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How Does Risk-based Deposit Insurance Premium Affect Bank Risk Taking? Islamic Bank vis a vis Conventional Bank

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Abstract: Central banks across the world implemented deposit insurance system as a major risk management practice in the post Global Financial Crisis (2007/2008) period. This study provides insights on the efficacy of deposit insurance policy in the Malaysian market where Islamic and conventional banking co-exist. Given that Islamic banking principles inherently limits bank risk taking ability, the study findings clearly identify the pertinent role of risk-based deposit insurance premium on mitigating potential increase bank risk in the post-financial crisis period. Using Malaysian banks data for the period 2002-2010, this study finds that Islamic banks have lower risk appetite than conventional banks. Most importantly, after the introduction of deposit insurance system, insolvency and operational risk increase mainly for conventional banks owing to inadequate premium. This calls for policymakers to carefully consider design features for an effective risk-based DI system that is risk-premium sensitive to ensure financial stability. Other policy implications include that the risk-based deposit insurance premium would prevent regulatory arbitrage, while Shariah compliance principles prevent the Islamic banks from adjusting their risk after the introduction of a deposit insurance system. Worth mentioning is the institution of an early warning mechanism policy as well as formal cooperation in information sharing protocols among policy makers, regulators and deposit insurance organisations to minimise operational risk in banks.

Keywords: Deposit insurance, Islamic banks, Conventional banks, Bank risk, Insurance premium.

1. Introduction

The financial crisis in 2007/2008 leads to an active global debate on the rationale for implementing deposit insurance (DI) system by Central banks. Many Central banks introduced DI system in the wake of the financial crisis. For instance, Australia in response to the financial crisis, is among the last countries to implement an explicit deposit insurance system in October 2008. Demirguc-Kunt, A., Kane, E. J., & Laeven, L. (2015) provides a comprehensive global database of deposit insurance arrangements as of 2013. The basic contention for DI is that, during the financial crisis, increase in bank risk affects their repaying capacity to the depositors. Hence, DI not only reduces the burden on the Central bank but also hedges against such an increase in bank risk. Academic researchers have raised concerns on DI system on the ground that any insurance mechanism will provide incentives for banks to take higher risk. Several researchers studied the role of DI on bank risk (see Kusairi, Sanusi, & Ismail, 2018; Chernykh & Cole, 2011; Hadad, Agusman, Monroe, Gasbarro & Zumwalt, 2011; and Ioannidou & Penas, 2010). For instance, Chernykh & Cole (2011) report that after the introduction of DI system, moral hazard[1], in the form of higher risk-taking by banks, has increased

[1] In an agency framework, a moral hazard problem or sometimes referred as "hidden action" is an action of one party to a transaction (agent) that is unobservable by the second party (principal) who authorized the transaction (Kreps, 1990). Krugman P. (2009) defines moral hazard as "the possibility that you will take less care to prevent an accident if you are insured against it".

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in Russia. However, it is hard to argue whether such an increase is caused by DI or other unobservable factors that might have led to an increase in bank risk.

This study extends the existing literature by providing new evidence in a country-specific study on how the shift from a flat rate to a risk-based DI premium policy would not necessarily be effective in mitigating the moral hazard problem when the risk-based premium is inadequate to cover for the increase in bank risk. Although there is a significant amount of literature on the impact of DI on conventional banks, due to data limitations, this study provides fresh insights on the impact of DI system on the Islamic banks. It might not be appropriate to apply the conclusions from conventional banks to interpret the impact of DI on the Islamic banks, although similar findings could occur. Secondly, exceptional from existing studies, in this study, the annual DI premium paid by the banks is estimated based on the deposit insurer methodology. This allows the investigation of the risk-based premium sensitivity and the magnitude of the annual premium paid. Finally, the findings of this study suggest that further reforms are needed under the risk-based insurance premium system and call for banking supervisors and regulators from countries with flat-rate premium to carefully consider an effective design of the risk-based premium as optimal bank regulation so that the premium is positively correlated with the increase in risk and thereafter provides the incentives for banks to improve their risk management practices.

This study has three important findings to report. Firstly, the results suggest that DI does not lead to an increase in risk-taking by Islamic banks. In the case of conventional banks, the findings are consistent with most studies (see for example, Hadad, Agusman, Monroe, Gasbarro & Zumwalt, 2011; DeLong & Saunders, 2011; Chernykh & Cole, 2011; Ashraf, Zheng, Jiang & Qian, 2020). The results provide strong evidence that conventional banks' risk increased after the introduction of DI system. Secondly, contrary to Chernykh & Cole (2011) study, this study finds strong evidence that operational risk increases in conventional banks after the introduction of DI system. Although the operational risk is a traditional risk, the operational risk profile is becoming more complex attributed to the rapid changes in new business activities, new delivery channel and advancement in financial technology and financial innovation (Moosa, 2007). Finally, the study provides new evidence in a country-specific study on how the policy shift from the flat-rate premium to risk-based premium does not necessarily mitigate the moral hazard problem. Literature suggests that the risk-based premium method will mitigate the moral hazard problem (see for example Cull, Senbet & Sorge, 2005; Demirguc-Kunt and Huizinga, 2004; Hovakimian P. K., 2003; Demirguc-Kunt & Detragiache, 2002;). However, none of the country-specific empirical studies in the DI literature (see Chernykh & Cole, 2011; Hadad et al., 2011; Ioannidou & Penas, 2010) has examined the sensitivity of DI premium towards bank risk in the risk-based premium method. This evidence is relevant as these countries (Russia, Indonesia and Bolivia) continue to adopt the flat rate insurance premium until today. Even though the risk-based DI premium in Malaysia is sensitive towards bank risk, the relationship is in the opposite direction indicating that risk-based premium is inadequate to cover increased bank risk. The results suggest that during the period under study, the current design of the risk-based DI premium policy in Malaysia is still not effective to mitigate the moral hazard problem.

This study uses Malaysian markets for analysis as Malaysia has both conventional banks and Islamic banks in the main stream banking system. Islamic banks have clear risk-taking principles that are invariant with market conditions. They have clear norms on the nature of assets that are considered as investments. Moreover, they are also compulsory DI member along with conventional banks. Interestingly, during the crisis, Islamic banking in Malaysia has grown its importance as an alternative to conventional banking that appears riskier than the Islamic banks (Abduh, Omar & Duasa, 2011). Apart from that, Islamic banks have significantly lower credit risk compared to conventional banks (Kabir et al., 2015). On the contrary, Sorwar et al. (2016), using a sample of 65 Islamic and 65 conventional banks, find no difference in risk-taking between Islamic and non-Islamic banks. In Malaysia, total Islamic banking assets recorded a leapt of 80% increase from RM435 billion in 2011 to RM835.19 billion in 2019 (Bank Negara Malaysia, 2011 & 2019).

The remainder of the paper is organised as follows. In Section 2, the study explains the institutional background and compares the Malaysian DI system with other countries. Hypotheses development is described in Section 3. Section 4 discusses the data and methodology. Section 5 presents the results of this study. Section 6 concludes with a few policy and literature implications.

2. Institutional Background: Malaysian Banking System

Table 1 reports the time series trend of banks in Malaysia. The Malaysia banking sector is rising in importance as a contributor to the Malaysian economic activity. Over the period 2002-2010, the number of banks has increased from 47 to 55. Banking represents an important economic activity as they represented around 300% of the Gross Domestic Product (GDP) of the economy. Therefore, it is important to ensure the stability of the banking system. The introduction of the DI system in September 2005 was among the measures undertaken by the government to accomplish this purpose as instability in the banking system could be chaotic for the entire economy.

In Malaysia, DI system was initially proposed in 2001 as part of the Financial Sector Master Plan. The Malaysian DI system is mandated by law and administered by Perbadanan Insurans Deposit Malaysia (PIDM), a statutory body established in 2005. PIDM is also known internationally as Malaysia Deposit Insurer Corporation (MDIC). MDIC complements Bank Negara Malaysia (which is the primary regulator and supervisor of the banking system) role by

providing safety nets for depositors and insurance policyholders (members' bank) in promoting financial stability. MDIC was established under the Akta Perbadanan Insurans Deposit Malaysia on 1 September 2005 to administer the national explicit DI system. The DI protection limit then was RM60,000 (principal and interest or return). Consistent with measures taken by neighbouring countries, the Government Deposit Guarantee (GDG) was implemented as a temporary pre-emptive and precautionary measure to preserve confidence in the banking system and maintain financial stability. Under the GDG, all Ringgit and foreign currency deposits placed in commercial banks, Islamic banks, investment banks and international Islamic banks are protected under guarantee. In addition, the five deposits-taking BNM licensed under the Development Financial Institution Act are also included in this GDG blanket guarantee. The Government provided the GDC until 31 December 2010. Thereafter, MDIC reverted to the previous coverage of an explicit DI system with an increased limit from RM60,000 to RM250,000 per depositor per member bank. In terms of its design features, membership for the DI is mandatory for all conventional banks licensed under the Banking and Financial Institutions Act and all Islamic banks licensed under the Islamic Banking Act, including foreign banks operating in Malaysia as provided under the MDIC Act.

The distinct design features between other country-specific empirical studies like Russia, Indonesia and Bolivia are the annual premium assessment method. Malaysia started with the flat rate premium in the first two years of the DI period before shifting to a risk-based premium in the year 2008 until today. In contrast, these three countries continue to adopt a flat rate system. Under a risk-based premium, each member bank annual premium is calculated differently according to their risk categories. A member bank with high risk will fall under the high-risk category while the low-risk bank will fall under the low-risk category. The annual premium is derived based on the total insured deposits held by a member bank and the prescribed premium rate according to an individual bank risk category. Malaysia introduced the risk-based premium amongst others to provide the incentives for banks to improve their risk management practices. Hence, this study also captures the cross-sectional variation in the deposit insurance premium.

Table 1 - Evolution of the Malaysian Banking System: Macro Indicator 1998-2010. Amounts in Millions of Ringgit Malaysia

	2002	2003	2004	2005	2006	2007	2008	2009	2010
No of banks	47	46	41	42	42	47	54	54	55
Assets	735,189.59	815,989.87	872,354.70	958,545.73	1,092,914.42	1,221,429.07	1,337,978.23	1,426,206.38	1,549,779.27
% of GDP	333.54	350.97	349.90	365.61	229.83	241.23	252.36	273.69	277.55
Capital	63,195.22	69,794.36	72,484.62	75,203.44	84,952.06	94,381.50	111,603.51	131,969.37	144,428.57
% of GDP	28.67	30.02	29.07	28.68	17.86	18.64	21.05	25.33	25.87
% to asset	8.60	8.55	8.31	7.85	7.77	7.73	8.34	9.25	9.32
Loans& Advances	451,488.44	472,984.17	511,782.07	555,494.78	587,863.72	639,768.39	723,454.01	782,020.71	880,414.44
% of GDP	204.83	203.44	205.28	211.88	123.62	126.35	136.45	150.07	157.67
% to assets	61.41	57.96	58.67	57.95	53.79	52.38	54.07	54.83	56.81
Household Deposits	217,206.52	238,146.62	258,448.48	273,649.82	299,101.55	329,332.81	364,579.60	377,107.19	407,765.30
% of GDP	98.54	102.43	103.66	104.38	62.90	65.04	68.77	72.37	73.03
% to asset	29.54	29.18	29.63	28.55	27.37	26.96	27.25	26.44	26.31

Source: Monthly Statistical Bulletin, Bank Negara Malaysia, selected issues (2002-2010)

3. Hypotheses Development

3.1 Deposit Insurance and Bank Risk

Regulators argue that credible DI system promotes financial stability in the banking system (Gropp, Hakenes & Schnabel, 2011) and enhances depositor confidence from shifting deposits (bank runs) (Fecht, Thum & Weber, 2019) given that any disruption in a country's bank can potentially create social cost outside the banking system. However, most empirical studies do not support regulators rationale for DI. Researchers find that an explicit DI has a negative impact which is likely to motivate banks to increase their risk-taking in the form of moral hazard. These studies for example, include those by Ashraf, et al. (2020), DeLong & Saunders (2011), Hadad et al., (2011), Ioannidou & Penas (2010) and Baer & Brewer (1986). Karels & McClatchey (1999) provide similar evidence in the credit union industry. On the contrary, Gropp & Vesala (2004) study show that the establishment of explicit DI may significantly reduce the risk-taking of banks. They show that explicit DI in the European banking system has reduced banks' risk-taking through a decrease in leverage risk. They argue that the limited government commitment in the design of explicit DI

may mitigate the moral hazard problem. Hence, their evidence points toward supporting the implementation of explicit DI as a risk deducing effect rather than implicit DI. On the other hand, Forssbaeck (2011) study support the view that the presence of explicit DI reduces bank risk-taking by creditors policing role. Hence, empirical results on the implication of DI system regulation are still inconclusive.

3.2 Islamic Banking Principles

With the importance of Islamic banking, it is overwhelming that the impact of DI on the Islamic banks has not been analysed as rigorously as the conventional banks. The Islamic banking system in the world either exists as a full-fledged system like Sudan or a dual banking system that operates alongside the conventional banks like Malaysia. However, during the period under study, only 10 countries[2] including Malaysia (International Association of Deposit Insurance, 2010) with an Islamic banking system have implemented an Islamic DI system. This Islamic DI system or a Shariah-compliance deposit insurance system is an arrangement to protect insured depositors with the Islamic banks against the loss of their insured Islamic deposits in the event of the failure of an Islamic bank. Among these 10 countries only Malaysia DI system managed the Islamic deposit insurance fund separately from the conventional deposit insurance fund and is invested in Shariah-compliant instruments in accordance with Shariah principles. In addition, both Islamic and conventional deposit insurance funds under the Malaysia DI system are administered solely by a government owned deposit insurer (MDIC) and regulated under specific legislation.

The theoretical underpinning of Islamic banks' differs from the conventional bank particularly in the prohibition of *gharar* (uncertainty) and compliance to the Shariah principles that constraints the incentives for Islamic banks being involved in risky business. Moreover, Islamic banks are likely to be seen as a proponent of ethical banking that emphasis on trust and business partnership with their borrower (Ostergaard et al., 2015). The dedicated Shariah board overlooking the conformity of products and practices to the Islamic law furthers inculcate prudence culture in the Islamic banks. Nonetheless, Islamic banks are sometimes perceived to have higher operational risk exposures that include the non-compliance of Shariah principle risk. The Shariah non-compliance conduct by the bank management and staff may lead to declining profitability (Tiby, 2011) as income from the Shariah non-compliance must be removed from the bank's profit in the form of *zakat*.

3.3 The Role of Premium Estimation Method

This study argues that Islamic banks' behaviour towards risk may also vary from conventional banks, particularly with the existence of explicit DI protection. Consequently, it may not be appropriate to simply apply the conclusions from conventional banks to interpret the impact on the Islamic banks, although similar findings can occur. DI premium is mainly estimated using either flat or risk-based premium prescribed by the regulator. With the flat-rate insurance premium, all member banks paid comparable insurance premium amount notwithstanding their risk portfolio. On the contrary, risk-based insurance premium incorporates the risk of each bank assets into the premium structure. Thus, the insurance premiums that each bank pays will depend on its portfolio of risk. Here it is expected that the risk-based premium system is sensitive with bank risk to mitigate the banks' increased risk-taking after the introduction of DI system. This is because under a risk-based premium if banks increase their risk, they will be penalised with a higher premium. In a different twist, in circumstances where banks have incentives to increase their risk-taking, the premium acts as a penalty for the increased risk as the riskier a bank is, the higher the premium paid. It is believed that this relationship will eventually motivate banks to improve their risk management practices. Based on the above discussion, this study frames the following four main testable hypotheses:

H1: Bank risks (credit risk, insolvency risk and operational risk) increase in Malaysian banks after the implementation of a DI system.

H2: Islamic banks do not exhibit any significant increase in risk-taking that is attributable to deposit insurance system.

H3: The risk-premium sensitivity significantly improves in the risk-based premium assessment method.

H4: The magnitude of the annual premium paid is positively correlated with bank risk.

4. Data and Methodology

4.1 Data and Sample

Malaysia is selected as the sample for this study for several reasons. According to a survey done by the International Association of Deposit Insurance (2010), there are currently nine countries namely Malaysia, Indonesia, Singapore, Turkey, United Kingdom, Bahrain, Jordan, Bosnia and Kuwait that practice dual banking system as well as conventional and Islamic DI system. Amongst these countries, during the study period, only Malaysia has an Islamic DI system that exists concurrently but is administered separately. In contrast, the other eight countries operate the

[2] Bahrain, Bosnia, Indonesia, Jordan, Kuwait, Malaysia, Singapore, Sudan, Turkey and United Kingdom.

Islamic DI together with the conventional fund while the Malaysian model manages their Islamic DI fund in accordance with Shariah principles that is separated from the conventional DI fund. Moreover, the Malaysian Islamic financial sector is the most advanced among the countries that have a dual banking system and ranks higher in terms of Islamic banking assets. An important reform on the DI premium has also taken place in Malaysia where the risk-based premium replaced the flat-rate premium. Therefore, this allows this study to investigate the efficacy of DI policy in reducing bank risk in Malaysian market where Islamic and conventional banking co-exist. Hence, the selection of Malaysia as a sample for this study is justified.

Further, among the studies examining bank-level data, none had investigated the impact of DI on Islamic banks. Although Indonesia also operates a dual banking system, the study by Hadad et al. (2011) excludes Islamic banks. More than 30 years ago, Malaysia was among the pioneers to develop an Islamic banking system with compatible Islamic principles that operate alongside the conventional system. The DI system in Malaysia covers both the conventional and Islamic banks with the DI fund being administered separately. Given this unique feature in Malaysia, a study using Malaysia as a country-specific sample for developing countries could not only provide in-depth analysis as opposed to the broad comparative cross-country studies but also compare and contrast the impact of DI on the conventional as well as Islamic banks. This unique difference for Malaysia appears to justify the expected different findings in the Malaysian context and adds to the Islamic banking literature.

Bank-level data are retrieved from BankScope database, developed by Bureau Van Dijk to construct a sample of an annual, balance and unbalanced panel from 2002 to 2010 of the Malaysian banks. However, the data was crossed verified from annual reports published by the banks. For the conventional bank balance sheet information, data for the period 2002-2010 are obtained exclusively from BankScope. However, for the Islamic bank, both the annual report and BankScope are used to gather the data due to limited data availability in the BankScope. Most of the Islamic banks in Malaysia became stand-alone subsidiaries after 2005 and 2008, apart from the two local stand-alone Islamic banks namely Bank Islam Malaysia Bhd and Bank Muamalat Berhad. Prior to that, these Islamic banks operated under the Islamic banking window of the conventional banks and their balance sheet information was reported in the notes to the balance sheet of the conventional banks.

The yearly data of 22 conventional banks and 18 Islamic banks were obtained which covers all the mandatory member banks under the DI system from 2002 to 2010. Hence, the sample consists of 9 years and covers before and after the period of DI system implementation. The panel is balanced for the conventional banks but is unbalanced for the Islamic banks due to the emergence of foreign Islamic bank after the year 2005. Overall, the panel is unbalanced for the full sample. This unbalance sample will lessen the self-selection bias of the banks in the study sample. Conventional banks are those licensed under the Banking and Financial Institutions Act (BAFIA) 1989, while the Islamic banks are those licensed under the Islamic banking Act 1983. To maintain the homogenous set of samples, only the mandatory members of the DI that is the banks licensed under BAFIA 1989 and the Islamic Banking Act 1983 were included. The investment banks and five deposit-taking institutions (both are not mandatory members) were excluded to reflect only the mandated members of the DI protection system.

The annual premium paid by the banks was estimated by the author based on MDIC methodology as it allows for the computation of the premium paid by conventional banks and Islamic banks. In determining the selection of data to estimate the annual premium, experts from MDIC were consulted. These experts verified that the annual premium estimated is relatively consistent with the actual figures.

Detailed formula is described in the MDIC guideline[3] accessible from MDIC website. Malaysia started with the flat-rate premium of 0.06% in the first two years of the DI period before shifting to a risk-based premium in the year 2008 until today. Under the risk-based premium method, each member bank annual premium is calculated differently according to their individual risk categories. Member banks with high risk will fall under the high-risk category while lower-risk banks will fall under the low-risk category. However, the annual insurance premium is not priced to risk like the insurance industry but it is calculated based on the risk category that depends on the risk profile of individual banks

4.2 Dynamic Panel Data Methodology

This study uses a dynamic panel data methodology because it captures the dynamic nature of bank risk taking that varies over time and the time-invariant variables like the dual banking system (conventional and Islamic banks) and ownership are important to be included and appropriate for the study model than a static panel that estimates using either fixed effect and/or the random effect models. Further, the random effect model can allow the estimation of time-invariant bank characteristic, however, at the cost of error term correlated with the variables in the model (Greene, 2012). As suggested by Baltagi (2005), this study uses dynamic panel and instrumental variables (that is the lagged explanatory variables) to address the correlation problem between the variables and error term. Specifically, the study

[3] The banks' annual premium is estimated based on the Guidelines on Total Insured Deposits with maximum deposit coverage of RM60,000, Guidelines on the Differential Premium System and Guidelines for Deposit Insurance Coverage for Deposits issued by Malaysian Deposit Insurance Corporation.

follows the System Generalized Method of Moments (GMM) estimator of Arellano & Bover (1995) and Blundell & Bond (1998) to better estimate the dynamic relationship between bank risk and DI system. More particularly, the two-step system GMM is applied to attain perfect estimators whereby one equation is indifference and the other is in levels. The two-step system GMM is ideal in this study where the number of period is small and cross-sections is large; dependant variable is persistent (dynamic); explanatory variables are not exogenous (they may correlate with error term); there are heteroscedasticity; and time-invariant individual fixed effect as well as autocorrelation within individuals, which are more common in bank-level data. With regards to time-invariant variables, the system eliminates the effect of time-invariant variables but estimates in first difference. Hence, it adjusts the biases of the time-invariant estimates while the moment condition ensures no correlation between the unobservable effect / time-invariant effect/instrument variables. All in all, the System GMM estimation is appropriate for this study as the method works by combining the set of moment conditions for the first difference equation and level equation and run the regression simultaneously.

The post-estimation test (Wald test, Sargan test and Arellano-Bond) is done to ensure that the GMM estimator is appropriate for this study. Wald statistic test is used to ensure the goodness of fit for all the regressions in the System GMM models while Sargan test specifies that the instruments introduced in the model is acceptable. The Arellano-Bond tests such as AR(1) and AR(2)[4] indicate that the estimates are consistent as there is no second-order serial correlation.

4.3 Dependent and Explanatory Variables

In the literature, the commonly used risk measure is the accounting-based measures of risk (accounting ratios). Previous studies indicate that the accounting-based risk measures explain a substantial portion of the market-based risk (see for example, Agusman, Monroe, Gasbarro & Zumwalt, 2008). This amongst others includes non-performing loans, z-score (Hadad et al., 2011) and the credit quality of bank loans (Ioannidou & Penas, 2010). Given that there is only one listed Islamic bank in our sample, the market measures of risk are not considered in our study. Following previous studies related to bank risks, this study uses credit risk; NPLASSET (the ratio of non-performing loan/financing over bank assets), insolvency risk; ZSCORE and operational risk in the form of OVERHEADTA (the ratio of overhead expenses to bank assets).

Consistent with Ioannidou & Penas (2010) and Chernykh & Cole (2011), the study uses a DI period dummy variable (POSTDI) as the key explanatory variable. The dummy variable takes value one if a given observation falls from 2002-2005 (before the introduction of DI system) and zero otherwise (2006-2010 ie. after the introduction of DI system). This study also uses two other explanatory variables which are the estimated banks' annual premium (PREMIUM) and an interaction term PREMIUM*RISKBASED. The RISKBASED is a dummy variable that takes the value one if the premium system is a risk-based premium (over the period 2008-2010) and zero if the premium system is a flat-rate premium (over the period 2006-2007). The author estimates the annual premium paid by the banks; PREMIUM to examine whether the magnitude of the annual premium paid is positively correlated with the banks' risk. Consistent with the moral hazard argument, a negative sign is expected for ZSCORE and a positive sign for NPLASSET and OVERHEADTA. The risk-premium sensitivity in the risk-based DI system (PREMIUM*RISKBASED) is expected to significantly improve and the magnitude of the annual premium paid (PREMIUM) is expected to be positively correlated with bank risk.

This study includes control variables for bank size (LOG_ASSET), ownership (FOREIGN-foreign versus local banks), risk variables (NPLTA/OVERHEADTA) and regulatory pressure, i.e., risk-weighted capital ratio (RWCR) that are commonly used in the literature. The inclusion of the risk variables NPLTA and OVERHEADTA are to control for bank risk taking behaviour. The study also controls the credit risk measure (NPLTA) as one of the control variables to redress the impact of DI on operational risk, while OVERHEADTA is controlled in the estimates for credit risk and insolvency risk (financial risk). Regulatory pressure (RWCR) on bank's capital is the primary cushion against adverse changes in the bank's asset quality and earnings. In order to control for the sensitivity of size on the estimated insurance premium, the study interacted the DI annual premium with bank size. There is no specific sign is expected for the control variables. Similar to Chernykh & Cole (2011), this study uses year dummy variables to control for general macroeconomics condition such as inflation, household income, economic growth etc. and seasonality effects apart from the presence of explicit DI system. As there are nine years in the sample period, the research will have eight-time dummies.

4.4 Empirical Models

Following the work of Chernykh & Cole (2011) as discussed in the earlier sections, this study tests the following general model, allowing for the aforementioned theoretical consideration:

[4] AR(1) and AR(2) test the presence of autocorrelation at first and second difference.

$$\text{Bank Risk}_{i,t(Full)} = \gamma_{\text{Risk it-1}} + \beta_0 + \beta_1 \text{POSTDI}_{i,t} + \beta_j \text{CONTROL}_{i,t} + \text{error}_{i,t} \quad (1)$$

$$\text{Bank Risk}_{i,t(PostDI)} = \gamma_{\text{Risk it-1}} + \beta_0 + \beta_1 \text{PREMIUM}_{i,t} + \beta_2 \text{RISKBASED}_{i,t} + \beta_3 \text{PREMIUM*RISKBASED}_{i,t} + \beta_j \text{CONTROL}_{i,t} + \text{error}_{i,t} \quad (2)$$

This study runs three separate sets of regression for the two above models using three measurements for bank risk, namely credit risk (NPLTA), insolvency risk (ZSCORE) and operational risk (OVERHEADTA). Credit risk, insolvency risk and operational risk are present in the banks when the POSTDI shows a negative sign ZSCORE and a positive sign for NPLTA and OVERHEADTA. The NPLTA is controlled when estimating for operational risk.

On the other hand, the risk-based premium (PREMIUM and PREMIUM*RISKBASED) shall act as a deterrent for higher risk-taking if the coefficients are significant and positively correlated with bank risk.

5. Result

5.1 Descriptive Statistics

Table 2 reports the descriptive statistics. This study sample consists of 345 bank years of observation. In a dual banking system, the majority of the sample is from the conventional banks (57%) while the remaining is the Islamic banks (43%). By ownership, 51% are local banks, and 49% are foreign banks. The foreign-owned banks are the majority (60%) observation in the conventional banks while local Islamic banks (60%) are the majority in the Islamic bank observations.

Table 2 - Descriptive Statistics

Variables	N (bank years)	Mean	Median	Std. dev	Min
Panel A: Full Sample					
NPLASSET	343	3.05	1.92	3.54	0
ZSCORE	345	29.99	19.58	30.75	-26.14
OVERHEADTA	345	1.28	1.24	1.67	0.03
POSTDI (Dummy)	345	-	1	-	0
PREMIUM (RM million)	200	2.42	0.46	4.24	0.25
RISKBASED (Dummy)	200	-	1		0
SIZE (RM million)	345	26.943.77	9369.6	42833.29	93.06
RWCR	345	24.61	14.44	29.36	-2.84
FOREIGN	345	-	0	-	0
Panel B: Conventional versus Islamic banks					
Conventional banks					
NPLASSET	196	3.49	2.34	3.85	0.006
ZSCORE	198	37.82	23.67	34.80	-26.14
OVERHEADTA	198	1.32	1.32	0.45	0.22
POSTDI (Dummy)	198	-	1	-	0
PREMIUM(RM million)	110	3.82	2.10	5.23	0.25
RISKBASED (Dummy)	110	-	1	-	0
SIZE(RM million)	198	41082.41	27664.95	50368.57	516.5
RWCR	198	25.74	14.35	28.82	9.16
FOREIGN	198	-	1	-	0
Islamic banks					
NPLASSET	147	2.47	1.18	3.01	0
ZSCORE	147	19.44	16.12	19.97	-15.46

OVERHEADTA	147	1.24	0.91	2.51	0.03
POSTDI(Dummy)	147	-	1	-	0
PREMIUM(RM million)	90	0.70	0.27	1.09	0.25
RISKBASED (Dummy)	90	-	1	-	0
SIZE(RM billion)	147	7899.90	5373.31	7993.16	93.06
RWCR	147	22.93	14.5	30.06	-2.84
FOREIGN(Dummy)	147	-	0	-	0

This table presents summary statistics of the raw variables included in this study. The study uses annual observations of Malaysian conventional and Islamic banks over the period 2002-2010. The dependant variables include: NPLASSET is the ratio of non-performing loans to bank asset, a proxy for credit risk; ZSCORE is a proxy for insolvency risk; and OVERHEADTA is the ratio of overhead expenses to bank assets, a proxy for operational risk. The independant variable include POSTDI a dummy variable that is equal to one after the introduction of deposit insurance (2006-2010) and zero otherwise; and PREMIUM is the premium amount paid by banks for the deposit insurance coverage. SIZE, RWCR (risk-weighted capital ratio) and FOREIGN (1=foreign banks; 0=local banks) are controlled for.

In the full sample, the dependant variables; NLPASSET, ZSCORE and OVERHEADTA have a mean of 3.05%, 447.63% and 1.28% respectively. It appears that there is not much difference in the dependant variables between the Islamic and the conventional banks. In general, the RWCR of Malaysian banks are on average, 24.61%. This is significantly more than the minimum requirement of 8% (Basel II) and 10.5% (Basel III). The RWCR indicates that Malaysian banks have sufficient capital buffer. The median bank has RM9.37 billion of total assets. An average Islamic bank is relatively smaller (RM7.89 billion) than an average conventional bank (RM41.08 billion).

Malaysian banks, on average, paid an annual premium of RM3.82 million with a median of RM0.46 million. This amount is minimal, which accounted for approximately less than 1% of the banks' profit. The minimum annual premium paid by the conventional banks and Islamic banks is RM0.25 million as required by the MDIC Act. The MDIC's experts confirmed that the DI premium estimated by the author is relatively consistent with the actual figures. The risk-based premium system is implemented in 2008 until today. Under a risk-based premium, each member bank annual premium is calculated differently according to their risk categories. However, the banks are subject to a minimum annual risk premium of RM0.25 million. The annual premium median for Islamic banks is RM0.27 million while the median for conventional banks is RM2.1 million.

5.2 Correlation Structure

The Pearson correlation coefficient is reported in Table 3. Although the correlation coefficients are low but some of the correlations are statistically significant. There is a strong and very significant correlation (70%) between PREMIUM and SIZE. To ensure that there is no multicollinearity problem in the data, this study performs the variance inflation test (VIF). The VIF test suggests that there is no multicollinearity problem as the VIFs of the regression are below 10.

5.3 Regression Results

This study employs the System GMM estimator to test the four hypotheses using the two general models as described in Section 4.4. The author prefers System GMM against difference GMM mainly due to limited number of observations. Difference GMM significantly reduces the time-series observations. All regressions in these models satisfy the requirement of the System GMM. The post-estimation test conducted to check the appropriateness of the model is the Wald, Sargan and Arellano-Bond tests. From the post-estimation test reported for each regression, the System GMM is significant (Wald test) and consistent as there is no second-order serial correlation and the instruments introduced in the model is acceptable (Sargan test).

Table 3 - Correlation Matrix

	A	B	C	D	E	F	G	H	I	J
NPLASSET (A)	1									
ZSCORE (B)	-0.001	1								

OVERHEADTA (C)	0.036	-0.077	1							
POSTDI (D)	-0.337***	-0.007	0.085	1						
FOREIGN (E)	-0.363***	0.011	0.055	0.0238	1					
BANKINGSYSTEM (F)	0.1421***	0.056	0.025	-0.058	0.234	1				
RWCR (G)	-0.179***	-0.006	0.299***	-0.058	0.335***	0.047	1			
SIZE (H)	0.248***	0.031	-0.001	0.214***	-0.427***	0.415***	-0.511***	1		
RISKBASED (I)	-0.1580**	-0.164**	-0.056	-	-0.000	0.000	-0.143**	0.106	1	
PREMIUM (J)	0.224***	0.262***	-0.015	-	-0.416***	0.367***	-0.193***	0.708***	0.033	1

This table presents the correlations between the variables included in this study. The study uses annual observations of Malaysian conventional and Islamic banks over the period 2002-2010. The dependant variable is NPLASSET; a proxy for credit risk (the ratio of non-performing loan/financing to bank assets), ZSCORE; a proxy for insolvency risk is calculated by the author following Boyd et al.(2006) but with two years moving windows and OVERHEADTA; a proxy for operational risk(the ratio of overhead to total assets). The independant variables dummy variables are POSTDI (1=PostDI and 0=otherwise), RISKBASED (1=risk based premium and 0=flat rate premium) and PREMIUM which is calculated with modification by the author based on the MDIC Guidelines. The rest of the variables (FOREIGN, RWCR, SIZE, BANKINGSYSTEM) are controlled for in the model.

5.3.1 What Can We Learn on Bank Risk After the Implementation of Deposit Insurance? (Hypothesis 1)

Table 4 reports the regression results that examine bank risk-taking for all banks after the implementation of a DI system in dual banking with both Islamic and conventional banks. From the result, it can be seen that credit risk decreases while insolvency risk and operational risk increase after the introduction of DI system in a dual banking system. This result suggests that banks increase their risk through insolvency risk and operational risk after the introduction of DI as shown by the negative and significant sign of ZSCORE and the positive and significant sign of OVERHEADTA. Hence, in a dual banking system like Malaysia, the banks are also subjected to the moral hazard problem by increasing risk as the DI system alters the willingness for the banks to assume greater risk. The results support Hypothesis 1.

Table 4 - Regression Results: Effects of the Introduction of Deposit Insurance on the Bank Risk Taking by Malaysian Banks

All Banks (Conventional & Islamic banks)	**Dependant variable (Expected sign with POSTDI)**		
	NPLASSET (+)	**ZSCORE (-)**	**OVERHEADTA (+)**
	Model 1	**Model 2**	**Model 3**
Constant	8.779***	-89.986***	0.043
	(1.367)	(14.323)	(0.114)
Risk $_{i,t-1}$	0.669***	0.197***	0.106***
	(0.007)	(0.017)	(0.002)
POSTDI	-0.335***	-14.482***	0.252***
	(0.075)	(1.931)	(0.049)
FOREIGN	-0.796**	36.511***	0.478***
	(0.374)	(5.551)	(0.074)
BANKING SYSTEM	0.103	-6.119***	-0.484***
	(0.139)	(3.776)	(0.089)
RWCR	-0.014***	-0.026***	-9.46e-06
	(0.002)	(0.041)	(0.001)
LOG_ASSET	-0.735***	1.612***	0.092***
	(0.131)	(9.944)	(0.013)

OVERHEADTA	-0.133*** (0.035)	9.387*** (1.119)	-
NPLASSET			0.047*** (0.005)
Time dummies (years)	Yes	Yes	Yes
Wald test	$Chi^2(13)$=434947.60 (0.0000)***	$Chi^2(13)$=26903.85 (0.0000)***	$Chi^2(13)$=46918.02 (0.0000)***
Sargan test	$Chi^2(32)$=37.916 (0.2175)	$Chi^2(32)$=25.797 (0.7725)	$Chi^2(32)$=28.046 (0.6671)
Arrelano-Bond test for AR(1)	N(0,1)=-1.8256 (0.0679)*	N(0,1)=-2.401 (0.0164)*	N(0,1)=-2.7544 (0.0059)***
Arrelano-Bond test for AR(2)	N(0,1)=0.7884 (0.4304)	N(0,1)=0.7321 (0.4641)	N(0,1)=0.2699 (0.7872)
N	303	305	304

This table presents the results from the two-step System Generalized Method of Moments estimations using STATA. The coefficients and standard errors (in parentheses). The Wald, Sargan and Arellano-Bond tests are the post-estimation test to check the appropriateness of the model (in parentheses is the p-value). From this table, the System GMM is significant (Wald test) and consistent as there is no second order serial correlation and the instruments introduced in the model is acceptable (Sargan test). The estimation uses unbalanced annual panel observations of conventional banks and Islamic banks in Malaysia over the period 2002-2010. The dependant variable is NPLASSET (the ratio of non-performing loan/financing to bank assets), ZSCORE calculated by the author following Boyd et al.(2006) but with two years moving windows and OVERHEADTA(the ratio of overhead to total assets). The independant variable is the dummy variable POSTDI(1=PostDI and 0=otherwise). The rest of the variables are controlled for in the model. *, **and *** indicates significant at the 10%, 5% and 1% level respectively.

5.3.2 What Can We Learn on Bank Risk of Islamic vis a vis Conventional Bank? (Hypothesis 2)

The BANKING SYSTEM variable suggests that there is a significant difference in the bank risk for the conventional and Islamic banks as both of the coefficients for ZSCORE and OVERHEADTA are significant.

The study runs a separate regression to compare the bank risk after the introduction of DI for the conventional and Islamic banks. The primary variable of interest is still the POSTDI. If the conventional banks or the Islamic banks increase their bank risk through insolvency risk and operational risk, a negative and positive sign is expected for ZSCORE and OVERHEADTA, respectively. As the sample split into two (conventional and Islamic banks), this study runs separate regressions for the Islamic and conventional banks to explore the impact of DI on bank risks for the conventional banks and Islamic banks.

The results, as shown in Table 5, indicates that there is a significant bank risk increase through insolvency risk and operational risk in the conventional banks after the introduction of DI system. Again, the result is consistent with the moral hazard hypothesis that banks have the incentives to increase their risk as they know that the insurance protection will provide a buffer for the downside risk. This study provides strong evidence that operational risk increases in conventional banks after the introduction of DI. Interestingly, this is not the case for Islamic banks. Table 6 suggests that the moral hazard problem is not present in the Islamic banks. The POSTDI coefficients are not statistically significant with all the three variables of bank risks ie. NPLASSET, ZSCORE and OVERHEADTA.

Table 5 - Regression Results: Effects of the Introduction of Deposit Insurance on the Bank Risk Taking by Conventional Banks

Conventional banks	**Dependant variable (Expected sign with POSTDI)**		
	NPLASSET (+)	**ZSCORE (-)**	**OVERHEADTA (+)**
	Model 4	Model 5	Model 6
Constant	4.175	-130.107	7.674***
	(5.848)	(51.682)	(0.877)
$Risk_{i,t-1}$	0.792***	-0.471***	0.249**
	(0.115)	(0.133)	(0.104)

POSTDI	1.432	-13.684**	0.256***
	(1.423)	(4.359)	(0.071)
FOREIGN	-1.344	29.467**	-0.7467**
	(1.270)	(11.728)	(0.305)
RWCR	-0.002	0.113	-0.003**
	(0.007)	(0.112)	(0.001)
LOG_ASSET	-0.325	12.350*	-0.616***
	(0.448)	(6.672)	(0.084)
OVERHEADTA	-0.618**	10.159	-
	(0.311)	(19.439)	
NPLASSET			-0.026*
			(0.013)
Time dummies (years)	Yes	Yes	Yes
Wald test	$Chi^2(12)=27311.37$	$Chi^2(12)=5122.76$	$Chi^2(12)=1329.86$
	(0.0000)***	(0.0000)***	(0.0000)***
Sargan test	$Chi^2(33)=8.673$	$Chi^2(33)=6.818$	$Ch^2(33)=8.968$
	(1.0000)	(1.0000)	(1.0000)
Adjusted values	(0.89)	(0.89)	(0.89)
Arrelano-Bond test for	N(0,1)=-1.4159	N(0,1)=-3.417	N(0,1)=-1.9914
AR(1)	(0.1568)	(0.0006)	(0.0464)**
Arrelano-Bond test for	N(0,1)=1.1325	N(0,1)=0.228	N(0,1)=1.1257
AR(2)	(0.2574)	(0.8196)	(0.2603)
N	174	176	175

This table presents the results from the two-step System Generalized Method of Moments estimations using STATA. The coefficients and standard errors (in parentheses). The Wald, Sargan and Arellano-Bond tests are the post-estimation test to check the appropriateness of the model (in parentheses is the p-value). Please note that "Adjusted values" under Sargan test are based on re-running the regression with combined lag instrumental variable method suggested by Roodman(2009). From this table, the System GMM is significant (Wald test) and consistent as there is no second order serial correlation and the instruments introduced in the model is acceptable (Sargan test). The estimation uses unbalanced annual panel observations of conventional banks in Malaysia over the period 2002-2010. The dependant variable is NPLASSET (the ratio of non-performing loan/financing to bank assets), ZSCORE calculated by the author following Boyd et al.(2006) but with two years moving windows and OVERHEADTA (the ratio of overhead to total assets). The independant variable is the dummy variable POSTDI (1=PostDI and 0=otherwise). The rest of the variables are controlled for in the model. *, **and *** indicates significant at the 10%, 5% and 1% level respectively.

Table 6 - Regression Results: Effects of the Introduction of Deposit Insurance on the Bank Risk Taking by Islamic Banks

Islamic banks	**Dependant variable (Expected sign with POSTDI)**		
	NPLASSET (+)	**ZSCORE (-)**	**OVERHEADTA (+)**
	Model 7	**Model 8**	**Model 9**
Constant	7.727**	21.969	0.222
	(1.367)	(274.255)	(2.943)
$Risk_{i,t-1}$	0.212	-0.376	0.122
	(0.514)	(0.027)	(0.089)
POSTDI	-2.540	-17.359	0.210
	(2.111)	(26.121)	(0.242)
FOREIGN	-0.936	245.002	1.476
	(9.393)	(311.761)	(1.432)
RWCR	0.010	0.002	-0.003
	(0.014)	(0.246)	(0.003)

LOG_ASSET	-0.491 (0.681)	-15.931** (20.469)	-0.012 (0.337)
OVERHEADTA	-0.118 (0.394)	-24.076 (17.687)	-
NPLASSET			-0.0076 (0.040)
Time dummies (years)	Yes	Yes	Yes
Wald test	$Chi^2(14)$=2203.53 (0.000)***	$Chi^2(14)$=429.11 (0.0000)***	$Chi^2(14)$=97.99 (0.0000)***
Sargan test Adjusted values	$Chi^2(33)$=2.558 (1.0000) (0.92)	$Chi^2(33)$=4.4574 (1.0000) (0.92)	$Chi^2(33)$=5.191 (0.6671) (0.664)
Arrelano-Bond test for AR(1)	N(0,1)=-0.3536 (0.7236)	N(0,1)=0.6023 (0.5470)	N(0,1)=-0.7043 (0.4812)
Arrelano-Bond test for AR(2)	N(0,1)=0.2241 (0.8227)	N(0,1)=-0.996 (0.3192)	N(0,1)=0.8504 (0.3951)
N	129	129	129

This table presents the results from the two-step System Generalized Method of Moments estimations using STATA. The coefficients and standard errors (in parentheses). The Wald, Sargan and Arellano-Bond tests are the post-estimation test to check the appropriateness of the model (in parentheses is the p-value). From this table, the System GMM is significant (Wald test) and consistent as there is no second order serial correlation and the instruments introduced in the model is acceptable (Sargan test). Please note that "Adjusted values" under Sargan test are based on re-running the regression with combined lag instrumental variable method suggested by Roodman(2009). The estimation uses unbalanced annual panel observations of Islamic banks in Malaysia over the period 2002-2010. The dependant variable is NPLASSET (the ratio of non-performing loan/financing to bank assets), ZSCORE calculated by the author following Boyd et al.(2006) but with two years moving windows and OVERHEADTA (the ratio of overhead to total assets). The independant variable is the dummy variable POSTDI (1=PostDI and 0=otherwise). The rest of the variables are controlled for in the model. *, **and *** indicates significant at the 10%, 5% and 1% level respectively.

One important inference based on the above analysis is that Islamic banks, due to their inherent principles, did not experience an increase in moral hazard problem due to increased bank risk in the post-DI period. Although this sounds plausible, however, there may be an econometric issue with these results. Roodman (2009) two plausible approach on the instrument proliferation problem associated with small datasets provides an excellent solution to overcome this. His first approach to arbitrarily choose only a few lags as instrument variables is not feasible in this study as this study examines pre-and post-regulation effect. Also, many years in the sample are affected by the financial crisis. Hence, Roodman's second approach is chosen to combine instruments through addition to smaller units. For instance, sharing the same dummy variable for the year 2002 and 2003. This solution reduces instrument proliferation problem, however, at the cost of not capturing time-varying effects. In this study, the problem is much more severe for Islamic banks sample.

Meanwhile, Sargan Test based p-value also does not change significantly due to such alternation. The p-values based on the new adjusted regressions are reported below the actual p-values. For instance, they marginally reduce to 0.94 in the case of Table 6 reporting Islamic banks results. This leads the author to conclude that the results need to be interpreted with caution keeping such instrument proliferation in mind. However, it is important to note that after the recent financial crises, Islamic banks have been credited for resilience performance due to the intrinsic strength of the Islamic banks. For example, restrictions on the use of leverage and speculation, less exposure to toxic assets such as collateralised debt obligations and mortgage-backed securities are explicitly imposed for Islamic banks. Such restrictions have the potential to prevent Islamic banks increase in riskiness to new insurance on deposits. In this spirit, the study result is in line with Hypothesis 2.

5.3.3 What Can We Learn on the Sensitivity and Magnitude of DI Premium Towards Bank Risk? (Hypothesis 3 and Hypothesis 4)

The study now focuses on whether the regulation on DI premium is sensitive to bank risk and thereby mitigate the moral hazard problem. The primary variable of interest is PREMIUM and PREMIUM*RISKBASED. This study examines the two final hypotheses by comparing the two premium methods, i.e., flat rate versus risk-based method and

also by estimating the annual premium paid by the banks. These hypotheses test whether risk-premium sensitivity significantly improves using the risk-based premium method as well as whether the magnitude of the annual premium paid by the banks is positively correlated with bank risk.

The annual premium paid, PREMIUM will identify whether the premium is adequate to cover for the increase in bank risk. The results reported in Table 7 indicate that the PREMIUM coefficient is not significant with operational risk; however, the coefficient is significant at 1 per cent level for NPLTA and ZSCORE. The PREMIUM coefficient under NPLTA is significant and negative while ZSCORE is significant and positive. Generally, these results report that the annual premium has a negative relationship with bank risk. When there is an escalation in risk, the premium is inadequate to cover the increase in risk while if there is a reduction in risk, it is adequately covered. For example, the annual premium would decrease by RM1.953 million for an RM1 million increase in bank's credit risk (Model 10). On the other hand, the annual premium could adequately cover by RM1.953 million for a RM1 million reduction in bank's credit risk. The PREMIUM variable suggests that when there is a reduction in risk, the banks still pay adequate annual premiums. However, when there is an increase in risk, the annual premium is inadequate to cover the increase in risk. Although the results for the relationship between the annual premium and risk are significant, the direction is negative or inversely related. In other words, the current DI premium is not adequate to cover increased bank risk or the DI premium reaction and fails to support Hypothesis 4 that the magnitude of the annual premium paid is positively associated with the bank risk.

Table 7 - Regression Results: The Risk-Premium Sensitivity and Bank Risk (All Banks: Conventional and Islamic Banks)

All Banks (Post deposit insurance)	**Dependant variable**		
	NPLTA	**ZSCORE**	**OVERHEADTA**
	Model 10	**Model 11**	**Model 12**
Constant	13.274***	-63.417	6.418***
	(4.738)	(69.241)	(1.509)
Risk $_{i,t-1}$	0.853***	0.248***	0.066***
	(0.036)	(0.076)	(0.003)
RISKBASED	0.769***	-4.899	0.262***
	(0.203)	(4.483)	(0.089)
PREMIUM	-1.953***	34.596***	-0.145
	(0.647)	(9.774)	(0.151)
PREMIUM* RISKBASED	-0.03***	0.271	0.002
	(0.014)	(0.398)	(0.008)
PREMIUM* LOG_ASSET	0.165***	-3.010***	0.012
	(0.056)	(0.840)	(0.012)
FOREIGN	-2.367**	104.417***	1.387**
	(1.191)	(26.927)	(0.623)
RWCR	-0.0003	-0.031	-0.001
	(0.001)	(0.036)	(0.001)
LOG_ASSET	-1.269***	3.463	-0.627***
	(0.437)	(7.716)	(0.157)
Time dummies (years)	Yes	Yes	Yes
Wald test	$Chi^2(10)=1574.39$	$Chi^2(10)=77.39$	$Chi^2(10)=6301.81$
	(0.0000)***	(0.0000)***	(0.0000)***
Sargan test	$Chi^2(7)=4.8027$	$Chi^2(7)=7.2180$	$Chi^2(7)=5.6230$
	(0.6840)	(0.4065)	(0.5836)
Arrelano-Bond test for AR(1)	N(0,1)=-1.773	N(0,1)=-2.515	N(0,1)=-2.1968
	(0.0762)*	(0.0119)*	(0.0280)**
Arrelano-Bond test for AR(2)	N(0,1)=0.453	N(0,1)=0.1312	N(0,1)=0.1491
	(0.650)	(0.7211)	(0.8814)
N	160	160	160

This table presents the results from the two-step System Generalized Method of Moments estimations using STATA. The coefficients and standard errors (in parentheses). The Wald, Sargan and Arellano-Bond tests are the post-estimation test to check the appropriateness of the model (in parentheses is the p-value). From this table, the System GMM is significant (Wald test) and consistent as there is no second order serial correlation and the instruments introduced in the model is acceptable (Sargan test). The estimation uses unbalanced annual panel observations of conventional banks and Islamic banks in Malaysia over the period 2002-2010. The dependant variable is NPLASSET (the ratio of non-performing loan/financing to bank assets), ZSCORE calculated by the author following Boyd et al.(2006) but with two years moving windows and OVERHEADTA (the ratio of overhead to total assets). The independant variables dummy variable RISKBASED (1=risk based premium and 0=flat rate premium) and PREMIUM which is calculated with modification by the author based on the MDIC Guidelines. The rest of the variables are controlled for in the model. We use the sample for all banks after the introduction of DI. *, **and *** indicates significant at the 10%, 5% and 1% level respectively.

The final variable of interest is PREMIUM*RISKBASED. The interaction variable PREMIUM*RISKBASED will probe whether the risk-premium sensitivity improves in the risk-based DI system. PREMIUM*RISKBASED coefficient is -0.03 and is significant at the 1% level. The negative coefficient indicates that the risk-based premium is inadequate to cover for the increased bank risk since if there is an increase in risk, there would be a drop in the annual premium. The results in Table 7 establish that the risk-premium sensitivity worsens in the risk-based premium assessment method as the premium is more inadequate compared to the flat rate DI system. This suggests that banks have the incentives to increase risk (moral hazard problem) in the risk-based DI premium system, as despite incurring the higher risk, the premiums paid are lower than their risk profiles. Indirectly, the results explain why during the period of study, there exists a moral hazard problem after the introduction of the DI system in Malaysia. In this instance, the risk-based DI system is an ineffective policy because there is no improvement in the risk-premium sensitivity under the risk-based premium compared to the flat-rate premium. The negative coefficient indicates that the risk-based premium is inadequate to cover for the increased bank risk. The result is contrary to Hypothesis 3.

5.3.4 What Can We Learn on Bank Risk with Different Ownership and Size?

With respect to the control variables, they show mixed results. The first control variables bank ownership; FOREIGN shows a negative and significant relation with NPLASSET and OVERHEADTA, but a positive and significant relation with ZSCORE and OVERHEADTA. Generally, this asserts that foreign banks are less risky than the local banks possibly because their asset portfolio is well diversified across countries. If too-big to fail guarantees exist in the Malaysian banks, one would expect large banks are taking more risk than smaller banks. However, this may not be the case for credit risk and insolvency risk, as shown in Table 4. A clear direction for RWCR could not be identified in the study models. The interaction term; PREMIUM*LOG_ASSET reveals that bank size matters in determining the annual DI premium paid by the banks. As risk increases in larger banks, these banks also pay adequate premium. On the contrary, the premium paid by the smaller banks is less adequate than the larger banks.

5.4 Robustness Checks

Cognizant of the instrument proliferation problem, time dummy variables are replaced with controls for general macroeconomic condition with the inflation rate and real GDP growth rate in all of the regressions. The results remain unchanged. This study also excludes size from the regression models as it is highly correlated (70%) with the estimated annual DI premium paid. This study obtains qualitatively similar results to the main results in Table 7. Finally, the study ran the static panel for comparison (result not reported) and corrected the model by running the Hausman-Taylor Instrumental Variable regression. The results are qualitatively similar to those reported in this paper.

6. Conclusions and Policy Implications

This study comes at an important juncture where it has become imperative for all central banks in the world to introduce DI mechanism. The academic literature is divided on the efficacy of DI as a mechanism to mitigate the moral hazard problem faced by banks. This study argues that existing studies on the relationship between bank risk and DI suffers from identification problem as many unobservable factors, other than, DI, can influence bank risk. It is deliberated that a credible risk-based DI system will eventually promote prudent and sound risk management practices among the banks. On the contrary, a poorly designed DI system may affect the stability of the banking system. In this study, moral hazard is present by way of increased risk-taking in the Malaysian banking system after the implementation of DI system. Following this, there is a significant difference in bank risk-taking between the conventional and Islamic banks in Malaysia after the introduction of DI system. These findings enable policymakers and regulators like the Ministry of Finance, Central banks and DI organisations to evaluate whether DI escalates or retards risk-taking behaviour by insured banks in addition to whether there is an improvement in the sensitivity of risk-premium to bank risk. Such an evaluation would enable policymakers and regulators to institute appropriate policy

measures to counter risk-taking behaviour by banks. In the following paragraphs, some of these implications are discussed.

6.1 Implications for the Policy

Bank Size Matters

The implications of this study for policy are to infer that the bank size matters in the annual premiums of the deposit insurance paid. The findings of this study suggest that big banks that have high risk pay adequate premium while at the same time, small banks that have high-risk profiles pay inadequate premiums. The findings of this study also offer a rationale on why the big banks are reluctant to participate in a deposit protection scheme if the participation is voluntary. In terms of the policy, the measures for the annual premium should differ between the small and big banks. The current measures for computing the annual premium are inadequate to cover the small banks. In a bigger picture, the small banks should be regulated more stringently.

Implementation of an Early Warning Mechanism

Risk-based DI premiums have been adopted by several DI agencies, including the Federal Deposit Insurance Corporation (FDIC) and the Canada Deposit Insurance Corporation to mitigate the moral hazard problem. A credible DI system promotes financial stability, thus provides sound and stable environment for bank intermediation to support economic growth. The potential problem of moral hazard requires articulation to design credible DI schemes particularly the deposit insurance premiums to rectify the moral hazard problem. In the case of Malaysia, thus far, there is no incidences of bank runs. Nonetheless, given the reality that the financial crisis is cyclical in nature, it is vital to put in place a well-designed DI premium that is risk-premium sensitive as part of the existing financial safety net. The ramifications of a financial crisis would impact more severely the small banks than the big banks as the premiums are inadequate to cover the small banks. In a financial crisis, small banks normally fail. This situation asserts the importance to institute an early warning mechanism as part of the early intervention framework for the deposit insurer to step in when a bank faces failure.

Cross-Border Cooperation and Information Sharing

This study provides new evidence that operational risk-taking increases in post DI period. Major operational losses caused by internal or external fraudulent activities or lack of internal controls are often the common source of bank failures. The inclusion of operational risk as one of the pillars in Basel II was in response to the collapse of Barings Bank in 1995, which was recognised as the oldest (1762-1995) merchant bank in London. The collapsed was due to the lag and lapses in internal control of its personnel (Nick Leeson) and the processes involved. The collapse of a bank that was in operation for more than 200 years took the financial sector players by surprise.

Barings suffered irreparable loss of $1.3 billion that was caused by rogue trading activities. This anecdote highlights the fact that conventional banks are constantly exposed to different kinds of operational risk. Operational losses of banks are more often passed on to their customers. This study resorts to management efficiency as a proxy for operational risk to include people as the essence of operational risk. Although operational risk is commonly perceived as firm or bank-specific, the systemic component of its impact is growing in importance as evidenced by the 2007/2008 global financial crisis. Specifically, as the relationships among financial institutions in particular, the systematically important financial institutions located in different countries increase, operational disruptions are likely to lead to increased market volatility and contagion across markets and countries. Hence, this necessitates formal cooperation in particular on compensation frameworks and information sharing protocols between DI agencies and supervisory authorities in the region to deal more effectively with systemic bank failures.

Ethical Principles of Islamic Finance

The findings of this study raise the question on why Islamic banks that also prescribe to the Islamic DIS or a Shariah-compliant DIS do not adjust their risk after the introduction of the DI system, unlike the conventional banks. This study suggests that compliance with Shariah principles prevent Islamic banks from adjusting their risk post DI. Islamic financing amongst others prohibits investment in activities that have uncertainties (*gharar*) especially related to risk, interest (*riba*) and gambling (*maysir*) activities. In other words, these ethical principles are the compelling aspects of Islamic banking that could be also applied to conventional banking. These important ethical fundamentals of Islamic finance inadvertently allow the Islamic banks' resources only to finance real assets rather than financial derivatives. On this front, this limits the Islamic banks' exposure to uncalculated risks. Therefore, Islamic banks do not adjust their risk contrary to their conventional counterparts after the introduction of DI system in Malaysia.

Bank failures may be caused by many other exogenous factors like bad economic environment, political instability or non-credible designs of existing DI systems that are more prone to banking instabilities. With the above in mind, it is suggested that policymakers should carefully consider design features for an effective risk-based DI system that is risk-premium sensitive to ensure financial stability.

6.2 Implications for the Literature

Risk-based Deposit Insurance System Not Necessarily Mitigate Moral Hazard Problem

The findings of this study indirectly evaluate the effectiveness of the risk-based DI system in Malaysia. It is apparent from the empirical evidence that the risk-based system replacing the flat rate system since 2008 is still an inferior policy to counter the moral hazard problem. The objective of regulators to migrate from the flat-rate premium to risk-based premium scheme is to prevent banks from increasing their risk-taking. However, the risk-based DI premium will only be effective in replacing the flat-rate premium if the risk-premium sensitivity improves. On the contrary, this is not the case for the Malaysian risk-based DI system. The moral hazard problem is present in the form of increased bank risk after the introduction of the DI system because the premium is inadequate to cover the risk. In general, the findings do offer an insight to regulators that migrating from the flat rate to risk-based premium may not necessarily mitigate the moral hazard problem unless the premium coverage adequately covers the increase in bank risk.

Significant Difference in Bank Risk between the Islamic Banks and Conventional Banks Post Deposit Insurance

The introduction of DI system does not alter the risk exposure of the Islamic banks, as there is no change in the Islamic banks risk-taking. Only the conventional banks alter their risk profiles after the introduction of DI system. The conventional banks' objectives have always been seen as seeking higher profits and their bottom-line considerations. High-risk investments will generate higher profits. Thus, the DI protection provides a protective buffer for the conventional banks to embark on risky investments as the deposit protection will partly cover their downside risks. On the other hand, the Shariah principles guided the Islamic banks to create value in their investments. Therefore, the Islamic banks will only consider a calculated risky investment that adds value not only to the borrower but also to the real economy.

Inadequate Risk-based Premium Provides Opportunity for Arbitrage

The risk-based DI system in Malaysia during this study period allows regulatory arbitrage for the small conventional banks. The first part of the empirical study indicates that only the conventional banks increased their risk-taking after the introduction of DI system. As such, the regulatory arbitrage is enjoyed only by the small conventional banks. If a small conventional bank increases risk, the bank only pays a low premium which is inadequate to commensurate with the increase in risk.

In conclusion, despite arguments forwarded especially by the efficient market school that deposit insurance system may not function as an effective safety net to prevent financial crisis; like the 2007/2008 global financial crisis, it could be concluded that deposit insurance is here to stay. Deposit insurance cannot prevent financial instability but it could buffer and insulate risks to minimise the effects. If financial instability other than bank runs causes bank failures, then to conclude that the deposit insurance system is ineffective is not correct. Elsewhere, this study suggests that the ethical financing under Shariah principles guide the operating principles for the Islamic banks and restrict the incentives for riskier businesses prohibited by the Shariah. However, it is important to note that this study results may suffer from small sample problem and proliferation of instrumental variables. Hence, this study does not draw any strong conclusions on Islamic banks risk-taking under a DI system. Future research can focus on addressing this issue for more meaningful policy and literature implications.

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