabreed	2011	\$ 463 Million
IIGF Funding	2011	\$ 200 Million

The case of Indonesia *sukuk* market, from the first issuance in 2002 until 2012 there is only one case of *sukuk* default. PT BerlianLaju Tanker (PT BLTA) is the first company that face default in Indonesia. Evidenced by the PT PEFINDO (rating agency) which have been lowered the ratings of *sukuk Ijarah* 11/2009 of PT Berlian Laju Tanker Tbk (BLTA or the Company) from "idCCC" to "idD" as BLTA failed to fulfil payment and *Ijarah* Benefit Instalment on those notes.

5. PREVIOUS STUDIES

Maria Vassalou and Yuhang Xing (2003) examine default risk in equity returns. This papers uses the Merton (1974) model to compute monthly DLI (default likelihood indicators) for individual firms, and examine the effect that default risk may have on equity returns. This research shows that the size and book to market value are intimately related to default risk. Small firms earn high returns than big firms, only if they also have high default risk. Similarly, value stock earns higher returns than growth stock, if their risk of default is high. In addition, high default risk firms earn higher returns than low default risk firms, only if they are small in size and/or high BM. In all other cases, there is no significant difference in the return high and low default risk stock.

Trussel (1999) conducted a study trying to find a relationship between the bond rating companies and the components of Black Scholes model. The study concluded that the value of par (face) loans, company size and variance of asset can be explained bond rating. Where, the model is capable to explain 68% of the total sample correctly.

In addition, Hillegeist (2002) compare prediction model of bankruptcy which accounting information base (Z-score and O-score) and Merton model. The result of research is that Merton model has better capability for predicting the default probability rather than accounting information namely Z-Score and O-Score.

Charkau (2006) also tried to compare the Merton model with Accounting Information model with the credit rating of company. The finding was that the Merton Model can explain additional information better than Z-score and O-score.

Tudela and Young (2004) use Merton model to predict the default probability of companies in United Kingdom. The researchers find that Merton model estimation is quite good for predicting and explaining companies which defaulted or not defaulted.

Manurung (2008) use Merton Model for predicting default probability of company that listed in LQ-45 in Indonesia. The result shows that company which has high stock liquidity also have chance to default. Company in financial sector have a higher default probability than the other sector.

Pasaribu, Tobing and Manurung (2009) also try to analyse the default probability based on Merton model. The research finds that some large company has high default probability, especially Bakrie and Brothers Subsidiaries. The result panel regression shows that liquidity ratio (cash to current asset ratio) and solvency ratio (debt to asset ratio) are the most important ratio to explain default probability. Profitability ratio (Net profit margin ratio) also can be good measure to predict Merton default probability.

Yiping Qu (2008) tested the relationship between macroeconomic variables and the probability default. The research finds that several results have been found. In Sweden, there are changes in macro factors such as Industrial Production, Interest Rate Spread, Exchange Rate, and Share Price affect the Probability of Default. However, this result cannot be used to generalise other countries cases, since this impact varies with countries.

6. DATA AND METHODOLOGY

6.1 SAMPLE SELECTION

In this part, we will describe the sample selection process. We use a training sample to build this model. The training sample is current companies which still have outstanding *sukuk* in the market. Originally it contains of 30 *sukuk* listed in IDX during period of from 2007 until February 2012. Furthermore, the data for some of originator companies are not accessible due to un-listed companies. As a result, out of total 30 *sukuk* issued listed in IDX and only 17 *sukuk* companies are relevant. The data is reduced to 7 *sukuk* because we have to make sure that each originator companies have a complete financial data and we drop companies that have missing variables. In addition, because of data limitation the observation periods of this research are from quarter 3 2007 till quarter 4 2010. Totally in this research we use 120 samples data of *sukuk*. All financial ratio data are obtained from Indonesia stock exchange (IDX), Bloomberg. In addition, for systematic data, we collect from some important sources namely www.bi.go.id, www.depdag.go.id.

To test the determinant of *sukuk* default, panel data analysis with Random Effect will be used as a main tool to analyze the impact of systematic risk and unsystematic risk on the *Sukuk* Default Probability. The random effects model a regression with a random constant term (Greene, 2003). The model is as follows;

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \dots + \beta_n X_{nit} + \epsilon_{it} + \mu_{it}$$

Where,

Y_{it} = Sukuk Default Probability

β_1 = Intercept

β_2 = Slope Coefficient

$X_2 - X_6$ = Systematic Risk

$X_7 - X_{15}$ = Unsystematic Risk

The study uses two main variables, namely systematic variables and unsystematic variable. Unsystematic variables used in this study are some of the financial ratios used by previous research, especially Pasaribu, Tobing, Manurung (2009), Beaver (1966), Altman (1968 and 1977) and Ohlson (1980). There are nine financial ratios that will be used to cover the liquidity ratios (Current Ratio, Quick Ratio), profitability ratios (Net Profit Margin, Return on Asset and Return on

Equity), activity ratios (Total Asset Turnover and Fixed Asset Turnover) and the Solvency Ratio (Debt to Asset Ratio and Debt to Equity Ratio). In addition, this study also included some systematic factors to see how this may affect default probability of Sukuk. There are five systematic variables, namely industrial production index (IPI), Money Supply (M1), the Base Lending Rate (BLR), Exchange Rate and Consumer Price Index (CPI).

6.2 MERTON MODEL FOR PREDICT THE DEFAULT PROBABILITY

The core concept of the structural models, which originated from the seminal work of Merton (1974), is to treat a firm’s equity and debt as contingent claims written on the firm’s assets value. Default is triggered when the underlying asset process reaches the default threshold or when the asset level below the face value of the debt at maturity date. (Jones and Hanser, 2008).

The total market value of the firm’s asset at the time t, V_t , is assumed to follow a standard diffusion process of the following form:

$$\frac{dV_t}{V_t} = (\mu - D)dt + \sigma dz$$

Where μ denotes the expected total rate of return on the firm’s asset value (subsequently ‘expected asset return’ μ) reflecting the business prospects (equal to the risk free rate, r , plus an asset risk premium), D is the total payout rate by the firm to all its claimant (including dividends to equity-holders and interest payment to debt holders) expressed as a percentage of V , σ is the business volatility or standard deviation of a firms asset returns (percentage asset value changes), and dz is an increment of a standard wiener process.

Recall that the holders of a firm’s equity have a residual claim on the firm assets at the same time as they have limited liability. Merton (1974) recognized that this makes a firm’s equity equivalent to a long position in call option on the firm’s assets and uses this equivalent to derive the market value and volatility of the firm’s underlying assets.

The Merton model is derived from by treating the value of leveraged equity as a call option on the assets of the firm.

$$V_E = V_A N(d_1) - e^{-r(T-t)} D N(d_2)$$

Where V_E , is the value of equity, V_A is the value of asset and D is the face value of debt. $(T-t)$ is the time to maturity of debt, r is the risk-free rate

$$d_1 = \frac{\ln\left(\frac{V_A}{D}\right) + \left(r + \frac{1}{2}\sigma_A^2\right)(T-t)}{\sigma_A\sqrt{(T-t)}}$$

$$d_2 = d_1 - \sqrt{(T-t)}$$

And $N(\cdot)$ is the function for cumulative normal distribution. To calculate σ_A we adopt an iterative procedure. We use daily data forms the past 12 month to obtain an estimate of the volatility of equity σ_E , which is then used as an initial value for the estimation of σ_A . Using Black-Scholes formulas, and for each trading day of the past 12 month, we compute V_A using V_E as the market value of equity of that day. In this manner, we obtain daily values for V_A . This then used to compute the standard deviation of those V_A , S , which is used as the value of σ_A , for the next iteration. That procedure is repeated until the value of σ_A , from the two consecutive iteration converge.

This approach also provides a relationship between equity and asset return volatility:

$$\sigma_E = \frac{V_A}{V_E} N(d_1) \sigma_A$$

Once daily value of V_A are estimated, we can compute the drift μ , by calculating the mean of change in $\ln V_A$.

The default probability is the probability that the firm’s assets will be less than book value of the firm’s liabilities. In the other word,

$$P_{def,t} = Prob\left(V_{A,t+T} \leq \frac{D}{V_{A,t}}\right) = Prob\left(\ln(V_{A,t+T}) \leq \ln(D)/V_{A,t}\right)$$

Since the value of assets follows the GBM of equation, the value of the assets at any time t given by:

$$\ln(V_{A,t+T}) = \ln(V_{A,t}) + \left(\mu - \frac{\sigma_A^2}{2}\right)(T-t) + \sigma_A\sqrt{(T-t)}\varepsilon + T$$

$$\varepsilon_{t+T} = \frac{W(t+T)-W(t)}{\sqrt{T}} \text{ and } \varepsilon_{t+T} \sim N(0,1).$$

Therefore we can write the default probability as follow:

$$P_{def,t} = Prob\left[\ln(V_{A,t}) - \ln(D) + \left(\mu - \frac{\sigma_A^2}{2}\right)T + \sigma_A\sqrt{T}\varepsilon_{t+T} \leq 0\right]$$

$$P_{def,t} = Prob\left(-\frac{\ln\left(\frac{V_{A,t}}{D}\right) + \left(\mu - \frac{\sigma_A^2}{2}\right)T}{\sigma_A\sqrt{T}} \geq \varepsilon_{t+T}\right)$$

Then we can define the distance to default (DD), as follow;

$$DD = \frac{\ln\left(\frac{V_{A,t}}{D}\right) + \left(\mu - \frac{1}{2}\sigma_A^2\right)T}{\sigma_A\sqrt{T}}$$

Default occurs when the ratio of the value of asset to debt is less than 1, or its log is negative. The DD tells us by how many standard deviations the log of this ratio needs to deviate from its mean in order for default to occur. We use Vassalu and Yuhang method that use Merton models. The theoretical distribution implied by Merton’s model, which is the normal distribution. In the case, the theoretical probability of default will be given by:

$$P_{def} = N(-DD) = N\left(-\frac{\ln\left(\frac{V_{A,t}}{D}\right) + \left(\mu - \frac{1}{2}\sigma_A^2\right)T}{\sigma_A\sqrt{T}}\right)$$

7. EMPIRICAL RESULT

7.1 SUKUK DEFAULT PROBABILITY

Result of test for default probability shows that there are two *sukuk* issued in Indonesia which have very high default probability. BerlianLaju tanker (BLTA) and PT PembangkitListrik Negara (PLN) are the two companies which have very high default probability. Using data from 2007 till 2010 this study finds that the average of default probability for BLTA was around 0.74546. This shows that the probability for *sukuk* that has been issued by PT BerlianLaju Tanker (BLTA) is about 74.546%. In addition, this number is also the highest probability in all *sukuk* in Indonesia.

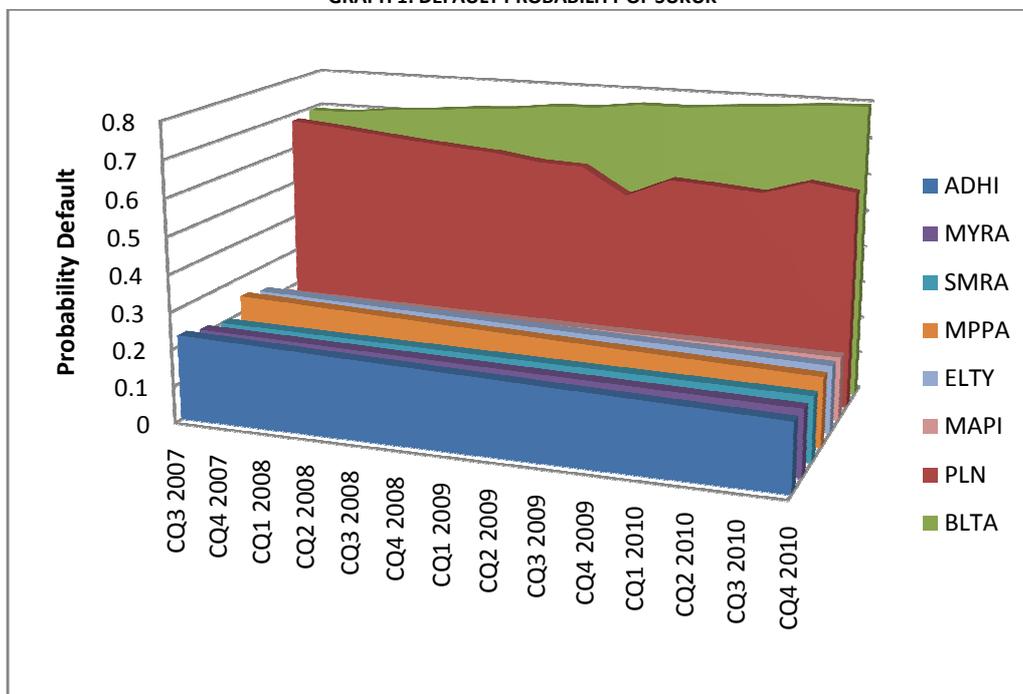
TABLE 3: DEFAULT PROBABILITY OF SUKUK

	Sukuk Type	Default Probability
AdhiKarya	Mudharabah	0.20529
BerlianLaju Tanker	Ijarah	0.74546
PembangkitListrik Negara	Ijarah	0.61339
Mayora	Mudharabah	0.19474
SummareconAgung	Ijarah	0.1866
Matahari Putra Prima	Ijarah	0.21593
Bakrie Land Development	Ijarah	0.20674
MitraAdi Perkasa	Ijarah	0.18457

The Table above also describes that PT Pembangkit Listrik Negara (PLN) which is a public company owned by Indonesia government and the second company with the highest default probability. On average, the probability of default for PT PLN is about 0.61339. This means that PT PLN, a government owned company, has a probability of default of 61.339% for its sukuk issued to increase their capacity for providing electricity in Indonesia.

In addition, the table above also describes the other company has lower default probability of default. These companies are such as PT Adhi Karya, PT Mayora, PT Summarecon Agung, PT Matahari Putra Prima, Bakrieland Development and PT Mitra Adi Perkasa. All company except BLTA and PLN have probability default from 0.18457 until 0.21593. For example, PT Adhi Karya has Default probability at 0.20529, Bakrieland Development around 0.10674. In this research, company that has lowest default probability is PT Mitra Adi Perkasa with the probability default around 0.18457

GRAPH 1: DEFAULT PROBABILITY OF SUKUK



This study is conducted to analyse why PT Berlian Laju Tanker defaulted and this is the only case of default reported in Indonesia sukuk market. Of course this case can be the bad precedent for the sukuk development in Indonesia. From the graph above, this study derives a very important finding that there are very high gap between two groups of company. PT BLTA and PT PLN in the first group and the other company comprise PT Adhi Karya, PT Mayora, PT Summarecon Agung, PT Matahari Putra Prima etc as the second group. PT BLTA and PT PLN have very high default probability compared with the other company. Therefore, from this research we can predict that PT BLTA and PT PLN will default. In case of PT BLTA, in February 2012 we had sufficient evidence that PT BLTA did default.

TABLE 4: DEFAULT PROBABILITY QUARTERLY

	Q3 07	Q4 07	Q1 08	Q2 08	Q3 08	Q4 08	Q1 09	Q2 09	Q3 09	Q4 09	Q1 10	Q2 10	Q3 10	Q4 10	average
ADHI	0.23	0.23	0.22	0.218	0.214	0.21	0.207	0.2	0.199	0.196	0.19	0.189	0.19	0.18	0.2053
BLTA	0.693	0.69	0.71	0.7149	0.726	0.73	0.747	0.75	0.765	0.765	0.77	0.782	0.79	0.8	0.7455
PLN	0.68	0.67	0.66	0.6456	0.636	0.63	0.61	0.61	0.534	0.586	0.58	0.568	0.6	0.59	0.6134
MYRA	0.213	0.21	0.21	0.2046	0.202	0.2	0.196	0.19	0.19	0.188	0.18	0.182	0.18	0.18	0.1947
SMRA	0.201	0.2	0.2	0.1942	0.192	0.19	0.188	0.19	0.183	0.181	0.18	0.177	0.17	0.17	0.1866
MPPA	0.247	0.24	0.24	0.2319	0.227	0.22	0.218	0.21	0.209	0.204	0.2	0.195	0.19	0.19	0.2159
ELTY	0.232	0.23	0.22	0.22	0.216	0.21	0.208	0.2	0.201	0.197	0.19	0.19	0.19	0.18	0.2067
MAPI	0.198	0.2	0.19	0.1915	0.19	0.19	0.185	0.18	0.181	0.179	0.18	0.176	0.17	0.17	0.1846

Moreover, this study also describes the default probability of sukuk issued by company between Quarter 4 2007 and Quarter 4 2010. The table above shows the default probability per quarter from 2007 until 2010. From the table, we see the default probability of PT Berlian Laju Tanker (PT BLTA) increased gradually per quarter from 0.68 in quarter 4 2007 to 0.73 in quarter 4 2008, and increased until Quarter 4 2010 around 80%. It means that year by year the default probability of company increased.

Although PT Pembangkit Listrik Negara (PLN) has very high default probability on average, from the table above the number fluctuates in each quarter. For example, in quarter 4 2007, the default probability of sukuk was at 0.68 and down to 0.63 in quarter 4 2008. In quarter 4 2010 the default probability decreased even more to around 0.59. This finding shows that in term of financial condition, PT PLN has better condition than PT BLTA.

7.2 DETERMINANT OF SUKUK DEFAULT PROBABILITY

After we have identified the default probability sukuk in Indonesia, this research will analyse the impact of systematic risk and unsystematic risk to default probability. Moreover, this study also will provide evidence which variable are more important to predict the default probability either systematic risk i.e. macro-economic variable or unsystematic variable namely financial performance of company issuing sukuk.

Therefore this study uses panel regression to find the impact of systematic and unsystematic variable on the default probability. This panel regression model tests are conducted to meet the objective of the study. This regression model tests carried out by using the F test and the test T, in which significant results of the test F and T tests should be below the level of significance α was set at 5%.

F-statistic (260.8617) is significant at 1% level. Because the probability is less than 0.05, the model can be used to predict the default probability of sukuk. Result of panel data analysis in the table shows that the independent variables namely systematic variable and unsystematic variable have a significant effect on default probability of sukuk.

Weighted Statistics			
R-squared	0.980223	Mean dependent var	0.558149
Adjusted R-squared	0.976465	S.D. dependent var	0.281241
S.E. of regression	0.043145	Sum squared resid	0.186151
F-statistic	260.8617	Durbin-Watson stat	0.627107
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	0.980223	Mean dependent var	0.558149
Sum squared resid	0.186151	Durbin-Watson stat	0.627107

T-test results show that there are two systematic variables and two unsystematic variables that have significance effect to the default probability of *sukuk*. Money supply (M1) has significant effect to probability default of *sukuk*, which from the statistical analysis show the t-value at 2.482009 and Probability 0.0147 less than 0.05. In addition, Exchange rate is the second variable of systematic factor that has significant impact on the *sukuk* default. The t-test result shows at 2.230964 with probability 0.0279 below 0.05, means that this variable is significant.

Dependent Variable: PD				
Method: Panel EGLS (Period random effects)				
Date: 04/27/12 Time: 21:54				
Sample: 1 120				
Periods included: 15				
Cross-sections included: 8				
Total panel (balanced) observations: 120				
Swamy and Arora estimator of component variances				
White cross-section standard errors & covariance (no d.f. correction)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.494448	0.052721	9.378561	0.0000
IPI	-0.000573	0.000595	-0.962360	0.3382
M1	1.31E-07	5.27E-08	2.482009	0.0147
BASE_LENDING_RATE	-0.000192	0.001289	-0.148995	0.8819
EXCHANGE_RATES	3.71E-06	1.66E-06	2.230964	0.0279
CPI	0.000102	0.000112	0.910101	0.3650
QR	-0.003235	0.002501	-1.293520	0.1988
NPM	0.000295	0.005924	0.049768	0.9604
ROA	-0.123388	0.046639	-2.645618	0.0095
ROE	-0.002984	0.002337	-1.276794	0.2046
TAT	0.006706	0.019031	0.352377	0.7253
DTA	-0.066273	0.055414	-1.195956	0.2345
DTE	0.000203	8.92E-05	2.278624	0.0248
Effects Specification				
			S.D.	Rho
Cross-section fixed (dummy variables)				
Period random			0.000000	0.0000
Idiosyncratic random			0.044819	1.0000

Furthermore, from the unsystematic variable namely financial ratios, there are only two variables that have significant impact to the default probability of *sukuk*. Profitability ratio and Solvency ratio are the two financial variables that can be used as predictor analysis in default probability of *sukuk*. Profitability ratio specifically return on equity has t-value around -2.645618, with the probability at 0.0095. While, for Debt to Equity Ratio (DTE) is the last variable that has significant impact to the default probability of *sukuk*.

From the results of statistical tests above, we can create a model that is

$$Y = 0.494448 + 1.31E - 07M1 + 3.71E - 06ExchangeRate - 0.123388ROA + 0.000203DTE + \epsilon_{it} + \mu_{it}$$

The ability of variable independent for predicting the default probability is very high around 98%. It is described by the R-square around 0.980223, meaning that the model can predict the default *sukuk* at 98%. Therefore from this point we can note that macro-economic variable, profitability ratio and solvability ratio are very important to analyses *sukuk* default probability

This research finding has similar result with the previous studies, especially Pasaribu, Tobing and Manurung (2009) which stated that profitability and solvency ratio are the two variables which have impact on the default probability. However, this research is different in term financial ratio. The previous study finds that the Net Profit Margin (Profitability ratio) significant, but this research find ROA that has significant impact to Default Probability. The coefficient is about -0.123388, means that when ROA increase 1%, the Probability default of *sukuk* will decrease at 0.123388%. In addition, this study reported similar result to the previous study that accepted ROA, EBIT to Asset and cash flow having significant role in determining default probability (Pasaribu, Tobing and Manurung 2009). In the context of profitability ratio, company that issues *sukuk* with higher profitability namely ROA will have smaller default probability. *Sukuk* are paid by the cash flow from profit. Therefore, company that has higher ROA will have more ability to pay its obligation *i.e* the *sukuk* fee.

Solvency ratio is another financial ratio that has significant impact on the default probability of *sukuk* with the coefficient of 0.000203. Means that when Debt to equity increases by 1% the probability default of *sukuk* will increase at 0.000203%. Debt to equity ratio (DTE) is the most important variable for predicting the default probability of *sukuk*. This means, company which has higher debt, when this company issues *sukuk*, it will have a higher default probability. Of course it is in line with the nature of *sukuk* and debt. Mostly, company issues *sukuk* also in debt perspective, or there are no different between *sukuk* and debt interest base, in term of purpose, uses of *sukuk* and debt, and accounting treatment. Actually, if company uses *sukuk* with *ijarah* or *mudharabah* or *musharakah*, company must have special treatment to this instrument. For example, *Sukuk ijarah* is the Islamic financial instrument that will pay *sukuk* holder based on the fee, or *ijarah* fee, but in reality all *sukuk* issued by financing purpose, capital structure purpose, or even company that has very high debt ratio will issue *sukuk* in order more attractive to the investor since this instrument is shariah base.

In addition, this study also uses macroeconomic variable as the benchmark for systematic risk. This study finds that there are two main macro variables that have significant impact on the default probability namely Money Supply (M1) and Exchange Rate variable. This finding is similar to the previous research conducted by YipingQu (2008) that finds changes in macro factors such as Exchange Rate, affect the Probability of Default. Furthermore, this research also finds

the impact of Money Supply to the default probability. Money supply is an important macroeconomic tool in controlling the economic condition. Money supply has an impact on the interest rate. And as the result Money supply will have effect on the default probability.

8. CONCLUSIONS

This paper analyzes the concept of default from *Shariah* perspective, especially default in *sukuk* that also can be categorized as debt based instrument. From literature analysis, this study has found that there are specific concepts of default in Islam namely concept of "*taflis*" that has been regulated in *Shariah* law. Therefore, as a preliminary research about default in *sukuk* and its relationship with *taflis* concept, this study concludes that the *sukuk* needs to be synchronized with the concept of *taflis* when this *sukuk* are defaulted. It is very important to ensure that all *sukuk* processes are clear in relation to the right and obligation of debtor and creditor, even in the case of default.

Analysis of *sukuk* default probability using Merton Model shows during the period of 2007-2010, there are two *sukuk*s with high default risk, PT Berlian Laju Tanker with an average default probability at 74.456% and PT Pembangkit Listrik Negara at 61.339%. In addition, the other *sukuk* has quite low default probability which is around 20% on average. More interestingly, in February 2012, PT Berlian Laju Tanker declared to be defaulted. This indicates the predictive power of Merton Model to detect probability of default.

Panel regression analysis shows that the systematic variables and unsystematic variables are able to explain *sukuk* default risk. Money supply and the exchange rate are the two systematic variables that could explain the changes of the *sukuk* default probability. In addition, unsystematic variables show that the solvency ratio (debt to equity ratio) and the profitability ratio (Return on Assets) have significant implications for default probability of *sukuk*.

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