

Dilemma of deposit insurance policy in ASEAN countries: Does it promote banking industry stability or moral hazard?

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Received 2 May 2017; revised 20 August 2017; accepted 20 August 2017

Available online 26 August 2017

Abstract

The goal of this article is to investigate the influence of deposit insurance policy on the stability of the banking industry. Stability is measured by the ratio of retail deposits to total assets and the ratio of loans to total assets to cover both positive and negative impacts, and deposit insurance policy is assessed in various stages. The survey uses a data panel of 127 commercial banks from 2000 to 2013 in six member countries of the Association of Southeast Asian Nations (ASEAN). Using a dynamic panel data investigation, we obtain results showing that the implementation of deposit insurance policy negatively affects the ratio of retail deposits to total assets while positively influencing the ratio of loans to total assets. This is an important finding, as it implies that deposit insurance policy causes bank managers to take greater risks to increase their returns, rather than increasing the confidence level of depositors and ultimately increasing total deposits. This result is important for regulators as they evaluate deposit insurance policy and anticipate any negative outcomes that might follow.

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JEL: G21; G28; E58

Keywords: Banking stability; Deposit insurance; Financial policy; GMM

1. Introduction

Financial crises during 1997 and 2008 provided valuable lessons for the banking industry and bank regulators in Southeast Asia about the safety of retail deposits and the trustworthiness of financial markets. Systemic risk could be created if bank regulators could not properly control the market, which could deepen a financial crisis. To avoid systemic risk, bank regulators since the end of twentieth century have proposed a deposit insurance program, in which the banking sector insures deposits received from customers. The program is not new in the banking industry in the United

States, where it has been in use since the early 1800s and where a deposit insurance system called the Federal Deposit Insurance Corporation (FDIC) was implemented in 1933 after the 1929 financial crash.

Academics, practitioners, and regulators have been discussing this program for as long as it has existed. Their discussion focuses on the costs and benefits of deposit insurance. Although deposit insurance has been used in the United States for many years, unfortunately banking crises still happen there. Similarly, in Asian countries, even though they have an explicit deposit insurance policy, the evidence indicates that the banking system could not withstand the negative effects of a financial crisis. Questions about the effectiveness of this policy still remain unanswered.

In response to financial crises, deposit insurance policy has evolved in line with problems in the banking industry. For instance, in 1933 the US financial system implemented

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Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

an explicit deposit insurance policy, meaning that the government would pay for certain amount of deposits (\$2500 in coverage) to help restore public confidence and stability in the banking system. The amount covered increased by \$100,000 in 1980 and is currently \$250,000 per depositor, per bank per ownership category. In the late 1980s and early 1990s, deposit insurance policy was harshly tested by the banking industry crisis because of an economic recession in 1990 and led to an improvement of the existing deposit insurance policy in 1991. Despite some improvements in deposit insurance policies, but bank failures still occur. In addition, Japan established a similar policy in 1971, forming the Deposit Insurance Corporation of Japan (DICJ), a separate national agency, with a mandate to protect depositors; this contributed to financial stability and assisted in the orderly resolution of banking problems. In 1996, the deposit insurance policy was amended to incorporate a bank guarantee, because of the implicit policy in Japan that did not support bank stability effectively in the face of a financial crisis in 1995. Then, in 1998, the policy was further enhanced to give the DICJ the power to offer a limited guarantee on both demand and time deposits.

However, several studies—such as Cull, Senbet, and Sorge (2005), Diamond and Dybvig (1983), and Mondschean and Opiela (1999) show that having deposit insurance did not affect the stability of the banking industry. They argue that the policy only brought higher operational costs for banks, and, consequently, bank managers took advantage of opportunities to increase their returns by making riskier investments, because they knew that their deposits were insured (moral hazard). Another argument is that the effectiveness of the implementation of deposit insurance depends on the structure of financial development in a particular country, such as the regulation of bank ownership structure, credit and deposit regulation, and interest rate regulation.

In contrast to these studies, others indicate that having a deposit insurance policy has had benefits for the banking sector. Gonzales (2005), Ho, Lai, and Lee (2014), and Imai (2006) show that the policy helped bring stability to the banking industry by preventing bank runs and liquidity problems. When they know that their deposits are insured, depositors have no rational reason to rush to withdraw their money in the event of a crisis, which otherwise causes systemic problems in the banking industry. Depositors can easily and quickly get back their insured money if a financial crisis arises, so negative rumors that might undermine confidence in the banking industry are avoided.

These mixed results persuade us that the effect of deposit insurance on the stability of the banking industry is not yet settled. To explore this issue, we use a sample of member countries of the Association of Southeast Asian Nations (ASEAN) because each country has a different level of financial development, which might lead to inefficiency in the utilization of funds in the banking industry. Hence, any benefits may not be able to compensate for the cost of introducing a deposit insurance policy. On the contrary, the policy may also lead to higher risk exposure. Accordingly, in this paper we

examine whether having a deposit insurance policy can lead to destabilization in the banking industry.

In this study, we test the argument that the implementation of deposit insurance will affect the behavior of depositors, banks, and the central bank. According to La Porta, Lopes-de-Silanes, and Shleifer (2002), the implementation of certain regulations affects actors in the financial system differently, depending on the landscape of the financial system itself—for instance, the level of financial system development and the legal environment. In particular, the objective of the paper is to analyze the effect of implementing deposit insurance on the stability of the banking industry in terms of the stability of assets and liabilities, taking into account dynamic factors.

The rest of the article is structured as follows. Section 2 discusses the relevant literature regarding deposit insurance and banking industry stability. The discussion focuses on deposit insurance from the perspective of depositors, banks, and regulators. In addition, the benefits, costs, and risks in the implementation of deposit insurance are also discussed. Section 3 provides our model and method of analysis by considering the theoretical framework, objective, and type of data. Section 4 discusses the results, testing the proposed model and discussing the findings based on the best model selected, and Section 5 concludes with our findings and policy implications.

2. Literature review

The basic argument for having deposit insurance is to share risk between banks and insurance providers, while ensuring the safety of depositors' funds, reducing risk when financial crises occur, and supporting the soundness of the banking industry. Diamond and Dybvig (1983) state that the benefit of deposit insurance is in ensuring the stability of the banking system from systemic risk. The existence of deposit insurance alleviates concerns by depositors about the safety of their money. However, it also presents an opportunity for the bank to become involved in activities that involve moral hazard; bank managers are more likely to invest the bank's funds in riskier ventures if they know that the deposits are insured (Kim, Kim, & Han, 2014).

Concerned with the deposit insurance regulation, Mondschean and Opiela (1999) explored the influence of different kinds of deposit insurance policy on the bank deposit market in Poland. They state that different laws and regulations will lead to different insurance coverage, with internal bank factors being less important in explaining different deposit interest rates. They also find a negative relation between market discipline and deposit insurance coverage. This finding is generally supported by La Porta et al. (2002), in that the differences in the origin law will affect the behavior of all players in the financial system.

In addition, Cull et al. (2005) find that the benefits of deposit insurance for the stability of banking system depend on the strength of regulations. Using cross-country data, they show that deposit insurance has a negative relationship with financial development and growth, except in countries with strong regulation and financial institutions. Their results imply

that the implementation of deposit insurance does not directly increase the confidence of depositors but does indirectly increase total consumer deposits, depending on regulations and the financial institution.

[Laeven \(2002\)](#) gives a deeper analysis of the relationship between the cost of deposit insurance and differences in the governance structure of bank ownership. Using a broader sample of 144 banks in various emerging countries over the period 1991–1998, he finds that different ownership structures have different cost levels: private banks have higher costs than public banks, implying that risk taking is higher at private banks than at their public counterparts. This is no surprise because public banks are implicitly insured by the government. [Chernykh and Cole \(2011\)](#) find that the implementation of deposit insurance leads to a shift in depositors from public to private banks.

At the same time, [Honohan and Klingebiel \(2003\)](#) analyze the impact of deposit insurance premiums on fiscal costs and risk taking. They explore the impact of blanket guarantees on the full fiscal costs of addressing banking system distress. Using 40 separate crises in 1980–1997, they state that unlimited deposit guarantees and capital forbearance increase the ultimate fiscal costs of unwinding a banking crisis. In addition, [Gueyie and Lai \(2003\)](#) track the impact of implementing fixed-rate deposit insurance in Canada. Their analysis, following its implementation in 1967, uses data from 1959 to 1982 from five listed banks, finding that various market-based measures of risk taking increased when capital ratios decreased.

Similarly, [Gonzales \(2005\)](#) examines how regulatory restrictions affect bank rent value and bank risk taking. Using a sample of 251 banks in 36 countries, he finds that deposit insurance gives banks an incentive to take higher risks and that different levels of governance reduce the incentives for such risk shifting. He shows that deposit insurance increases bank rent values. In addition, [Duan, Moreau, and Sealey \(1992\)](#) examine whether bank shifts introduce risks for deposit insurers. Using a sample of 30 large publicly traded US banks, they find that banks largely fail to increase their actuarial liabilities for the deposit insurer.

[Angkinand \(2009\)](#) addresses the relationship between deposit insurance policy and the cost of financial crises. Using 47 financial crises in 35 countries during 1970–2003, she finds that deposit insurance can reduce the output cost of bank crisis, and countries with higher deposit insurance coverage have fewer crises. In other words, the implementation of explicit deposit insurance has a positive impact on the banking industry's stability and increases coverage of insured deposits, which in turn reduces the negative effect of a financial crisis.

In contrast, [Chernykh and Cole \(2011\)](#) find that banks that introduce a deposit-insurance increase both the level of retail deposits and the ratio of retail deposits to total assets more than banks without a deposit-insurance system. They utilize a multivariate panel-data analysis that controls for bank- and time-random effects in addition to a number of control variables. They also find that the longer the period in which a bank has a deposit insurance policy system is, the higher are its level of retail deposits and its ratio of retail deposits to assets.

Addressing the main issues in deposit insurance, [Forssbäck \(2011\)](#) analyzes the impact of market discipline by creditors and ownership structure on banks' risk taking in the presence of partial deposit insurance. He uses traditional agency-cost theory to explain the impacts of creditor discipline and shareholder control. He uses a panel regression model with research samples comprising several hundred banks worldwide in the period 1995–2005. The results show that creditor discipline has a negative individual risk effect and that shareholder control has the expected convex effect. It is implied that increased shareholder control significantly strengthens the negative effect of market discipline on asset risks, but joint effects on overall default risk are limited. The existence of deposit insurance reduces market discipline by the bank's creditors and introduces a subsidy on increased risk, but the size of this subsidy depends on the agency-cost structure of the bank and therefore on its ownership structure.

At the same time, [Morrison and White \(2011\)](#) provide a rational argument in terms of the provision of deposit insurance. They consider that banking institutions present both adverse selection and moral hazard, which indicates that the social benefit of bank monitoring must be shared between depositors and the banks. Socially, it is difficult for deposits to reach equilibrium, and for this reason deposit insurance and bank recapitalization should correct for this market failure. As an implication of this result, deposit insurance should not be funded by governments through general taxation if the failure is due to both adverse selection and moral hazard. The optimal premium of deposit insurance negatively depends on the quality of the banking system. This implies that when the banking sector is sound, the systemic risk will be lower and then premiums for deposit insurance will decrease. Therefore, premium deposit insurance is able to cover the potential for bankruptcy and the government does not need to subsidize this insurance.

[Mälkönen and Niinimäki \(2012\)](#) study the restructuring of deposit insurance – blanked guarantee policies at multinational banks and how the home countries share the financial burden when financial crises occur. The results state that when options are available, regulators have the power to share the financial burden depending on the scenario of normal and panic risks. Normally the home country has more bargaining power when the liquidation cost is less than the recapitalization cost for restructuring the bank with the foreign country, since the home country has the legal right to liquidate or close the bank. Conversely, if the panic of risk occurs and damages policy negotiations, it will affect the home country.

In contrast, [Engineer, Schure and Gillis \(2013\)](#) explore the provision of deposit insurance based on the noncooperative policy game among countries. Countries compete for deposits in order to protect their banking systems from destabilization, due to the potential effect of capital flight. Policies and rules are chosen to attract depositors, who rationally and optimally respond to earning expected returns on deposits, and those returns depend on deposit insurance levels, systemic risks, and transaction costs. They identify policies for both defensive and nondefensive policies in neighboring countries. Depositors maximize their returns on deposits; therefore, they always

respond to any changes in deposit insurance policy in another country. The model comprehensively illustrates the standard normative rationales for deposit insurance: if countries are symmetric, both are better off without deposit insurance and achieve this outcome in the absence of shocks. In the model, deposit insurance is an inefficient response to shocks or the presence of asymmetries.

Other issues are related to the pricing and progress of the implementation of deposit insurance. [Ho et al. \(2014\)](#) investigate the effectiveness of financial reform in Taiwan, measure the adequacy of the deposit insurance fund, and design reserve ratios and implicit costs of government guarantees of a deposit insurance fund. The findings show the lower average premiums of deposit insurance for financial holding companies compared to sampled banks, although the financial holding companies are larger. They also show that the designed reserve ratio and implied reserve for certain years are different. Indirectly, this finding goes against the fair premium, which should be based on the size of insured deposits and asset risks. The results imply that a fixed target ratio for the deposit insurance fund may not be appropriate. Nevertheless, financial reform in Taiwan has generally been able to protect against systemic crisis and lower the volatility of deposit insurance.

[Boyle, Stover, Tiwana, and Zhylyevskyy \(2015\)](#) investigate the effectiveness of deposit insurance at the onset of a banking crisis, using a conjoint analysis approach in considering the simultaneous impact of multiple deposit insurance characteristics and various contrary facts. The sample was a multinational bank, and the researchers consider how they would inspect the hypothetical account profiles following the failure of a large competing bank. The results state that such a policy response may only be partially successful, at least compared to the effectiveness of an existing insurance scheme. Depositors from countries without deposit insurance clearly indicate that they would withdraw a higher proportion from insured accounts and require a higher interest premium when these accounts are maintained than depositors from countries with explicit deposit insurance. The findings imply that more generous insurance schemes are more effective in reducing these systemic and funding risks, but they will become a problem if the pricing is not optimal, because the government will pay a higher cost.

Discussions of deposit insurance and banking stability address some important issues. For instance, different laws and regulations and levels of enforcement, the cost of deposit insurance, rent value and risk taking, market discipline and banking ownership, and competing deposit insurance policies among countries. Nevertheless, the previous results still leave room for continued discussion and offer empirical evidence on the implications of deposit insurance for banking stability.

3. Data and methodology

3.1. Research data

In this study, we use a banking database for ASEAN countries. The motivation for this is that countries in the

region have very similar banking industry backgrounds. In 1997–98 they faced a financial crisis and then in 2008–2009 were affected by the global financial crisis. In addition, the region has tremendous economic development and progressive financial development. The type of data used includes total retail deposits, total assets, total loans, total equity, and the net interest margin. The total sample is 127 banks that set up deposit insurance in 2000–2013: Indonesia, 44 banks; Malaysia, 10 banks; the Philippines, 22 banks; Singapore, 14 banks; Thailand, 20 banks; and Vietnam, 17 banks. The sources of data are the Bankscope database and the deposit insurance corporation and central bank in each country.

3.2. Research methodology

We aim to explore the effect of introducing and implementing deposit insurance on the banking industry's stability and sustainability, the latter two being our dependent variables. We measure stability by total retail deposits and the ratio between retail deposits and total assets, total loans, and the ratio between loans and total assets. These show the benefits to the banking industry of deposit insurance. The level of loans shows the cost of deposit insurance due to the possibility that implementing it will introduce moral hazard.

We argue that if deposit insurance benefits financial stability, then it will have a positive effect on stability more broadly. For instance, it might increase the confidence level among depositors that their money is safe even in the event of their bank's bankruptcy. The implication of this is that total deposits increase without the potential of a bank run. However, if deposit insurance has any costs (negative benefits) for financial stability—for instance, if it encourages moral hazard at banks), then deposit insurance will have a positive effect on the ratio of loans to total assets ([Imai, 2006](#); [Kim et al., 2014](#)). In addition, using deposit insurance policy as an independent variable, we look at the date of implementation of deposit insurance policy and explore the various effects of deposit insurance on the bank's asset structure.

The other variable expected to influence the stability of the banking industry is total assets, which represent the size of bank; larger banks have more stability, because of their capacity to overcome liquidity problems and generate higher profits ([Imai, 2006](#)). Leverage is included to indicate the burden of the bank as a control variable, where increasing the bank's leverage creates instability because of greater financial responsibility; a higher leverage ratio then makes it difficult to generate profits ([Forssbäck, 2011](#)). Finally, the interest margin variable is used to represent the level of banks' operational efficiency—for example, how it collects funds and invests them in profitable activities—and a more-efficient bank generates more profits than a bank with less-efficient operations ([Kusairi, Sanusi, & Ismail, 2015](#)).

As the data comes from banks in various Asian countries, the appropriate research model to use for presenting and analyzing the effect of deposit insurance policy on the stability of the banking industry is panel data analysis. Data panel analysis is able to identify more characteristics in terms of in-

time variance and cross-sectional patterns. The model is as follows.

3.3. Dynamic panel data analysis

The basic model of dynamic panel data model is as follows:

$$y_{it} = \rho_i y_{it-1} + z_{it}\gamma + c_i + u_{it} \quad (1)$$

where u_{it} is the error with a mean of zero and a fixed variance. z_{it} is a matrix of exogenous variables, and y_{it-1} is a pre-determined variable (exogenous variables are derived from endogenous variables).

According to [Arellano and Bond \(1991\)](#), the solutions dynamic panel data model AR (1) with a 2SLS (two-stage least squares) estimation produces consistent results but may not be efficient (no minimum variance), therefore we do not consider that a condition moment exists. Arellano and Bond suggest using Δy_{it-2} as instruments of Δy_{it-1} . This procedure results in a more efficient procedural estimator ([Anderson and Hsiao, 1981](#)). Therefore, the Arellano-Bond use an estimator with GMM (general method of moments) to estimate $\alpha_1 \dots \alpha_p, \beta_1, \beta_2$.

$$y_{it} = y_{it-1}\alpha_1 + \dots + y_{it-p}\alpha_p + x_{it}\beta_1 + z_{it}\beta_2 + c_i + u_{it} \quad (2)$$

where x_{it} is a strictly exogenous variable (matrix), z_{it} is a pre-determined variable matrix, c_i is random effects, iid (independent and identically distributed), and u_{it} is an error term, iid.

Eq. (2) is transformed to the real research variable to explore the effect of deposit insurance on banking stability. The dynamic panel data process of the dependent variable is as follows:

$$LOA_{it} = \beta_0 + \beta_1 LOA_{it-1} + \beta_2 DI_{it} + \beta_3 DOA_{it} + \beta_4 Lev_{it} + \beta_5 Size_{it} + \beta_6 NIM_{it} + \omega_{it} \quad (3.1)$$

$$DOA_{it} = \beta_0 + \beta_1 DOA_{it-1} + \beta_2 DI_{it} + \beta_3 Lev_{it} + \beta_4 Size_{it} + \beta_5 NIM_{it} + \omega_{it} \quad (3.2)$$

$$\omega_{it} = \varepsilon_i + u_{it} \quad (4)$$

where LOA is the ratio of retail deposits to total assets, and DI is deposit insurance policies, counted as a dummy variable. In this study, we consider two policies, namely, full coverage (FDI), partial coverage (PDI) and no deposit insurance indicated by constant as baseline. DOA is the ratio of retail deposits to total assets. LEV is the ratio of loans to equity. $Size$ is total assets. NIM is the net interest margin.

Eqs. (3.1) and (3.2) have some potential technical problems. First, there is causality between independent variables and the possibility of regressors related to the error term. The best solution to the problem is by using first-difference GMM, as suggested by [Arellano and Bond \(1991\)](#). Eq. (3) transformed to first-difference form is as follows.

$$\Delta LOA_{it} = \beta_0 + \beta_1 \Delta LOA_{it-1} + \beta_2 \Delta DI_{it} + \beta_3 \Delta DOA_{it} + \beta_4 \Delta Lev_{it} + \beta_5 \Delta Size_{it} + \beta_6 \Delta NIM_{it} + \Delta \omega_{it} \quad (5.1)$$

$$\Delta DOA_{it} = \beta_0 + \beta_1 \Delta DOA_{it-1} + \beta_2 \Delta DI_{it} + \beta_3 \Delta Lev_{it} + \beta_4 \Delta Size_{it} + \beta_5 \Delta NIM_{it} + \Delta \omega_{it} \quad (5.2)$$

In general form, the transformation is given as follows: $\Delta LOA_{it} = \beta_0 + \beta_1 \Delta LOA_{it-1} + \beta_2 \Delta DI_{it} + \beta_3 \Delta DOA_{it} + \beta_4 \Delta Lev_{it} + \beta_5 \Delta Size_{it} + \beta_6 \Delta NIM_{it} + \Delta \omega_{it}$, and the same in Eq. (5.2), by transforming the regressors by first difference, the fixed-country effect is removed, because time is not invariant. From Eqs. (5.1) and (5.2), we obtain:

$$\Delta \omega_{it} = \Delta \varepsilon_i + \Delta u_{it} \quad (6)$$

[Arellano and Bover \(1995\)](#) suggest a new estimation process to improve [Arellano and Bond \(1991\)](#) when there is an exogenous variable that is endogenous to the right side of equation (or, in other words, there is a correlation with the number of exogenous variable error terms). Unlike in [Arellano and Bond \(1991\)](#), [Arellano and Bover \(1995\)](#) did not do a first-difference transformation but used the transformation (separation of variables, the right side of the equation of a purely exogenous endogenous and exogenous nature) such that orthogonal conditions are met. This estimator, as well as the use of GMM, also applies 3SLS (three-stage least squares) to estimate the instrumental variable.

[Blundell and Bond \(1998\)](#) estimate the equation by combining the level equation and first difference, known as system GMM. Their estimator is fixed with the situation in which T (variable series) is limited to being small and stationary. They suggest taking the instrumental variable y_{it-2} as instruments of Δy_{it-1} . They claim that the efficiency of estimators is higher than in [Arellano and Bond \(1991\)](#).

4. Research results and discussion

[Table 1](#) shows the result of FD_GMM and system GMM analysis in Eq. (5.1). Every model was analyzed using one-step, two-step, and two-step in the loan stability model. In this part, the analysis focuses on whether a deposit insurance policy encourages bank managers to take more risks, which is considered moral hazard behavior. The overidentifying restrictions test, or the Sargan test, shows that the null hypothesis cannot be rejected and there is no serial correlation, as shown by the fact that AR(1) is significant and AR(2) is insignificant. Therefore, both models (FD_GMM and system_GMM) are valid for two-step, but system GMM gives better results because the coefficient of lag LOA is 0.5504, which is between the lower bound and the upper bound.

The final result discussion, based on SYS_GMM two-step analysis, shows that the first difference of LOA , the ratio of loans/total equity, size, and NIM affect the ratio of loans/total assets at a significant level of 1%, except NIM , which has a significant level of 10%, with a positive effect. The result implies that an increase in the ratio of loans/total equity, size, and NIM will increase the ratio of loans/total assets. The deposit insurance policy, whether partial coverage deposit insurance (PDI) or full coverage deposit insurance (FDI), shows a positive effect on the ratio of loans/total assets, and it is significant.

Table 1
Results for the loan-to-assets (LOA) model.

	FD_ GMM		System_ GMM	
	One-step	Two-step	One-step	Two-step
Constant	−0.1282 (0.0707)*	−0.1697 (0.0480)***	−0.0607 (0.0682)	−0.1052 (0.0341)***
Lag LOA	0.2308 (0.0718)***	0.2434 (0.0280)***	0.5504 (0.0452)***	0.5616 (0.0149)***
PDI	0.0032 (0.0079)	0.0047 (0.0050)	0.0045 (0.0091)	0.0087 (0.0032)***
FDI	0.0022 (0.0083)	0.0046 (0.0051)	0.0045 (0.0091)	0.0058 (0.0035)*
DOA	0.1601 (0.02823)***	0.1538 (0.0145)***	0.1180 (0.0286)***	0.1263 (0.0083)***
LEV	0.00015 (0.0005)***	0.0016 (0.0002)***	0.0014 (0.0006)***	0.0014 (0.0002)***
Ln Asset	0.02889 (0.0052)***	0.0311 (0.0029)***	0.0145 (0.0052)***	0.0168 (0.0020)***
NIM	0.0021 (0.0012)*	0.0022 (0.0016)	0.0019 (0.0013)	0.0015 (0.0008)*
Sargan Test	150.289***	89.9856	165.843***	101.502
AR(1)		−5.0475***		−5.674***
AR(2)		−0.8370		−0.5824
NxT	1210	1210	1337	1337

Standard errors are in parentheses; statistical significance: *** $p \leq 1\%$, ** $p \leq 5\%$, and * $p \leq 10\%$. NxT is total sample (cross section multiply with time series).

This finding is very interesting, as it implies that deposit insurance policy can cause the bank manager to take higher risks. This is shown by the increase in total loans to compensate for additional costs and increasing returns or by the bank manager thinking that higher risks can be taken with no problem because the deposits are insured. In other words, deposit insurance did not benefit the bank in terms of increasing confidence levels among depositors and increasing total deposits. This is shown by the fact that the effect of the deposit insurance policy and the ratio of total deposits to total assets is negative, as shown in Table 2.

Table 2 shows the result of FD_GMM and system_GMM analysis in Eq. (5.2). Every model was analyzed using one-step, two-step, and two-step for a deposit stability model. In this part, the analysis focuses on whether a deposit insurance policy to promotes banking industry stability. The over-identifying restrictions test, or Sargan test, shows that the null hypothesis cannot be rejected, and there is no serial correlation, as shown by the fact that AR(1) is significant and AR(2) is insignificant. Therefore, both models (FD_GMM and system_GMM) are valid for two-step, but system_GMM gives better results because the coefficient of lag DOA is 0.7453, which is between the lower bound and the upper bound.

As in the first part, this discussion focuses on system_GMM two-step analysis, which shows that the first difference of DOA, LEV, Size, and NIM affect the ratio of loans to total assets at a significance level of 1%, with a positive effect, but with a negative effect for NIM. The result implies that an increase in the ratio of loans to total equity (LEV) and size will increase the ratio of retail deposits to total assets, with the opposite effect for NIM. The deposit insurance policy, whether full (FDI) or partial coverage (PDI), has a negative effect on the ratio of deposits to total assets. It is statistically significant at the 1% level for both partial and full coverage. In this case, the result indicates that the enforcement of deposit insurance will decrease the deposits-to-total assets ratio. These models also show the dynamic factor by significance of the first difference of dependent variables.

These findings also strongly support the previous finding, that the deposit insurance policy can cause bank managers to take higher risks by increasing total loans, rather than by increasing total deposits. To compensate for the additional costs, bank managers increase total loans to increase returns. Unfortunately, deposit insurance does not increase confidence levels among depositors, as shown by the decrease in the ratio of deposits to total assets. It is also indicated by the positive

Table 2
Results for the deposits to assets (DOA) model.

	FD_ GMM		System_ GMM	
	One-step	Two-step	One-step	Two-step
Constant	0.0532 (0.1114)	0.1338 (0.0314)***	−0.2371 (0.0916)	−0.1750 (0.0228)***
Lag DOA	0.4967 (0.0730)***	0.4979 (0.0165)***	0.7495 (0.0429)***	0.7453 (0.0090)***
PDI	−0.0265 (0.0098)***	−0.0245 (0.0028)***	−0.0203* (0.0104)	−0.0176 (0.0019)***
FDI	−0.0247 (0.0101)**	−0.0217 (0.0030)***	−0.0224 (0.0107)**	−0.0188 (0.0023)***
LEV	0.0012 (0.0006)**	0.0013 (0.0002)***	0.0011 (0.0007)*	0.0011 (0.0001)***
LnAssets	0.0195 (0.0063)***	0.0134 (0.0021)***	0.0283 (0.0061)***	0.0237 (0.0012)***
NIM	−0.0021 (0.0014)*	−0.0012 (0.0009)	−0.0020 (0.0015)	−0.0014 (0.0004)***
Sargan Test	147.667***	75.4524	135.0818***	94.5927
AR(1)		−5.1302***		−5.2011***
AR(2)		−0.1212		0.1262
NxT	1210	1210	1337	1337

Standard errors are in parentheses; Statistical significance: *** $p \leq 1\%$, ** $p \leq 5\%$, and * $p \leq 1\%$; NxT is total sample (cross section multiply with time series).

effect of deposit insurance on the loans-to-assets ratio. These findings are supported by Demirgüç-Kunt and Detragiache (2002), Demirgüç-Kunt and Huizinga (2004), Diamond and Dybvig (1983), and Kusairi et al. (2015), in which deposit insurance did not support market discipline, and there is a possibility of moral hazard among bank managers, supported by evidence of increasing total loans and decreasing total deposits. But this finding is directly opposed to that of Imai (2006), which holds that deposit insurance can support market discipline.

We use a basic validity model in two stability models: a loans-to-assets model (Table 1) and a deposits-to-assets model (Table 2). The loans-to-assets model shows that a one-directional result for both models from FD_GMM and system_GMM is rejected because the null hypothesis is not rejected in the Sargan test, where chi-square is 150.289 for FD_GMM and 165.843 for system_GMM with a probability higher than chi-square is 0.000 for both models. In addition, the deposits-to-assets model shows that a one-directional result for both models from FD_GMM and system_GMM is rejected because the null hypothesis is not being rejected in the Sargan test, where chi-square is 147.667 for FD_GMM and 135.0818 for system_GMM, with a probability higher than chi-square is 0.000 for both models.

Conversely, the loans-to-assets model (Table 1) and deposits-to-assets model (Table 2) show that a two-directional step result for both models from FD_GMM and system_GMM are accepted in hypothesis testing; the null hypothesis can be rejected in the Sargan test, finding that chi-square is 75.4524 and 94.5927 in the deposits-to-assets model, and a probability higher than chi-square is 0.5286 and 0.3226, respectively. The Sargan test finds that chi-square is 89.9856 and 101.502 for the loans-to-assets model, with the probability higher than chi-square of 0.1478 and 0.1721 respectively.

Autocorrelation or serial correlation testing in first-difference errors shows that AR1 for the loan and deposit stability model and both FD and system GMM state are rejected, and AR2 are accepted, meaning there is no autocorrelation or serial correlation. Therefore, this test indicates that the two-directional model is better than one-directional model analysis. In conclusion, two-directional system GMM is the best model for explaining the behavior of deposit insurance policy with respect to the ratio of retail deposits to total assets and the ratio of loans to total assets, as well as the stability of the banking industry.

5. Conclusion and Policy Implications

It is expected that the implementation of certain rules and regulations will differ between countries and banks—for instance, deposit insurance at different levels of the financial system. The objective of this paper is to analyze the effect of implementing deposit insurance on the stability of the banking industry, asking whether it is an asset or liability for stability and taking account of dynamic factors.

The result shows that the ratio of loans to total equity and bank size positively affects the ratio of retail deposits to total

assets. The result implies that an increase in the ratio of loans to total equity and bank size will increase the ratio of total retail deposits to total assets and the ratio of loans to total assets. But the effect of the net interest margin is negative on the ratio of deposits to total assets and positive on the ratio of loans to total assets. The result implies that an increase in the net interest margin will decrease the ratio of retail deposits to total assets and increase the ratio of loans to total assets. In addition, the deposit insurance policy negatively affects the ratio of retail deposits to total assets and positively affects the ratio of loans to total assets. This is an important finding, as it implies that, rather than increasing the confidence of depositors and therefore the amount of their deposits, a deposit insurance policy can make bank managers more likely to take higher risks to compensate for additional costs, when seeking to increase their returns. Both the loan and deposit models have dynamic factors through their own moment.

Moreover, deposit insurance policy can cause bank managers to take higher risks by increasing total loans, rather than increasing total deposits. To compensate for additional costs, bank managers increase total loans to increase returns. Unfortunately, deposit insurance does not increase the confidence level of depositors, as shown by a decrease in the ratio of deposits to total assets and a positive effect of deposit insurance on the loans to assets ratio. This result is very important for regulators in evaluating deposit insurance policy and anticipating any negative outcome that may occur.

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