

# Information Disclosure and Depositor Discipline: Evidence Based on the East Asian Crisis

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## Abstract

*This paper analyses the dynamic relationship between banks' information disclosure and depositor discipline. Signalling theory posits that the amount of information that banks disclose depends on their risk. In line with this, we model the relationship between deposit growth and information disclosure as an endogenous process. This paper investigates how depositor discipline constrains banks' behaviour by extracting the impact of an exogenous increase in the amount of information that banks disclose on the quantity of deposits. We find that healthy banks can raise deposits by disclosing more information, while weak banks cannot. This confirms that depositor discipline encourages healthy banks to disclose more information. These findings offer support to the proposition of the third pillar of Basel II which aims to encourage market discipline through greater disclosure.*

**Keywords:** Banks, Disclosure, Market Discipline, Depositor Discipline, East Asia

JEL classification: G21; G28

## 1. Introduction

Banking crises have become a common occurrence in recent years. From 1980 to 1995, 133 out of the International Monetary Fund's 181 member countries experienced some form of banking crisis (Lindgren et al., 1996). These crises brought a large scale of disruption in the economy through output losses. For example, the cumulative fiscal costs incurred in the resolution of the banking crises expressed as a percentage of GDP was as high as 50 to 55 percent in Indonesia and 42.3 percent in Thailand, as the result of the 1997 East Asian crisis (Hoggarth et al., 2002). Given the important role that banks play in the economy, the common occurrence of banking crises brings forward the need for greater monitoring of banks. In line with this, the third pillar of the Basel II highlights the role of market discipline in easing the existing pressure on traditional monitoring measures, like capital requirement and government supervision.

Market discipline is the tool through which stakeholders can monitor and discipline banks that have engaged in high risk taking activities, by making them pay for the actual cost of their risk taking. Depositor discipline is one form of market discipline. Depositors can discipline banks either by withdrawing their funds or by demanding higher returns (Freixas and Rochet, 2008). The threat of action by the depositors puts the management under heightened scrutiny. Disciplining action by the depositors encourages greater prudence and efficiency among bank managers. Early detection of weak banks can contain the problems in a particular bank from spreading to the entire banking sector.

Information disclosure is a prerequisite for depositor discipline to take effect. The amount of information that banks disclose matters because absence of information prevents depositor discipline from taking place, while limited information weakens it. Existing theory is divided on whether banks should disclose more information. One strand of literature argues that disclosure is good for banks as it encourages greater prudence while another strand of

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literature argues that disclosure is bad for banks, since in extreme cases, it can cause coordination failure among depositors. Banks have a general tendency to under disclose. Full disclosure is not the optimal choice for banks as it is costly, may cause banks to lose their competitiveness and may create negative externalities. Theoretical ambiguity surrounding the role of information disclosure in banking emphasizes the need for empirical analysis in ascertaining the effect. Nevertheless, to date, there is a lack of studies that have dwelt on this topic. This study fills the gap in the existing literature by answering a pertinent question: Should banks disclose more risk-related information?

In answering the above question, we will analyse banks ability to use greater information disclosure as a signal to attract more deposits. This will be done based on the disclosure practise of the East Asian banks. The East Asian crisis highlights the need for greater transparency and sufficient information disclosure in their banking system. Mondiale (1998)' identifies "unreliable financial reporting, lack of adequate disclosure, lax enforcement to ensure compliance, and poor audits" (p.67) as factors that aggravated problems in the banking sector in East Asia. As a result of this, international banking institutions like the Basel Committee, World Bank and International Monetary Fund (IMF) have urged these countries to enhance their banking sector transparency by improving disclosure<sup>2</sup>. In line with this, regulatory bodies in the East Asian banking system have taken measures to enhance disclosure. This paper aims to analyse the effect of greater information disclosure by the East Asian banks on depositor behaviour.

Existing empirical studies have focused on the content of information disclosure in analyzing depositor discipline. This study contributes to the existing literature by looking at the content as well as the quantity of risk-related information disclosure. This study will directly test the hypothesis of whether banks are able to attract more deposits by disclosing additional risk-related information. This is done by investigating depositors' reaction to the amount of risk-related information that banks disclose during the period from before crisis to after crisis (i.e. 1995 to 2005) and after crisis only. Greater responsiveness of depositors to information disclosure after the crisis period will be in line with the wake-up-call hypothesis. This study also contributes to the existing literature by looking at depositors reaction to the information disclosed by weak (Restructured) and healthy (Non-restructured) banks. Since depositors respond to ex-ante weaknesses in individual banks' fundamentals, they may react differently to the amount of information disclosed by weaker banks compared to the stronger ones. Weaker banks may, in turn, try to stop deposit drain by disclosing less information. If depositor discipline is effective, for a given increase in the amount of information disclosure, healthier banks should attract relatively more deposits than average banks. However, weaker banks may not be able to do so.

This study contributes to the existing literature by adopting a dynamic panel data analysis method in analyzing the relationship between the amount of risk-related information disclosure and deposit growth. In line with the proposition of signalling theory, empirical studies by Nier and Baumann (2006) and Wu and Bowe (2010) confirm that greater ex-post risk-related disclosure is associated with lower ex-ante risk-taking by bank managers<sup>3</sup>. Since depositors' withdrawal actions and banks' response to them is a jointly determined process, the simultaneity that exists in the depositor discipline model needs to be controlled for, in order to find out if greater information disclosure helps banks to attract more deposits. Dynamic panel data analysis is used to confirm whether changes in the amount of information disclosure have an exogenous impact on the quantity of deposits, independent of the endogenous impact of deteriorating fundamentals on disclosure and quantity of deposits.

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<sup>2</sup> Bank of International Settlement (2006) provides the guideline for banks in disclosing information.

<sup>3</sup> Signalling theory posits that by choosing to disclose more information banks chose to lower their default risk in equilibrium (Cordella and Yeyati, 1998 and Boot and Schmeits, 2000).

Overall, the results of this study confirm that greater disclosure helps banks to attract more deposits. Dynamic panel data analysis confirms that changes in the amount of disclosure can exogenously influence depositor behaviour. More specifically, the results show that banks in East Asia were able to attract more deposits over time by disclosing greater risk-related information. In line with the wake-up-call hypothesis, depositors' responsiveness to greater disclosure was higher during the post-crisis period as opposed to the whole sample period. The results also show that healthier (Non-Restructured) banks were able to raise higher deposits over time by revealing more information. However, weaker (Restructured) banks were not able to do so. This confirms that the amount of risk-related information that banks disclose relates to their quality. Greater disclosure is a good signal to attract deposits only for the healthy banks but not the weak ones. Those results suggest that depositors in East Asia reward healthy banks for greater disclosure but they do not discipline weaker banks by demanding greater disclosure.

This paper is organized as follows; section 1.2 describes the disclosure practice in East Asia. Section 1.3 provides the review of the literature. Section 2 describes the methodology used in the analyses. Section 3 explains the results while Section 4 concludes the paper.

### 1.1. Disclosure Practise in East Asia

Information disclosure and transparency varied across the countries in the East Asian region<sup>4</sup>. Within the crisis led countries, information disclosure before crisis was less in Indonesia, Philippines and Thailand (where the regulatory system was mostly merit based) compared to Korea and Malaysia (where the regulatory system was disclosure based) (Ghosh, 2006 and Huang, 2006)<sup>5</sup>. Goldman and Sachs gave a "satisfactory" rating to the transparency of financial systems Indonesia, Malaysia and Philippines, a "fair" rating to Korea and a "poor" rating to Thailand (Gochoco-Bautista et al., 2000). This variation is partly attributed to the differences in the accounting and auditing standards and practices<sup>6</sup>. Apart from this, financial statements of banks in East Asia also lacked compliance with international accounting standards such as the International Accounting Standard (IAS) 30 (Rahman, 1998)<sup>7</sup>.

Prior to the crisis, among the weaknesses that were present in the accounting and disclosure practices in East Asia were:

- Insufficient disclosure of related-party transactions and off-balance sheet financing that concealed high corporate leverage.
- Insufficient reporting of the contingent liabilities of the parent of a conglomerate, or of financial institutions for loan guarantee (mainly foreign-currency loans).
- Insufficient reporting of the large foreign-currency exposure by banks and corporations that happened as a result of high foreign-currency short-term debt.
- Insufficient information disclosure on sectorial loan segmentation, although all countries set a large exposure limit on them.
- Consolidated statements were usually not provided.

<sup>4</sup> Transparency refers to the process by which information about existing conditions, decisions, and actions is made accessible, visible, and understandable (IMF report, 1998).

<sup>5</sup> Thailand was progressing towards a disclosure-based system.

<sup>6</sup> This is attributable to the differences in their legal framework origins. The legal framework of Malaysia and Thailand originated from United Kingdom while the legal framework of Indonesia and Philippines originated from French. Korea, however, has German legal origin.

<sup>7</sup> IAS 30 prescribes appropriate presentation and disclosure standards for banks and similar financial institutions that supplement other requirements standards.

- Weak information disclosure on derivative financial instruments.
- Weak disclosure on loan classification, provisioning for non-performing loans and interest accrual. Even though banks report the accounting policy governing loan loss provisions, information on the aggregate amount of problem loans and advances were not disclosed. Time period for overdue criteria for interest suspension and loan classification were longer.
- In Korea, there was a difficulty in evaluating the solvency of the largest borrowers due to the existence of cross-guarantees.

Source: IMF (1998), Teo et. al (2000) and OECD (2003)<sup>8</sup>

Limited information availability hides details about banks over lending, insufficient credit control and prudential internal regulation of the East Asian banks (MacDonald, 1998). In order to overcome these shortcomings, the East Asian countries took measures to improve transparency and financial disclosure. Among the steps taken by them were adopting IAS, introducing consolidated reporting requirements for corporate groups and requiring disclosure on non-financial information (OECD, 2003)<sup>9</sup>. New rules on loan classification provisioning and interest accrual and by greater participation of on-site examiners and international auditors enhanced disclosure quality (Teo et al., 2000). In addition to this, the Central Bank of Malaysia mandated more frequent reporting of non-performing loans, provisions, and capital positions for all financial institutions and decreased the time lag in releasing data on key indicators of financial soundness to public from six to four months. Similarly, Indonesia, Korea and Thailand also mandated greater and more frequent disclosure.

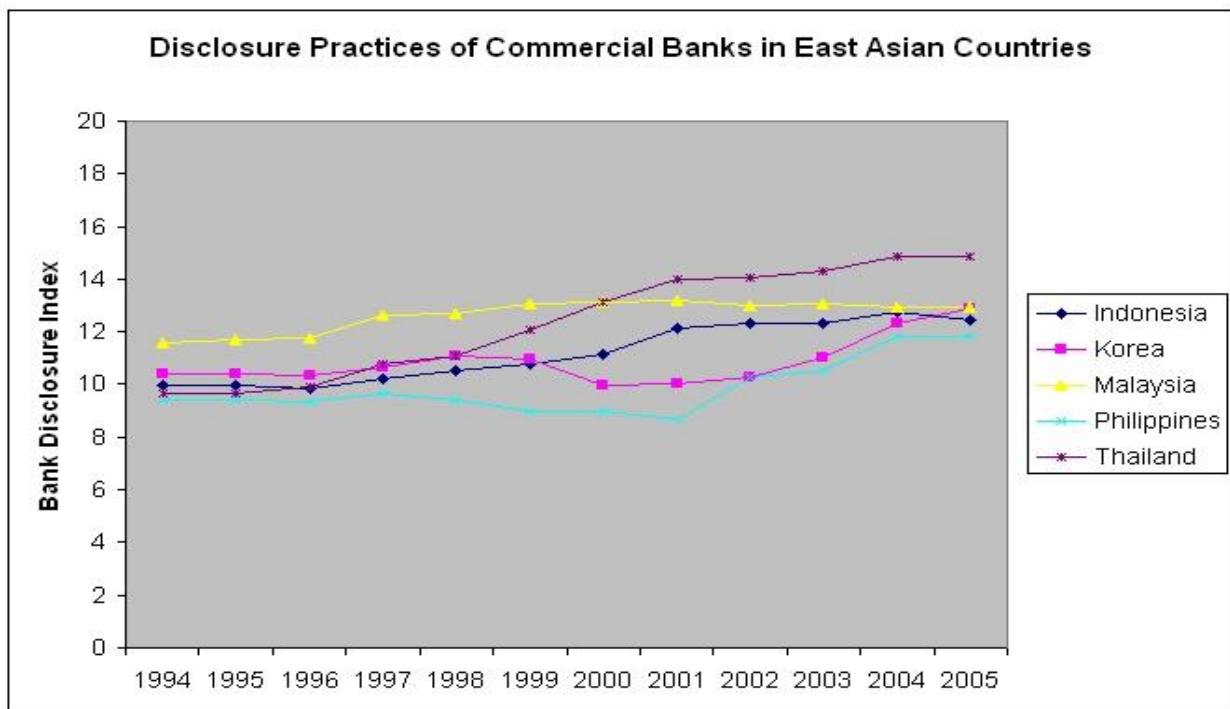


Figure 1. Disclosure Practices of Commercial Banks in the East Asian Countries

<sup>8</sup> The Asian Roundtable on Corporate Governance prepared the White Paper on Corporate Governance in Asia. This is a collective effort by Asian policy makers, regulators, business leaders and regional and international experts in identifying the weaknesses that existed before and during the crisis, and formulating common reform policy to improve corporate governance in Asia.

<sup>9</sup> High number of conglomerates, which are mainly family controlled, exist in Asia. They are able to hide poor financial performance of the holding company by moving the incurred losses to their subsidiaries.

Regulators in these countries took measures to enhance the disclosure on standard of capital adequacy, loan classification and provisioning rules as shown in the World Bank Database on Bank Regulation and Supervision. However, disclosure regulation still varied across these countries. Bank Disclosure Index shown in Figure 1 is created based on the measurement framework originally proposed by Erlend Nier from the Bank of England<sup>10</sup>. This index shows that banks in Korea and Malaysia had better disclosure practice before crisis. Since then, banks in Indonesia and Thailand have gradually increased their disclosure. Bank disclosure in Malaysia increased gradually during the crisis before stagnating since 1999, while disclosure by banks in Korea and Philippines reduced post-crisis before increasing gradually since 2001.

## 1.2. Review of Literature

Disclosure relates to signalling theory in the economic literature. This theory asserts that the signal sent via the disclosure of risk related information by the informed party (i.e., management) to the uninformed (i.e., investors) reduces informational asymmetry (Morris, 1987). Information disclosure also helps financial statement users in making better investment decisions and mitigates resource misallocation in the economy (Watts and Zimmerman, 1986). The role of information disclosure in banking is dwelt well in the existing literature.

Chari and Jagannathan (1988) model shows that availability of information can alter depositors' behaviour as it facilitates their investment decision-making. The role of interim private information about banks' asset payoffs in influencing depositors behaviour has also been looked into in studies by Bryant (1980), Jacklin and Bhattacharya (1988), Alonso (1996), Kaplan (2006) and Chen and Hasan (2006). Existing theory suggests that disclosure is beneficial as it allows depositors to punish bad banks for higher risk taking and reward good banks for greater prudence (Berger, 1991 and Flannery, 1994). Cordella and Yeyati (1998) asserts that when there are no bankruptcy costs and corporate governance problems between bank shareholders and manager, uninsured depositors are able to discipline banks when banks' risk choices are observable. This happens because depositors are able to punish banks that have engaged in high risk taking by demanding higher compensation. Cordella and Yeyati (1998) and Boot and Schmeits (2000) assert that disclosure can reduce moral hazards because by choosing to disclose more information, banks choose to lower their default risk in equilibrium.

Nevertheless, information disclosure by banks can cause investors to misinterpret particular information revealed by a single bank to show the weaknesses of the entire banking system. Misinterpretation is costly as it can trigger depositor panic and even cause strong banks to fail, as postulated by Goldstein and Pauzner (2005). This happened in the case of commercial bank failure in Chicago during the early 1930s as shown by Calomiris and Mason (1997). Review of literature by Healy and Palepu (2001) and Verrecchia (2001) shows that full disclosure is not an optimal disclosure strategy for banks due to the costs (e.g., proprietary costs) involved in producing and disseminating information.

Existing empirical studies confirm that greater disclosure requirement can enhance market discipline (Jordon et al., 1999), reduce the cost of banking crises (Rosengren, 1999), reduce the probability of runs on healthier banks (Hoggarth et al., 2003), improve banks performance and banking sector stability (Barth et al., 2004) and reduce the probability of a

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<sup>10</sup> The index is created for individual banks based on fifteen dimensions of risk-related accounting information disclosed by banks in their financial statements. The country level index is created by averaging the index values of each bank in a country (only banks that is covered in this study).

banking crisis (Tadesse, 2006). Even though the findings of Baumann and Nier (2004) confirms that greater disclosure of risk-related information reduces stock price volatility, this finding is questionable as it does not account for the fact that the management decision to disclose information changes over time<sup>11</sup>. Looking at the time series dimension will require dynamic analysis of stock volatility.

Mitton (2002) highlights the benefit of greater information disclosure in East Asia. His findings confirm that greater performance during crisis time (1997 to 1998) is linked to higher disclosure quality and greater transparency. Caprio (1998) studies the role of information disclosure in twelve Asian and Latin American financial systems in 1997. This is done by developing a transparency score using information about the countries' requirement in having the banks rated, the number of top ten banks with international ratings and a corruption index<sup>12</sup>. His findings show that countries that were badly affected by the crisis had lower transparency while countries like Singapore and Hong Kong, which were less affected by the crisis, had higher transparency<sup>13</sup>.

## 2. Methodology

This study aims to analyze the existence of depositor discipline in the East Asian banking system. The focus of this study is to find if banks are able to attract higher deposits overtime by disclosing more risk-related information in their financial statements. Accordingly, the null hypothesis of this study is that depositor's withdrawals do not respond to the amount of risk-related information that banks disclose in their financial statements. If the amount of risk-related disclosure does not matter to depositors, deposits growth should be uncorrelated with this variable.

### 2.1. Dynamic Panel Data Analysis

Consider the following regression equation:

$$\text{DEPGR}_{i,j,t} = \alpha_i + \lambda_t + \sigma_j + \mu \text{DEPGR}_{i,j,t-1} + \beta \text{BANKSPECIFIC}_{i,j,t-1} + \gamma \text{COUNTRYSPECIFIC}_{j,t} + \varepsilon_{i,j,t}$$

such that  $i = 1, \dots, N$ ;  $j = 1, \dots, J$ ; and  $t = 1, \dots, T$ . DEPGR is the growth rate of real deposits for an individual bank  $i$  at time  $t$  in country  $j$ .  $N$  is the number of banks in each country.  $J$  is the number of countries (i.e. 5 countries).  $T$  is the number of observations per banks ( $i, t$  varies because the panel is unbalanced). BANK SPECIFIC is a vector of bank-level variables that represent banks' risk characteristics. This vector is included with a lag in order to account for the fact that balance sheet information is available to the public with a certain delay. The COUNTRY SPECIFIC represents macroeconomic variables, banking sector variables and other country-level variable.  $\alpha$  accounts for the bank specific effect,  $\lambda$  accounts for the time effect and  $\sigma$  accounts for the country effect. All the variables are expressed in levels.

Estimating depositors discipline using FE model can be biased in the presence of endogeneity and lagged dependency of the dependent variable. Interest rate and the amount information that banks disclose are endogenous in the above model. Endogenous relationship can arise between the deposits growth and disclosure variables as forward looking bank managers are able to anticipate that bank fundamentals at time  $t-1$  affect deposits at time  $t$ ,

<sup>11</sup> They shows that lower volatility of equity return is associated with lower cost of capital and greater effectiveness of stock based compensation.

<sup>12</sup> Corruption index is included because higher corruption is likely to be linked to lower accuracy of information disclosure.

<sup>13</sup> However, this evidence does not show that insufficient transparency caused the crisis to happen.

and as a result they may try to adjust the amount of information that they disclose in order to prevent future deposit withdrawals. Lagged dependency can arise in our model due to the inertial behaviour of the dependent variable. Estimating deposit growth using FE model can be problematic as the lagged dependent variables will be correlated with the compound disturbance terms  $(\alpha_i + \varepsilon_{i,j,t})$ .

In overcoming the possibility of simultaneity and reverse causality in the model, dynamic GMM estimation methods developed by Arellano and Bond (1991) will be used. This method enables one to determine whether the movement of the disclosure index variable has an exogenous impact on the quantity of deposit, independent of the endogenous impact of deteriorating fundamentals on the amount of risk-related disclosure and quantity of deposits. Estimations using a dynamic panel data method removes the potential parameter inconsistency that happens due to simultaneity or reverse causality present between these variables and deposit growth.

Differencing Equation 1 gives:

$$\begin{aligned} \text{DEPGR}_{i,j,t} - \text{DEPGR}_{i,j,t-1} = & \mu'(\text{DEPGR}_{i,j,t-1} - \text{DEPGR}_{i,j,t-2}) + \\ & \beta'(\text{BANKSPECIFIC}_{i,j,t-1} - \text{BANKSPECIFIC}_{i,j,t-2}) + \\ & \gamma'(\text{COUNTRYSPECIFIC}_{j,t} - \text{COUNTRYSPECIFIC}_{j,t-1}) + \\ & (\varepsilon_{i,j,t} - \varepsilon_{i,j,t-1}) \end{aligned}$$

Arellano and Bond (1991) propose the use of the traditional first-differenced GMM (denoted as Difference-GMM) estimator in resolving the endogeneity problem, whereby lagged levels of the endogenous variables are used as instruments. In this study, lagged values of interest rate and disclosure variables, which are highly correlated with the endogenous variables but not directly correlated with the error term  $(\varepsilon_{i,j,t} - \varepsilon_{i,j,t-1})$  can be used as instruments. Under the assumption that a) the error term  $\varepsilon_{i,j,t}$  is not serially correlated, and b) the endogenous variables are assumed to be correlated with the past and present realization of the error term but uncorrelated with the future realization of the error term, a GMM estimator uses the following moment conditions:

$$[\text{DEPGR}_{i,j,t-s} (\varepsilon_{i,j,t} - \varepsilon_{i,j,t-1})] = 0 \text{ for } s \geq 2 ; t = 3, \dots, T$$

$$[\text{Interest Rate}_{i,j,t-s} (\varepsilon_{i,j,t} - \varepsilon_{i,j,t-1})] = 0 \text{ for } s \geq 2 ; t = 3, \dots, T$$

$$[\text{Lagged Disclosure Index}_{i,j,t-s} (\varepsilon_{i,j,t} - \varepsilon_{i,j,t-1})] = 0 \text{ for } s \geq 2 ; t = 3, \dots, T$$

Analysis of this study will be carried out using Difference-GMM. Estimation using this method focuses on the overtime variation in the dependent and independent variables. This facilitates in answering the question as to whether banks are able to attract relatively higher deposits overtime by disclosing additional risk-related information.

## 2.2. Data

The analysis of this study is carried out using the sample of commercial banks in five East Asian countries namely Indonesia, Korea, Malaysia, Philippines and Thailand. Bank level data is obtained from BankScope. The database for each bank is obtained for the period between 1995 to 2005. This period of study is chosen in order to find out if the evidence of depositor discipline is higher during the post crisis period as opposed to the whole sample period. Effectiveness of depositor discipline during the time of country level macroeconomic data is obtained from the International Monetary Fund's International Financial Statistics database. Data on the coverage of the deposit insurance scheme is obtained from Demirgüç-Kunt et al (2005). Data for the Disclosure Intensity variable is obtained from the World Bank's database on the regulation of disclosure in the banking sector as described in Barth et al. (2001). Data on bank restructuring in the five East Asian countries is obtained from

BankScope, bank and central bank website, and academic sources that have detailed the restructuring<sup>14</sup>.

All commercial bank data that is available from BankScope are used for our analysis. This yielded an initial sample of 197 banks. The number of observation available for the regression analysis changes according to the variables used in the regressions. Since two periods lags of the dependent variable are used in the dynamic panel data analysis, banks with less than three-year financial data in the BankScope database will be automatically eliminated in the regressions. Therefore, the actual number of banks used in the regression analysis is around 150.

### 3. Results

#### 3.1. Summary Statistics

The summary statistics are presented in Table 1 and Table 2. The names of the variables are provided in column 1. Table 1 presents the summary statistics for the variables over the entire 1995 - 2005 sample period while Table 2 presents the summary statistics for all periods; before crisis, during crisis and after crisis. Columns 3 and 7 of Table 1 show the average value for each variable and the total number of observations, while columns 4 to 6 indicate the overall, between and within variations in the standard deviation, and the minimum and maximum value for each variable. For each period, Table 2 indicates the total number of observations and the average value for each variable, with the standard deviation presented below in parentheses.

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<sup>14</sup> Ariff et al. (2001), Ito and Hashimoto (2007), Ito and Hashimoto (2007a), Kawai and Takayasu (1999), Teo et al. (2000), Num and Lum (2006), Pangestu and Habir (2002), Park (2005), Polsiri and Wiwattanakantang (2006), Sato (2005) and Soon and Koh (2005).



Variable Name		All Period				Observation
		Mean	Std. Deviation	Min	Max	
Deposits Growth	overall	19.21	58.96	-95.96	515.23	1315
	between		23.77	-21.59	222.55	
	within		54.56	-136.67	470.77	
Interest Rate	overall	7.43	5.87	0.70	48.50	1018
	between		4.16	1.68	22.38	
	within		4.27	-4.57	37.33	
Disclosure Index	overall	11.58	2.23	4.00	17.00	1327
	between		1.99	4.00	17.00	
	within		1.34	5.58	17.00	
Total Equity / Total Assets	overall	11.03	12.37	-129.21	99.72	1640
	between		8.75	-11.09	55.15	
	within		8.92	-107.08	82.20	
Return on Equity	overall	3.22	77.21	-975.36	967.12	1632
	between		34.95	-242.66	115.08	
	within		70.48	-789.86	855.25	
Liquid Assets / Total Assets	overall	22.96	16.87	0.20	96.79	1640
	between		13.03	1.09	72.01	
	within		10.40	-20.03	86.83	
Costs to Income Ratio	overall	64.33	55.19	2.30	873.58	1575
	between		31.72	12.00	236.14	
	within		45.19	-94.13	742.82	
Loan Loss Reserve / Gross Loans	overall	6.80	9.46	0.00	90.19	1575
	between		6.38	0.84	52.43	
	within		7.48	-43.24	70.50	
Log Size	overall	14.11	1.95	9.27	19.01	1638
	between		1.88	9.71	18.06	
	within		0.41	11.39	16.40	
HHI	overall	0.13	0.06	0.05	0.35	2364
	between		0.03	0.09	0.17	
	within		0.05	0.04	0.32	
Deposit Insurance	overall	1.49	0.95	0.00	3.00	2364
	between		0.42	0.92	2.25	
	within		0.85	-0.76	2.57	
GDP Per Capita	overall	3004.31	3649.10	3.00	13303.82	2364
	between		3350.33	768.94	10073.83	
	within		1464.04	-7065.79	6234.29	
Disclosure Intensity	overall	3.24	0.60	2.00	4.00	2364
	between		0.47	2.33	4.00	
	within		0.37	2.91	4.91	

Table 1: Summary Statistics

Variable Name	All Period		Before Crisis		Crisis		Post Crisis	
	Obs	Mean (Std. Dev.)	Obs	Mean (Std. Dev.)	Obs	Mean (Std. Dev.)	Obs	Mean (Std. Dev.)
Deposits Growth	1315	19.206 (58.959)	255	32.880 (54.921)	267	-11.683 (46.817)	793	25.209 (60.380)
Interest Rate	1018	7.429 (5.872)	114	8.885 (3.872)	222	12.096 (8.610)	682	5.667 (3.792)
Disclosure Index	1327	11.57875 (2.228555)	332	10.43975 (1.743174)	243	11.08642 (1.835357)	752	12.24069 (2.292068)
Total Equity / Total Assets	1640	11.035 (12.370)	409	11.134 (9.665)	306	9.165 (17.949)	925	11.610 (11.051)
Return on Equity	1632	3.219 (77.210)	409	11.197 (19.507)	301	-14.326 (132.373)	922	5.407 (67.431)
Liquid Assets / Total Assets	1640	22.957 (16.874)	409	20.843 (13.497)	306	20.971 (16.217)	925	24.549 (18.220)
Costs to Income Ratio	1575	64.328 (55.189)	406	57.664 (28.837)	283	65.961 (59.131)	886	66.860 (62.408)
Loan Loss Reserve / Gross Loans	1575	6.803 (9.460)	390	2.300 (3.218)	298	7.598 (10.429)	887	8.516 (10.291)
Log Total Assets	1638	14.115 (1.9475)	409	14.231 (1.804)	306	13.777 (1.899)	923	14.175 (2.0130)
Total Assets Growth	1405	3.173 (32.056)	256	18.387 (11.545)	277	-23.950 (43.496)	872	7.322 (26.433)
HHI	2364	0.126 (0.061)	591	0.109 (0.0409)	394	0.091 (0.015)	1379	0.144 (0.070)
Deposit Insurance	2364	1.485 (0.946)	591	0.386 (0.789)	394	1.563 (0.995)	1379	1.934 (0.514)
GDP Per Capita	2364	3004.307 (3649.096)	591	2951.375 (3134.772)	394	3104.459 (3340.73)	1379	2998.376 (3929.342)
Disclosure Intensity	2364	3.245 (0.595)	591	3.081 (0.535)	394	3.091 (0.535)		3.355 (0.611)

Table 2: Summary Statistics by Time Period

### 3.1.1. Dependent Variables

Growth rate of real deposits is used as the dependent variable in our analysis. This variable is a measure of Total Deposits Growth from one period to another expressed in real terms as a percentage and adjusted for inflation. Table 1 show that real deposits growth averaged around 19% for all period. The overtime variation of this variable is more than double than the between-bank variation as shown by the standard deviation.

Table 2 shows that deposits growth of the banks in the sample averaged 32% before crisis. Deposit growth plummeted during crisis to -12% before rising to 25% after crisis.

### 3.1.2. Disclosure Variable

The Disclosure Index is one of the most commonly used disclosure variables in the existing literature<sup>15</sup>. The Disclosure Index consists of the list of selected accounting information that can be disclosed in the company report (Marston and Shrikes, 1991). More specifically, Hassan and Marston (2010) define the disclosure index as "a research instrument to measure the extent of information reported in a particular disclosure vehicle(s) by a particular entity(s) according to a list of selected items of information".

For the present study, the Disclosure Index will be measured based on the measurement framework proposed by Erlend Nier from the Bank of England. The index for each bank is derived using the amount of information available in the bank's annual report on fifteen core disclosure items, as reported in the Fitch IBCA BankScope database. This disclosure index is constructed using the check box approach similar to the CIFAR (Center for International Financial Analysis Research) index, but it is constructed at the bank level<sup>16</sup>. This index consists of sub-indices that represent 15 categories of disclosure related to interest-rate risk, credit risk, liquidity risk, market risk, and capital<sup>17</sup> (see Appendix). These items are very compatible with the frameworks proposed by IMF's Financial Soundness Indicators (FSI) and Basel Committee (Huang, 2006). Studies by Baumann and Nier (2004), Nier and Baumann (2006), Huang (2006) and Wu and Bowe (2010) have used this index. Table 1 show that Disclosure Index ranges from 4 to 17. On average, banks disclose risk-related information in 11 risk categories. Table 2 shows that disclosure of risk related information is lower before crisis. Disclosure is higher during the post-crisis period compared the whole sample period.

### 3.1.3. Bank Specific Variables

Banks can use price variable to attract more deposits. This study uses the ratio of Interest Expense to Interest-Bearing Debt to measure banks funding cost per unit of debt. Studies by Demircuc-Kunt and Huizinga (2004) and Bowe and Wu (2007) have used this variable to represent the price of deposits. Table 2 indicates that price increased during crisis period. However, price during the post-crisis period is shown to be lower than the price during the all period.

The CAMEL variables are used as the remaining explanatory variables. These variables are proxies for bank quality that depositors are reasonably likely to monitor. Capital adequacy is measured using the ratio of Total Equity to Total Assets. This variable measures banks' health and ability to withstand adverse shocks. According to Table 1, this variable averaged 11% during all periods. Assets quality is measured using the ratio of Loan Loss Provisions to Gross Loans. Higher provision can either be linked poor assets quality or greater prudence. Table 1 show that the ratio of Loan Loss Provisions to Gross Loans averaged around 7% for the whole sample period. Table 2 indicates that banks' provisions are lower before the crisis period (2%).

<sup>15</sup> Marston and Shrikes (1991) provides survey of the use of disclosure indices. Hassan and Marston (2010) provide the comprehensive survey of the use of various disclosure proxies.

<sup>16</sup> CIFAR index consist of ninety items that are included in the companies' annual report. Seventy percent of the companies are involved in the non-financial sector.

<sup>17</sup> Even though the definition of the items included in the index may vary from one country to another, it is less of a concern as far as this study is concerned because this study is mainly interested in the availability of information instead of the content of information.

Management quality is measured using the Cost to Income Ratio (CIR). This variable is defined as the ratio of operating costs (it may include expenses such as salary, investment in training, and the marketing fees for banks' financial products) to operating income. Lower ratio may indicate that banks have been efficiently run while higher ratios may be linked with greater engagement of banks in sales and marketing activities to attract more business. CIR averaged 64% during the whole period (Table 1). This ratio is lower before the crisis period (58%) as shown in Table 2.

Return on Equity (ROE) is used in order to measure bank earnings. This variable is measured by the ratio of pre-tax profits to total equity. The average ROE during the whole period is 3%. The banks' earnings ratio varied more overtime than across banks as shown in Table 1. The banks' liquidity is measured using the ratio of Liquid Assets to Total Assets. Liquid Assets take into account of the cash reserves and balances with the central bank. Banks were holding higher liquid assets (25%) after the crisis period as shown in Table 2. Size is measured as the natural logarithm of Total Assets. Depositors' incentive in monitoring and disciplining banks is likely to be weakened by the perception that larger banks are less likely to fail. This is in line with 'too-big-to-fail' hypothesis. Studies by Park and Peristiani (1998), Barajas and Steiner (2000), Maechler and McDill (2003) and Bowe and Wu (2007) and Levy-Yeyati et al. (2010) have controlled for size.

### 3.1.4. Country Specific Variables

Deposit growth can be linked to general economic conditions in a country. Demirgüç-Kunt and Huizinga (2004) have used GDP per capita to control for the general strength of the economy<sup>1819</sup>. This variable averaged \$3000 during the whole period. The Herfindahl–Hirschman Index (HHI) is used to measure market concentration, and it is used as a proxy for competition. It is defined as the sum of the squares of market shares of all the banks in a country, where the market shares are expressed as fractions. It has the following form:

$$H = \int_i^N s_i^2$$

where  $s_i$  is the market shares of bank  $i$  and  $N$  is the number of banks in the system. The market share of banks is measured using total assets as a proxy for bank size. HHI gives higher weight to larger banks compared to the smaller ones. Higher HHI is associated with greater concentration in the banking industry while lower HHI is associated with greater competition in the industry. Park and Peristiani (1998) and Ungan et al, (2008) have controlled for market concentration in the banking sector when analyzing depositor discipline. Table 2 shows that concentration in the banking industry increased after the crisis period.

Introduction of safety net measure such as deposit insurance scheme is likely to influence depositors' sensitivity to banks' risk. Depositors' discipline can be weakened by the existence of deposit protection schemes. This study controls for the existence of depositor discipline by using a deposit insurance index. This index is derived based on Demirgüç-Kunt and Huizinga (2004) study. The variation in the deposit insurance schemes is measured based on three aspects, which include explicit deposits insurance, unlimited coverage, and inter-

<sup>18</sup> Since total deposits in this study are all measured in real values, inflation is not included as a control variable.

<sup>19</sup> GDP per capita, which is measured as the gross domestic product (GDP) divided by the number of people in the country, is especially useful when doing cross-country analysis as it shows the relative performance of the countries.

bank deposit coverage. The deposit insurance index ranges from 0 to 3. Table 2 shows that deposit insurance is lower before the crisis period.

In addition to these, Disclosure Intensity is used as an external instrument. The World Bank provides the database on the regulation of disclosure in the banking sector for many countries based on the response of the supervisory bodies as described in Barth et al. (2001). This data has been extensively used in studies by Barth et al. (2004), Cull et al. (2005), Cleassens and Laeven (2004), Demirguc-Kunt and Huizinga (2004) and Tadasse (2006). Based on Bushman et al. (2004)'s framework in measuring corporate reporting quality, Tadasse (2006) describes Disclosure Intensity as a measure of the degree and magnitude of financial information disclosure that is required by the banking regulators.

The variable is constructed by adding the survey response on information relating to whether banks are required to disclose information about risk management practices, if it accurately exhibits non-performing loans, provides detailed information on bank activity by reporting consolidated financial statements, and exhibits detailed information by reporting off balance sheet transactions. The amount of information that banks disclose is conditional on the regulated disclosure in the banking sectors in each country. Hence, this variable should be related to higher Disclosure Index (see Appendix 2 for detail). Table 2 shows that compared to the whole sample period, Disclosure Intensity are lower before crisis and higher post-crisis. This shows that regulators in East Asia required banks to disclose more information after the crisis.

## 4. Results

### 4.1. Dynamic Panel Data Analysis

Panel data estimations can be biased in the presence of lag dependency of the dependent variable and endogeneity. This section will address the shortcomings of the panel data analysis by using dynamic panel data analysis. All variables are entered in difference (not level) in the Difference-GMM estimations. The dynamic relationship between the disclosure and deposit growth is estimated using one-step robust, two-step and also two-step robust Difference-GMM estimator. This study aims to find out if an increase in the Disclosure Index is linked to higher deposit growth. Initially, a model specification that treats the Disclosure Index as an exogenous variable and directly enters it in the dynamic panel models is examined. Then, a model specification which treats the Disclosure Index as an endogenous variable is looked into. This will be done with and without controlling for the interest rate effect. Further to this, the endogenous relationship between Disclosure Index and deposit growth will be analyzed for the post-crisis period only. Similar analysis is carried out by segregating banks in the sample into healthy (i.e. Non-restructured) and weak (i.e. Restructured) ones.

Since there are two endogenous variables in this model, the number of instruments used in the analysis needs to be limited to ensure that the problem of weak instruments does not arise. Estimations have been carried out by increasing or decreasing the number of instruments. Three period lag in level and difference (i.e. lag (3 3)) is chosen as any other limits worsen the diagnostics.

#### 4.1.1. Exogenous Disclosure Mechanism

This section examines whether disclosure influences the behaviour of depositors. The Disclosure Index, the amount of risk-related information that banks disclose, is included as an additional explanatory variable. In this section, the Disclosure Index is treated as an exogenous variable and directly entered in the dynamic panel models. This specification focuses on whether an increase in the disclosure is associated with a rise in deposit growth. Column 1 to 3 of Table 3 shows the estimation results without controlling for the price effect.

The findings show that an increase in the disclosure, when treated as an exogenous change, affects deposit growth positively. But this effect is not statistically different from zero. Estimations by controlling for the price effect are shown in column 4 to 6 of Table 3. The results show that the coefficient of the Disclosure Index is positive but not statistically significant.

The diagnostic tests for the estimation without interest rate variables show that there is no second-order serial correlation, but the Hansen test of over-identification has a p-value of 0.10. This provides some support that the dynamic process between the deposit growth and disclosure is still not properly controlled for. The diagnostic test for the estimation with the interest rate variable shows that there is a second-order serial correlation under the one-step robust estimation, while the diagnostic test for the two-step robust estimation shows that the Hansen test has a p-value of 0.081. This suggests that the used instruments are not valid.

By treating the Disclosure Index as an exogenous variable, it is assumed that changes in the amount of risk-related information disclosure and quantity of deposits are not jointly determined with the financial strength of a bank. However, forward looking bank managers may expect depositors to react to changes in bank fundamentals. In line with this, their decision to disclose information may change over time depending on banks financial strength. In expectation of depositor reaction ex-post, managers of the stronger banks may disclose more information while that of weaker banks may disclose less information. To address this issue, the impact of a change in banks' financial strength on the deposit growth and disclosure needs to be controlled for. Doing so enables the examination of the effect of a bank's decision to disclose information on depositor behaviour.

VARIABLES	Exogenous Disclosure Mechanism					
	Dependent Variable : Growth Rate of Real Deposits					
	(1)	(2)	(3)	(4)	(5)	(6)
L1 Deposits Growth	0.170 (0.244)	0.145 (0.173)	0.145 (0.249)	-0.182 (0.122)	-0.164*** (0.0422)	-0.182** (0.0720)
L2 Deposits Growth	-0.134 (0.101)	-0.152* (0.0831)	-0.152 (0.121)	-0.140* (0.0715)	-0.0644** (0.0264)	-0.0865** (0.0393)
Interest Rate				0.994 (1.828)	-0.766 (0.953)	0.479 (1.199)
Lag (Disclosure Index)	1.398 (1.787)	2.270 (1.707)	2.270 (2.193)	1.273 (1.706)	0.275 (1.302)	1.175 (1.640)
Lag (Total Equity / Total Assets)	4.697*** (1.221)	4.928*** (1.069)	4.928*** (1.592)	3.234*** (0.812)	3.431*** (0.674)	3.438*** (0.970)
Lag (Return on Equity)	-0.000884 (0.0525)	-0.0278 (0.0452)	-0.0278 (0.0587)	-0.00112 (0.0665)	-0.0847** (0.0375)	-0.0348 (0.0355)
Lag (Liquid Assets / Total Assets)	-0.264 (0.266)	-0.420* (0.236)	-0.420* (0.235)	-0.0274 (0.205)	-0.196 (0.120)	-0.127 (0.164)
Lag (Costs to Income Ratio)	0.00309 (0.0378)	-0.0183 (0.0362)	-0.0183 (0.0466)	0.00796 (0.0556)	0.0587* (0.0354)	0.000946 (0.0346)
Lag (Loan Loss Reserve / Gross Loans)	-0.0709 (0.277)	-0.260 (0.249)	-0.260 (0.355)	-0.0555 (0.252)	-0.290* (0.170)	-0.186 (0.263)
Size	133.4*** (15.68)	124.9*** (14.84)	124.9*** (20.17)	137.6*** (38.94)	156.0*** (14.49)	133.2*** (16.08)
HHI	894.2*** (113.5)	911.8*** (94.16)	911.8*** (123.4)	739.2*** (97.06)	749.9*** (57.42)	754.6*** (95.62)
Deposit Insurance	5.273 (6.878)	4.189 (4.913)	4.189 (5.146)	1.736 (61.46)	67.14** (29.89)	2.898 (3.961)
GDP Per Capita	0.00274 (0.00583)	0.00283 (0.00576)	0.00283 (0.00702)	0.00194 (0.00574)	0.00118 (0.00552)	-0.000775 (0.00733)
Type of Difference GMM Estimator	One-step Robust	Two-step	Two-step Robust	One-step Robust	Two-step	Two-step Robust
Lags	lag (3 3)	lag (3 3)	lag (3 3)	lag (3 3)	lag (3 3)	lag (3 3)
Observations	466	466	466	454	454	454
Number of Banks	113	113	113	110	110	110
Number of Instruments	25	25		31	31	32
External Instrument						
AB test of no AR(1)						
Prob > z =	0.154	0.067	0.254	0.609	0.086	0.91
AB test of no AR(2)						
Prob > z =	0.287	0.202	0.358	0.063	0.338	0.35
Hansen test of overidentification						
Prob > chi2 =		0.100	0.100		0.189	0.081

1)\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

2)Each regression also contains time dummy variables that are not reported

Table 3 Dynamic Panel Data with Exogenous Disclosure Mechanism

#### 4.1.2. Endogenous Disclosure Mechanism

In this section, the Disclosure Index is treated as an endogenous variable to control for the simultaneity or reverse causality between the Disclosure Index and deposit growth. By doing so, this study aims to find if changes in the amount of disclosure can exogenously influence depositor behaviour. Difference-GMM controls for the dynamic interactions between disclosure and deposit growth by using internal instruments. These instruments are

highly correlated with the endogenous variables and not correlated with the error term. This technique uses the lagged levels of the endogenous variables as valid instruments and combines it with first differences of the strictly exogenous variables to control for potential biases induced by simultaneity or reversal causality between endogenous variables.

The estimations without the interest rate variable are presented in columns 1 to 3 of Table 4. The results are consistent with the requirement of no second-order serial correlation. The Hansen test of over-identification has a p-value of 0.058. This suggests that the model specifications presented in these columns are miss-specified. Columns 4 to 6 present the results of the estimations when the interest rate is added as an additional endogenous regressor. The model specification passes the Hansen test, suggesting that the model is correctly specified. The results are also consistent with the requirement of no second-order serial correlation.

Estimations with the interest rate variable in column 4 to 6 show that the coefficient of the Disclosure Index is positive and statistically significant. This implies that once the dynamic relationship between the amount of information disclosure and deposit growth is controlled for; for a given price, banks are able to attract relatively higher deposits by disclosing more risk-related information. The coefficient of Disclosure Index is 9.68. This implies that one unit increase in Disclosure Index raises deposits growth by 9.68 percent. This finding suggests that banks should disclose more risk-related information as it enables them to attract more deposits.

In order to check for the robustness of the findings, the lag value of Disclosure Intensity is added as an external instrument<sup>20</sup>. Estimations are shown in column 7 to 9 of Table 4. The diagnostic tests show that there is no second order serial correlation, and the Hansen test shows this instrument is valid. The results show that greater disclosure significantly increases deposit growth. In addition to this, the findings also show that depositors prefer banks that are more solvent and bigger. Results in column 7 shows that once the endogenous effect of disclosure and price is taken into account, profitability and provisioning are linked to higher deposits growth while liquidity and costs to income ratio are linked to lower deposits growth.

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<sup>20</sup> GMM technique allows the use of external instruments (Roodman, 2007).



VARIABLES	Endogenous Disclosure Mechanism								
	Dependent Variable : Growth Rate of Real Deposits								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1 Deposits Growth	-0.0486 (0.178)	-0.0889 (0.110)	-0.0857 (0.179)	-0.206** (0.0854)	-0.209*** (0.0504)	-0.209** (0.0855)	-0.205** (0.0835)	-0.208*** (0.0504)	-0.208** (0.0856)
L2 Deposits Growth	-0.0606 (0.0793)	-0.124* (0.0673)	-0.121 (0.102)	-0.100*** (0.0503)	-0.0722** (0.0301)	-0.100** (0.0493)	-0.100** (0.0495)	-0.0711** (0.0300)	-0.0711 (0.0499)
Interest Rate				-0.407 (1.336)	-0.770 (0.660)	-0.770 (1.005)	-0.397 (1.299)	-0.751 (0.658)	-0.751 (1.005)
Lag (Disclosure Index)	12.51*** (4.808)	11.00*** (3.445)	11.15** (5.010)	9.682** (4.326)	9.476*** (2.882)	9.476** (4.035)	9.708** (4.303)	9.558*** (2.874)	9.558** (4.055)
Lag (Total Equity / Total Assets)	4.37*** (1.081)	3.607*** (0.890)	3.693*** (1.276)	3.666*** (0.821)	3.182*** (0.649)	3.182*** (1.080)	3.668*** (0.828)	3.240*** (0.618)	3.240*** (1.068)
Lag (Return on Equity)	0.0209 (0.0361)	0.0328 (0.0325)	0.0346 (0.0544)	0.00437 (0.0284)	-0.0278 (0.0210)	-0.0278 (0.0467)	0.00421 (0.0283)	-0.0268 (0.0205)	-0.0268 (0.0448)
Lag (Liquid Assets / Total Assets)	-0.0976 (0.177)	-0.230 (0.150)	-0.237 (0.231)	-0.0931 (0.206)	-0.124 (0.112)	-0.124 (0.171)	-0.0932 (0.206)	-0.131 (0.109)	-0.131 (0.165)
Lag (Costs to Income Ratio)	-0.00522 (0.0328)	-0.0108 (0.0280)	-0.0102 (0.0521)	-0.00982 (0.0311)	-0.0102 (0.0243)	-0.0102 (0.0502)	-0.00985 (0.0310)	-0.00970 (0.0243)	-0.00970 (0.0489)
Lag (Loan Loss Reserve / Gross Loans)	0.163 (0.269)	-0.108 (0.201)	-0.110 (0.313)	0.0647 (0.264)	-0.0237 (0.176)	-0.0237 (0.293)	0.0650 (0.264)	-0.0271 (0.176)	-0.0271 (0.296)
Size	131.1*** (14.07)	133.3*** (11.76)	133.1*** (16.97)	130.3*** (14.86)	137.7*** (9.700)	137.9*** (15.97)	130.4*** (14.68)	137.9*** (9.676)	137.9*** (16.09)
HHI	771.3*** (102.9)	733.5*** (72.86)	735.4*** (122.1)	696.6*** (76.78)	667.2*** (53.74)	667.2*** (84.36)	697.2*** (75.99)	670.5*** (52.61)	670.5*** (82.96)
Deposit Insurance	-1.490 (5.484)	1.885 (4.065)	1.634 (5.209)	-2.842 (4.274)	2.763 (3.302)	2.763 (4.180)	-2.833 (4.266)	2.673 (3.287)	2.673 (4.159)
GDP Per Capita	0.00228 (0.00566)	-0.00113 (0.00534)	-0.00180 (0.00842)	0.00238 (0.00569)	0.000376 (0.00527)	0.000376 (0.00869)	0.00239 (0.00566)	-0.000206 (0.00484)	-0.000206 (0.00796)
Type of Difference GMM Estimator	One-step Robust lag (3 3)	Two-step lag (3 3)	Two-step Robust lag (3 3)	One-step Robust lag (3 3)	Two-step lag (3 3)	Two-step Robust lag (3 3)	One-step Robust lag (3 3)	Two-step lag (3 3)	Two-step Robust lag (3 3)
Lags	466	466	466	454	454	454	454	454	454
Observations	113	113	113	110	110	110	110	110	110
Number of Banks	32	32	33	39	39	39	40	40	40
Number of Instruments									
External Instrument									
AB test of no AR(1)									
Prob > z =	0.313	0.166	0.37	0.543	0.969	0.973	0.551	0.965	0.969
AB test of no AR(2)									
Prob > z =	0.877	0.323	0.472	0.868	0.822	0.836	0.867	0.833	0.845
Hansen test of overidentification									
Prob > chi2 =		0.04	0.058		0.162	0.162		0.202	0.202

1)\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

2)Each regression also contains time dummy variables that are not reported

Table 4: Dynamic Panel Data with Endogenous Disclosure Mechanism

#### 4.1.2. Post-Crisis

Estimations are performed using post crisis data (i.e. from 1999 to 2005) in order to find out if depositors' response to banks' risk problems and the amount of information

disclosure changes after crisis<sup>21</sup>. Greater sensitivity by depositors to bank-specific information during the post-crisis period will be in line with the wake-up-call hypothesis. All estimations pass the diagnostic tests. Estimation of depositor discipline during the post crisis period is reported in column 1 to 3 of Table 5. The results show that Disclosure Index is associated with higher deposits growth. More specifically, two-step robust estimation shows that one unit increase in the Disclosure Index raises deposit growth by 11.60 percent. Estimation for the whole sample period shows that a one-unit increase in the Disclosure Index raises deposit growth by 9.56 percent. This finding suggests that depositors are more responsive to the amount of risk-related information that banks disclose after the crisis. Similarly, the coefficient of the solvency ratio and size are also higher under the post-crisis period estimations.

#### **4.1.3. Restructured vs Non-restructured Banks**

In this section, the study aims to find out whether depositors react differently to the risk-related information disclosed by healthier banks compared to weaker ones. Existing studies by Bongini et al. (2001), Bongini et al.(2002), Rojas-Suarez (2002) and Arena (2008) show that bank restructuring exercise is a good proxy for the overall quality of banks in East Asia. In line with this, bank restructuring is used as the criteria to subdivide the sample of banks in the data set into weak and healthy banks. Restructured banks are categorized as weak banks while Non-restructured banks are categorized as healthy banks. Overall, 74 banks in the sample are categorized as healthy while 36 are categorized as weak. Healthier banks have an average deposit growth of 21.07 percent while the weaker ones have an average deposit growth of 13.72 percent.

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<sup>21</sup> All period consist of time period from 1995 to 2005.

VARIABLES	Endogenous Disclosure Mechanism								
	Dependent Variable : Growth Rate of Real Deposits								
	Post-Crisis			Restructured			Non-Restructured		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1 Deposits Growth	-0.164* (0.0658)	-0.164*** (0.0620)	-0.164* (0.0904)	-0.456*** (0.141)	-0.248* (0.134)	-0.248 (0.211)	-0.166* (0.0993)	-0.186*** (0.0536)	-0.186*** (0.0908)
L2 Deposits Growth	-0.0849 (0.0523)	-0.0568 (0.0378)	-0.0568 (0.0510)	-0.223* (0.123)	-0.164** (0.0721)	-0.164 (0.141)	-0.111** (0.0554)	-0.0755** (0.0301)	-0.0755 (0.0480)
Interest Rate	0.238 (1.401)	-0.231 (0.935)	-0.231 (1.207)	-4.234 (3.108)	-4.449* (2.347)	-4.449 (3.407)	-0.802 (1.175)	-1.135** (0.519)	-1.135 (0.767)
Lag (Disclosure Index)	15.00*** (4.942)	11.60*** (3.278)	11.60** (4.609)	5.889 (4.436)	-2.799 (5.228)	-2.799 (7.923)	9.166* (5.331)	9.788*** (2.932)	9.788** (4.467)
Lag (Total Equity / Total Assets)	4.667*** (1.025)	4.235*** (0.709)	4.235*** (1.024)	3.661* (1.963)	4.099*** (1.115)	4.099 (2.747)	4.063*** (0.868)	3.281*** (0.560)	3.281*** (0.938)
Lag (Return on Equity)	0.0263 (0.0364)	0.000777 (0.0251)	0.000777 (0.0455)	-0.0190 (0.046)	-0.0881*** (0.0317)	-0.0881* (0.0513)	0.0768 (0.0507)	0.0133 (0.0241)	0.0133 (0.0298)
Lag (Liquid Assets / Total Assets)	-0.0385 (0.189)	-0.0458 (0.114)	-0.0458 (0.144)	-0.392 (0.475)	-0.796*** (0.287)	-0.796 (0.567)	0.0555 (0.220)	-0.0399 (0.105)	-0.0399 (0.153)
Lag (Costs to Income Ratio)	-0.00986 (0.0353)	0.00634 (0.0278)	0.00634 (0.0475)	-0.0709*** (0.0257)	-0.0631*** (0.0207)	-0.0631** (0.0316)	0.0513 (0.0409)	0.0886*** (0.0280)	0.0886** (0.0388)
Lag (Loan Loss Reserve / Gross Loans)	0.163 (0.268)	0.0302 (0.184)	0.0302 (0.276)	-0.323 (0.849)	-0.620 (0.722)	-0.620 (1.341)	0.0680 (0.304)	0.0787 (0.177)	0.0787 (0.240)
Size	138.9*** (15.28)	141.7*** (10.77)	141.7*** (15.24)	87.46*** (21.54)	92.42*** (18.49)	92.42*** (29.08)	127.7*** (17.70)	131.2*** (10.19)	131.2*** (16.02)
HHI	741.1*** (93.56)	740.1*** (72.93)	740.1*** (105.4)	602.2*** (146.4)	667.3*** (117.7)	667.3*** (257.6)	659.1*** (71.46)	673.7*** (40.27)	673.7*** (61.00)
Deposit Insurance	7.908 (19.06)	14.60 (17.33)	14.60 (19.10)	3.256 (8.077)	10.07 (7.397)	10.07 (14.01)	-7.884 (5.218)	-4.430 (3.822)	-4.430 (4.727)
GDP Per Capita	0.00287 (0.00572)	0.000289 (0.00490)	0.000289 (0.00819)	-0.00977 (0.00750)	-0.0118*** (0.00290)	-0.0118 (0.00859)	0.00743* (0.00402)	0.00588** (0.00241)	0.00588* (0.00355)
Type of Difference GMM Estimator	One-step Robust lag (3 3)	Two-step lag (3 3)	Two-step Robust lag (3 3)	One-step Robust lag (3 3)	Two-step lag (3 3)	Two-step Robust lag (3 3)	One-step Robust lag (3 3)	Two-step lag (3 3)	Two-step Robust lag (3 3)
Lags	391	391	391	108	108	108	346	346	346
Number of Banks	102	102	102	36	36	36	74	74	74
Number of Instruments	38	38	38	39	39	39	40	40	40
External Instrument									
AB test of no AR(1)									
Prob > z =	0.26	0.619	0.658	0.643	0.59	0.762	0.313	0.765	0.784
AB test of no AR(2)									
Prob > z =	0.942	0.853	0.865	0.305	0.76	0.833	0.536	0.785	0.796
Hansen test of overidentification									
Prob > chi2 =		0.44	0.44		0.936	0.936		0.655	0.655

1)\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

2)Each regression also contains time dummy variables that are not reported

Table 5: Dynamic Panel Data with Endogenous Disclosure Mechanism for Post-Crisis Period, Restructured and Non-restructured Banks

The analyses performed in this section aims to find out whether depositors in weak banks are more sensitive and as a result require more information disclosure, compared to depositors in healthy banks. If depositor discipline is present, healthier banks in East Asia should be able to raise more deposits by disclosing additional risk-related information compared to an average bank. The results for the diagnostic tests show that there is no second order serial correlation in both cases. However, estimation for the weak banks can be biased

as the number of instruments exceeds the number of panels, and the p-value of the Hansen J-statistic is close to 1. This suggests that the depositor discipline model for the weak banks is miss-specified. The results in column 7 to 9 of Table 5 suggest that healthier banks are able to attract relatively higher deposits by disclosing more information. More specifically, the finding shows that healthier banks are able to increase deposit growth by 9.79 percent in the next period by disclosing an additional unit of information. This rate is marginally more than what an average bank in the whole sample can achieve (9.56 percent). In addition to solvency ratio and size, costs to income ratio also help healthier banks attract more deposits.

## 5. Conclusion

This study extends the existing literature on disclosure in banking (Nier and Baumann, 2006; Wu and Bowe, 2010; Baumann and Nier, 2004; Tadesse, 2006 and Rosengren, 1999) by finding out if greater risk-related disclosure enables banks to attract more deposits. Overall, the findings of this study provide support to the proposition of the third pillar of the Basel II, which aims to encourage market discipline by requiring banks to disclose more risk-related information.

This paper confirms the presence of depositor discipline in the East Asian banking system. Dynamic panel data analysis confirms the endogenous relationship between disclosure and deposits growth. Once the endogeneity is controlled for, this study finds that banks are able to attract more deposits overtime by disclosing higher amount of risk-related information. This implies that depositors in East Asia react to the changes in the risk profile of banks and also changes in the amount of risk-related information that banks disclose. Greater responsiveness of depositors to disclosure after the crisis period provides support to the wake-up-call hypothesis. The ability of the stronger banks (non-restructured) to attract higher funds overtime by disclosing greater information and the inability of the weaker banks in doing so imply that depositors in East Asia are more responsive to the amount of information disclosed by the healthier banks compared to the weaker ones. This finding is consistent with the depositor discipline hypothesis.

These results suggest that regulators can encourage depositor discipline by requiring banks to disclose more information. Admati and Pfleiderer (2000) assert stringent disclosure requirements also can contribute towards greater investor confidence, which increases liquidity and market efficiency and decreases a firm's cost of capital. However, greater regulated disclosure may generate fragility in the banking sector when bank managers are not able control banks' risk exposure (Cordella and Yeyati, 1998), when it hampers the bank manager's ability in using their insights in disclosing information (Östberg, 2006)<sup>22</sup>, when firms operate under different constraints (Admati and Pfleiderer, 2000) and when the return is low (Kaplan, 2006). This presents a dilemma for regulators since they have to decide to either provide incentives for bank managers to voluntarily disclose more information or regulate information disclosure in the banking sector.

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<sup>22</sup> Firms will be better off by choosing their optimal disclosure policy endogenously in order to maximize firm value (Ostberg, 2006).

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## Appendix

### Disclosure Index

Bank level disclosure index is constructed using the BankScope database as the information source. The indices are intended to measure the level of detail that banks provide in their published accounts on fifteen disclosure items. These indices reveal whether banks disclose information relating to various sources of risk that they face such as interest rate risk, credit risk, liquidity risk, market risk and solvency risk.

The composite index is defined as

$$DISC = \frac{1}{15} \sum_{i=1}^{15} S_i$$

where each sub-index,  $s_i$  can be related to one or more sources of risk. Rather than ordering the sub-indices based on the sources of risk, the definition and the ordering of the fifteen sub-indices are created based on the presentation in the BankScope database. The table below lists the sub-indices used in the study in more detail.

For all sub-indices, we assign a value of 0 if there is no entry in any of the corresponding categories and a value of 1 otherwise, except for the capital sub-index. For the latter, we assign a value of 0 when there is no entry in any of the four categories, 1 if there is only one entry, 2 if there are two entries and 3 if there are three or four entries. Note that whenever a bank discloses information on three of these items, one can infer the fourth. Providing three item is therefore considered as informatively same as providing four items. The maximum attainable score on the sum of the sub-indices is 17.

### Disclosure Informativeness

Tadasse (2006) construct this variable to measures the extent and comprehensiveness of the regulation on banks financial reporting. The data to construct this variable is obtained from the responses in the World Bank survey of bank regulation and supervision described in Barth et al. (2001).

The variable is constructed by adding the survey response on the following indicator variables:

- a variable that takes the value 1 if banks are required to disclose risk management procedures to the public
- a variable that takes 1 if the disclosure regulation requires that accrued income on non-performing loans (NPL) should not be reported in the bank's income statement
- a variable that assumes 1 if consolidated financial statements of bank and non-bank financial subsidiaries are required
- a variable that takes 1 if off balance sheet items need to be disclosed to the public

The above indicator variables are coded as a 0 or 1, whereby a value 1 represents good disclosure practice with respect to the disclosure item the variable denotes while 0 otherwise. Reporting risk management procedures to investors is considered as a good disclosure practise as it enables investors to assess banks risk profile. Similarly, not reporting the income on NPL is good as it provides a more accurate representation of banks' financial condition. Disclosure of consolidated financial statements is considered good as it provides comprehensive information about banks activities. Reporting off balance sheet items is good as it provides a more complete picture of banks' financial standing.



<b>ASSETS</b>	<b>Sub-index</b>	<b>Categories</b>	<b>Basel Risk Category</b>	
Loans	S1: Loans by maturity	Short-term loan (< 1 year), Medium-term loan (< 3 years) & Long-term loan(> 3 years)	Interest rate risk, Liquidity risk	
	S2: Loan by type	Mortgage Loan, Retail Loan, Commercial Loans, Loans to Banks and Other Loans	Credit risk	
	S3: Problem loans	Total Impaired Loans	Credit risk	
	S4: Problem loans by type	Normal Loan, Special Mention Loan, Substandard Loan, Doubtful Loans Loss Loan, Overdue Loans and Restructured Loan	Credit risk	
	Other Earning Assets	S5: Investments by type	Loans and Advances to Banks Reverse Repos and Cash Collateral Securities, Investments in Property and Other Earning Assets	Liquidity risk
		S6: Securities by type	Trading Securities, Derivatives, Government Securities, Equity Investments, Other	Liquidity risk
		S7: Investments by maturity	Debt Securities, Senior Debt, Subordinated Debts, (< 3 months , 3 to 12 months, 1 to 5 years & > 5 years)	Liquidity risk
<b>LIABILITIES</b>				
Deposits	S8: Deposits by maturity	Retail and Other deposit (< 3 months , 3 to 12 months, 1 to 5 years & > 5 years)	Interest rate risk, Liquidity risk	
	S9: Deposits by type	Customer Deposit, Bank Deposit, Government / Municipalities Deposit	Liquidity risk	
	S10: Long-term funding	Senior Debt, Subordinated Borrowing, Other Funding	Liquidity risk, Market risk	
Memo Lines	S11: Reserves	Loan Loss Reserve	Credit risk	
	S12: Capital	Total Capital Ratio, Tier 1 Ratio, Total Capital, Tier 1 Capital	Cushion for risk	
	S13: Off-balance sheet items	Letter of Credit Issued, Bank Guarantee Letter, Total Contingent Liabilities	Credit risk	
<b>INCOME STATEMENTS</b>				
	S14: Non-interest income	Net Fees & Commission Income, Net Gain	Market risk	
	S15: Loan Loss Provisions	Loan Loss Provisions	Credit risk	

Table 6: Sub-indices to Construct the Synthetic Disclosure Index