Bank Failure Model for Asian Financial Crisis and Subprime Mortgage Crisis: A Comparison

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Abstract

The purpose of this paper is to examine the determinants of bank failure/merger timing in 10 East Asian countries during 1999-2007, using a multivariate logit model and a split population duration analysis, as well as North American & West European countries during July 2008-September 2009. Apart from bank-specific information, we also focus on the effects of macroeconomic and financial characteristics.

In this paper, firstly we apply the split population survival model to investigate the factors determining bank failure in ten East Asian countries during the period 1999-2007. This methodology is adopted because it assumes that some banks will never experience exits and, therefore, our results are more appropriate than those resulting from standard survival analysis. This is the first study to use the split population survival model to predict bank failure in East Asian countries. For comparative purposes, we also apply both logit and parametric survival analysis models.

Secondly, we apply both logistic and survival analysis models, including parametric and nonparametric ones) to analyze bank failure in North American and West European countries in 2008-2009. This study will help deepen the understanding of determinants of both bank failure timing and mergers in ten East Asian countries as well as those in North American and West European countries.

This paper is organized as follows. Section 2 discusses our sample data and describes the methodology used. Section 3 summarizes the empirical results. Section 4 discusses the conclusions of the study.

The following empirical findings are obtained. First, the results based on the logit model and parametric survival time regressions (Weibull) indicate that individual bank factors, such as asset quality, liquidity, earnings, and macroeconomic and financial characteristics (namely real interest rates, inflation and the ratio of M2 to foreign exchange reserves), are important in explaining the likelihood and timing of bank failure. Second, by applying a split-population duration model, the evidence further demonstrates that relative timing had a significantly positive influence on the probability of bank failure during the 1999-2007 period. The study also finds that not all variables that explain failure probability are useful in explaining failure timing. Additionally, these results confirm that bank liquidity, earnings, and the macroeconomic environment significantly affect the likelihood and timing of bank failure.

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1. Introduction

During the past two decades, many countries with developed and emerging market economies have experienced large-scale financial sector crises. Of particular note are the Mexican currency crisis (1994-1995), the Asian financial crisis (1997-1998), the Russian debt crisis (1998), the Brazilian financial crisis (1998-1999), the Turkish financial crisis (2000-2001), Argentina's external debt crisis (2001), and the U.S. subprime mortgage crisis (2007-2009). As a result, both the academic and official sectors have begun to develop early warning system (EWS) models to predict the future risk of financial institution failure.[1] Many EWS studies have been primarily concerned with explaining bank failure and most have tended to focus on either individual country's financial institutions or on financial institutions among a large number of countries with widely differing economic and financial systems. The EWS model in this paper firstly focuses on ten East Asian countries after the Asian financial crisis of 1997-1998, and secondly on North American and West European countries, that exhibit similarities among their economic and financial systems and are geographically proximate to one another. Our goal is to examine factors influencing bank failure and survival time. Bank-specific factors, macroeconomic factors and financial factors are the major determinants with which we are concerned.

The empirical literature on the EWS model of banking failure is large and makes use of a wide variety of different techniques. For example, Altman(1968) first used U.S. financial ratio data and applied multiple discriminant analysis (MDA) to predict corporate bankruptcies.[2] MDA is not easy to utilize in practice because it must meet the requirements of normal distribution and an equal covariance assumption. Subsequently, both logit and probit regression techniques have been used to provide a measure of probability for bank failure. Studies that have adopted the latter approach include Cole et al.(1995), Demirquc and Detragiache(1998), Poon et al.(1999), Hardy and Pazarbasioglu(1999), Bongini et al.(2001), Daniel(2004), and Daley et al.(2008).

There are also numerous other techniques that have been applied to bank failure prediction. Lane et al. (1986) based a survival analysis on Cox's proportional hazard model, utilizing data from the U.S. bank failures from the period 1979-1984. Later,

[1] See Wu et al. (2000) and Sahajwala and Bergh(2000).
[2] See Sinkey(1975) and Altman et al. (1981).

Whalen(1991) and Wheelock and Wilson(1995, 2000) also used Cox's proportional hazard model to explain failure and survival of the U.S. commercial banks. These studies found that capital adequacy, return on assets, and non-performing loans are useful in explaining the probability of bank failure and survival time. Wheelock and Wilson(2000) further showed that the number of branches and technical efficiency were important factors in determining bank bankruptcies.

Cole and Gunther(1995) applied the split-population survival time model to predict the time of failure for 1043 banks in the United States during the period 1986-1992. Their empirical results show that the factors influencing the probability of bank failure may be different from those that explain survival time. Additionally, Dahl and Spivey(1995), Hunter et al.(1996) and Deyoung(1999) applied the split-population survival time model to de novo banks, undercapitalized banks and commercial banks. Recently, Maggiolini and Mistrulli(2005) also used the model to examine the determinants of survival and survival probability of the Italian Cooperative Credit bank during the period 1990-2000. Their results show that survival is related to both the market share of large banks and local GDP. Evrensel (2008) applied parametric and non-parametric survival analysis to explain the effects of bank concentration, regulations, and macroeconomic policies on bank failures. Her results showed that a lower inflation rate, a lower domestic credit growth, a lower real interest rate, a higher real GDP growth, and a depreciation of home currency result in a low probability of bank failure.

Arena(2008) estimated the logit and survival duration models by using bank-level data from banking crises occurring in the 1990s in East Asia and Latin America to examine the determinants of bank failure; the results showed that bank-level characteristics not only significantly affect the likelihood of bank failure but also explain why banks are likely to fail. He also completed a survival time analysis in the Latin American case and found that bank system liquidity and macroeconomic variables (such as real exchange rate volatility and GDP growth rate) also help explain the likelihood of failure.

A number of papers have studied Taiwan's financial institutions. For example, Lee(1993) applied the accelerated failure time model to Taiwan's credit union data to estimate the hazard function and the determinants of survival time. Chuan and Jang(2002) employed a parametric survival analysis model to examine the determinants of the exit of foreign banks in Taiwan. Hsu et al.(2003) used parametric survival analysis to explain the effects of bank failure in six East Asian countries,

including Taiwan, Korea, Thailand, Indonesia, the Philippines, and Malaysia, during the period 1997-2000. Their results found that macroeconomic variables, bank scale, operating efficiency and capital adequacy play significant roles in explaining survival times and crisis probabilities of banks in those countries.

Recently, Chen and Wang(2007) took a sample of merging financial institutions and financial holding companies and applied the parametric survival analysis model to measure the spell lengths of hazard rates. They showed that with fewer branches, lower total asset turnovers and smaller ownership by directors and supervisors, financial institutions might reduce the spell lengths required to merge. Yu et al. (2008) chose a mixed distribution function for the split population duration model to investigate bank runs in the credit department of Farmer's Institution. Their results found that higher ratios of insured borrowing to total borrowing or joint deposit insurance were likely to both postpone bank runs and lower the risk of bank runs.

In this paper, firstly we apply the split population survival model to investigate the factors determining bank failure in ten East Asian countries during the period 1999-2007. This methodology is adopted because it assumes that some banks will never experience exits and, therefore, our results are more appropriate than those resulting from standard survival analysis. This is the first study to use the split population survival model to predict bank failure in East Asian countries. For comparative purposes, we also apply both logit and parametric survival analysis models. It should be noted in this study, we had adopted some results from Hsu and Liu(2014).

Secondly, we apply both logistic and survival analysis models, including parametric and nonparametric ones) to analyze bank failure in North American and West European countries in 2008-2009. This study will help deepen the understanding of determinants of both bank failure timing and mergers in ten East Asian countries as well as those in North American and West European countries.

This paper is organized as follows. Section 2 discusses our sample data and describes the methodology used. Section 3 summarizes the empirical results. Section 4 discusses the conclusions of the study.

2. Data and Methodology

2.1 Data Description

In this paper, we firstly investigate the failures of commercial banks in ten East

Asian countries: Taiwan, Japan, Hong Kong, Korea, Singapore, China, Indonesia, Malaysia, the Philippines, and Thailand. The data cover the period 1999-2007 and the countries were observed annually. The sample contains 349 banks, including 297 normal banks and 52 failed banks, with complete records from 1999 to either the year of exit or to the final sample date, 2007.

Secondly, we go further to analyze the failures of different kinds of banks and financial holding companies in North American and West European countries. The sample contains 696 banks, including 661 normal banks and 35 failed banks during July 2008 and September 2009. These 35 failed banks are in 6 countries: 18 in the US, 10 in the UK, 3 in Iceland, 2 in Belgium, 1 in Germany, 1 in Ireland. Among these 35 failed banks, there are 16 commercial banks, 11 financial holding companies, 1 investment bank, 4 mortgage banks, 3 savings banks.

Macroeconomic and financial data for each country were collected from World Development Indicators (WDI). The bank-level balance sheets and income statement data used are from the BankScope database, published by the Bureau van Dijk (BvD). The sample was split into two groups: failed and non-failed banks. Table 1 provides the frequency distribution of our sample with respect to surviving and distressed banks in the East Asian countries. Total of 349 banks were assessed, 52 of which were classified as failed.[3] The average survival time was 54.48 years. Japan had the most failed banks, followed by Malaysia and Indonesia. Thailand and China had the lowest number of failed institutions. The maximum survival time is 156 years (in the Philippines). The minimum survival time was 7 years (in Japan).

The bank-specific variables studied are mainly based on the CAMEL rating categories (capital adequacy, asset quality, management, earnings, and liquidity), and growth and size, which are taken from banks' financial statements. For macroeconomic and financial variables, we used six indicative measures, which are commonly adopted in the literature: GDP per capita growth, inflation, real interest rate, M2/foreign exchange reserves, domestic credit growth and the volatility of the exchange rate.[4] Table A in the Appendix summarizes bank-specific, macroeconomic and financial variables, along with the expected signs of their impact on the likelihood of a bank's failure and survival time.

[3] A bank is identified as being in distress when at least one of the following criteria is met, according to the information from the BankScope database: bankruptcy, dissolved merger or in liquidation. Of the 52 distressed banks, 1 was further classified as in bankruptcy, and the remaining 49 were classified as dissolved mergers.

[4] See Demirgüc-Kunt and Detragiache (1998, 2005), Kaminsky and Reinhart(1999) and Davis and Karim (2008).

2.2 Methodology

Our empirical analysis of banking failure adopted a survival analysis. Most studies of survival analysis are based on the parametric model and Cox's (1972, 1975) proportional hazard rate model; however, these models' assumption that each bank will eventually experience an exit is not appropriate. In fact, it is possible that some banks will never experience exits. The split population duration model relaxes this assumption by essentially splitting the sample into two groups: one group that will eventually experience an exit and another group that will not. Thus, the probability that a bank will eventually exit is assumed to be less than one. Let F be a binary variable that equals one for banks that eventually exit and zero for those that will never exit. Then, we assume

The parameter δ is the "split population parameter" that denotes the probability of eventual exit, and 1-δ is the survival rate.

We define a cumulative distribution function for banks that ultimately exit, and let be the corresponding probability density function. Let T be the length of time that passes before a bank ultimately exits. Similarly, the survival function conditional on F=1 can be written as .

Next, let Q_i be an indicator variable that equals one for an uncensored observation and equals zero otherwise, i.e., Q_i=1 for a bank that exits, and Q_i=0 for a bank that survived the entire sample period. The number of banks in the sample is denoted as N. For cases that experience exit, Q_i=1, which implies that F=1. For these observations, the appropriate density is as follows:

(1)

On the other hand, for sample banks that would never exit, we observe only F=0. The probability of this event is as follows:

(2)

Therefore, the likelihood function for the split population duration model consists of expressions (1) and (2):

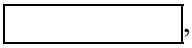
(3)

Then, a log transformation produces the log-likelihood as follows:

We fit split population durations to our data using the log-logistic distribution. The log-logistic hazard and survival functions are given by the following:

(4)

(5)

where $\lambda>0$ and $p>0$ are the definition parameters, respectively.  , where x is a vector of bank characteristics and time invariant covariant.

The substitution of equation (4) and equation (5) into equation (3) results in the complete likelihood function. The parameters can be estimated using maximum likelihood estimation procedures. A significantly negative coefficient indicates that an increase in that variable reduces the chances that the bank will exit.[5]

3. Empirical Results

3.1 The Asian Financial Crisis and Bank Failure/Acquisition of East Asian Countries During 1999-2007

3.1.1 Descriptive statistics and correlations for the East Asian banks

We calculated the differences in the means of the explanatory variables of both groups and tested the statistical significance of those differences. The mean differences of the variables for both non-failed and failed banks are given in Table 2. In the first and second columns, the mean values for both failed and non-failed banks are shown. The last column shows the p-value of the mean difference test. According to the mean difference test, 11 variables have significant differences in their means. Comparing these differences, we find that failed banks had a lower average equity to asset ratio (5.778%); a higher average ratio of loan loss reserve to the sum of equity and loan loss reserve (96.43%); a higher average ratio of loan loss reserve to total loans (6.833%); a higher average cost-to-income ratio (123.20%); a higher average operating expense ratio (4.176%); a higher average non-interest ratio (3.913%); a

[5] For a detailed discussion of split population duration models, see Schmidt and Witte (1989) and Cole and Gunther(1995).

lower average return on total assets (-0.871); a lower average liquidity ratio (22.57%); a lower average deposit growth (0.450%); a lower average loan growth (-1.515%); and a lower average total assets growth (-1.501%). These statistics show that the performance of surviving banks was better than that of failed banks. The failed banks presented a lower capital adequacy, less relative managerial efficiency, weaker asset quality, lower profitability, less liquidity and lower growth during the sample period.

Table 3 shows summary statistics for the major macroeconomic variables. Over the sample period, China's average GDP per capita growth rate 10.02% and its domestic private credit growth rate 14.26%, the highest among the studied economies. Japan's GDP per capita growth rate and domestic private credit growth rate were lowest. The ratio of M2 to foreign exchange reserve was largest in Japan (11.90%) and smallest in Singapore (1.23%). Indonesia had the highest average inflation rate (13.89%). The volatility of the exchange rate was largest in the Philippines, Indonesia, and Thailand (-6.091%, -5.936%, and -5.630%, respectively); Hong Kong and Taiwan had the lowest volatility of the exchange rate (-0.0691% and -0.326%, respectively). The average exchange rate depreciation was positive only in Japan, indicating the yen depreciated over the period, while the other countries' currencies appreciated. Hong Kong, South Korea and Singapore had the highest average real interest rates (8.779%, 6.285% and 5.013, respectively); Thailand, Mainland China and Taiwan had the lowest (2.409%, 2.465% and 2.699%, respectively). It is noteworthy that the volatility of the standard deviation of the overall macroeconomic and financial indicators in Taiwan was smallest; i.e., Taiwan's macroeconomic performance was relatively stable over the studied period.

Table 4 reports the results of the correlation matrix and the variance inflation factor (VIF) of the variables.[6] The variance inflation factor values are less than 10 for all variables, indicating a low degree of multicollinearity. The correlation coefficients are markedly higher in several variables. First, the correlation between the cost-to-income ratio and the return on assets is 0.78. Second, loan growth is positively and highly correlated with deposit growth, with a correlation coefficient of 0.65. Third, the correlation between deposit growth and total assets growth is 0.74. Fourth, loan growth is strongly correlated with total asset growth, with a correlation coefficient of 0.79. It appears that these variables are highly correlated over the sample period. These correlations suggest that, if all of these variables were included in each regression, multicollinearity might be a serious problem. Therefore, only one variable

[6] As a rule of thumb, a VIF greater than 10 indicates a problem with multicollinearity.

was included in each regression.

3.1.2 Results

We first use the logit model to estimate the determinants of bank failure/merger. The logit model has a binary outcome. It is used to assess whether bank-specific variables and macroeconomic factors are important in explaining East Asian countries' differences in bank failure rates. The dependent variable takes a value of one if a bank is identified as failed in any of the categories during the sample period. Table 5 reports the results of our estimation. We specified ten different models. Columns (1) to (5) take account of the cost to income ratio variable. Columns (6)~(10) incorporate the return on average assets. Columns (1) and (6) only consider the results of bank-specific variables, while columns (2)~(5) and (7)~(10) include not only the bank-specific variables but also macroeconomic and financial variables. Table 5 also shows the overall model selection criteria, i.e., Akaike's information criteria (AIC), and the pseudo R^2. According to both criteria, the estimates in the full model specification, which uses bank-specific, macroeconomic and financial variables, provide higher pseudo R^2 and lower AIC values than those of the former model, which uses only bank-specific variables. In addition, a high overall classification accuracy suggests that the model is good and fits the data well. The logit model displays good predictive power: between 86% and 94% of financial institutions were correctly classified. From Table 5, model (3) and (8) seem to have the highest pseudo R^2 values, the lowest AIC values and the highest predictive powers.

For comparison purposes, we discuss only columns (3) and (8). As shown in columns (3) and (8) of Table 5, the ratio of loan loss reserve to the sum of equity and loan loss reserve and the cost-to-income ratio are both positive and statistically significant; the ROA and liquidity ratios are negative and statistically significant, as expected. This means that banks with weaker asset quality, management inefficiency, lower earnings and lower liquidity have a higher risk of failure. With regard to macroeconomic and financial variables, the inflation rate, the real interest rate and the ratio of M2 to foreign exchange reserves have a positive effect on the probability of failure. The results reveal that a high ratio of M2 to foreign exchange reserves, high inflation and a high real interest rate are the main macroeconomic and financial factors that explain banking failure in these ten East Asian countries. These findings are consistent with those of Demirgüc-Kunt and Detragiache (1998,2005) who suggested that high inflation, the real interest rate and the ratio of M2 to foreign exchange reserves are associated with banking distress and increase the likelihood of

bank failure. Hardy and Pazarbasioglu (1999) also reported similar findings.[7] Finally, except for that reported in column (3) of Table 5, none of the coefficients on the domestic private credit growth rate are statistically significant. The results suggest that the probability of bank failure and merger is not related to credit growth.

To highlight the characteristics of this behavior and facilitate comparison, the next Table of the survival model is based on both models (3) and (8). Table 6 reports the results of the re-estimation of two specifications of both models (3) and (8) using a standard parametric survival model. We applied the maximum likelihood method to estimate four different distribution types: the Weibull, Exponential, Log-logistic and Log-normal distributions. The four distributions of the model may be compared using the AIC and log-likelihood value. On the basis of both criteria, the Weibull regression model is preferred: it has the smallest AIC value and the largest log-likelihood. To conserve space, we only report the results of the estimation of the Weibull regression model, as shown in Table 6. The estimated values of the scale parameter (σ) are significantly less than 1 (i.e., $p = 1 / \sigma > 1$), indicating that the hazard function is monotonically decreasing in duration. This means that the probability of bank failure increases over time. Among the bank-specific variables, only the coefficients of ratio of loan loss reserve to the sum of equity and loan loss reserve, the return on average assets and the liquidity ratio have the expected signs and are statistically significant. This suggests that a weaker assets quality, a lower return on assets, and a lower liquidity ratio yield a higher risk of failure and a shorter survival time. This is consistent with the result of Wheelock and Wilson(2000). With respect to the role of macroeconomic and financial variables, the inflation rate, the real interest rate, the ratio of M2 to foreign exchange reserves, and the domestic private credit growth rate have a negative influence and are significant, as expected. The results reveal that asset quality, profitability, liquidity, and macroeconomic and financial factors explain the survival time of banks in the ten Asian countries studied.

Finally, we consider that some banks will never experience exits. We apply the split population survival time model to our data and compare the results with those of the parametric survival model and the logit model. The results are shown in Table 7. By comparing the estimated values of the reciprocal of the scale parameter of model (1) and (2) in Table 6 and Table 7, the reciprocals of the Table 6 scale parameters (model 1: (1/0.482= 2.075); model 2: (1/0.485 = 2.062)) are less than the reciprocals of the Table 7 scale parameters (model 1: (1/0.425 = 2.353); model 2: (1/0.467 =

[7] Their results also show that high inflation and real interest rate cause a higher risk of bank failure.

2.141)), indicating that the hazard function is higher when estimated with the split population duration model. Therefore, if we do not consider that some banks will never experience exits, we underestimate the probability of failure/exit. The last row of Table 7 reports the average predicted failure probability. The probability of failure is within the range 36.68% to 43.98%.

With regard to the explanatory variables, the coefficients for the ratio of equity to assets, the cost to income ratio, the return on average assets, inflation and the real interest rate have the expected signs and are statistically significant. Note that some of the split population survival time model estimation results are different from those of the standard logit and parametric survival models. However, the three econometric methodologies have consistently demonstrated that the return on average assets, the liquidity ratio, inflation and the real interest rate are important determinants of bank failure.

3.2 The Subprime Mortgage Financial Crisis and Bank Failure/Acquisition of North American and West European Countries in July 2008-September 2009

In this subsection we go further to study the impact of the US Subprime Mortgage Financial Crisis on the world's financial system, in particular the results of the failure, acquisition, or bailout of some of the largest financial institutions(FIs) in the US and some west European Countries, such as UK, Iceland, Belgium, Germany, Ireland during July 2008 to September 2009. Table B in the Appendix shows those 35 FIs with failure or acquisition or bailout during this financial crisis period.

The financial institution specific finance variables used in our empirical statistical analysis in this subsection are reported in Table 8. There are 39 variables, which are classified into 8 categories. The macroeconomic variables are expressed in Table 9. There are 11 variables and are classified into 6 categories.

The statistical and econometric models utilized here include Logit and Probit Discrete Models, Survival Analysis Model, and Dynamic Survival Model. The Survival Analysis Model could be composed of parametric, semiparametric, nonparametric models. The parametric and semiparametric models are classified into log survival model and Cox(1972,1975) proportional hazard rate model (see Tables a and b below). Nelson(1972) and Aalen(1978) proposed nonparametric models. Scheike and Zhang (2002) extended Cox proportional parametric models and Aalen nonparametric model by considering time-varying effects on hazard function to present a dynamic survival model.

Table a Parameter models

	Survival	Log survival	Parametric proportional hazard
pattern	Linear regression	Exponential Weibull Log-normal Log-logistic gamma	Exponential Weibull Gompertz

Table b Proportional hazard rate model

Distributions	hazard function	characteristics
Exponential	$h(t \mid x_j) = \exp(\beta_0 + x_j\beta_x)$	Hazard function and survival tme(t) are independent
Weibull	$h(t \mid x_j) = pt^{p-1}\exp(\beta_0 + x_j\beta_x)$	If size parameter $\gamma \le 1$ or scale parameter $p \ge 1$, $\frac{dh(t)}{dt} \ge 0$. If $\gamma > 1$ or $p < 1$, $\frac{dh(t)}{dt} < 0$.
Gompertz	$h(t \mid x_j) = \exp(\gamma t)\exp(\beta_0 + x_j\beta_x)$	If $\gamma > 0$, $\frac{dh(t)}{dt} > 0$. If $\gamma < 0$, $\frac{dh(t)}{dt} < 0$. If $\gamma = 0$,

		$h(t)=\exp(\beta_0)$ and t are independent.

Data sources：Lin(1993)、Lee（1993）、Hsu-Liu-Hsieh(2003),

where $h=\exp(-\beta_0 - x_j\beta_x)$

4. Conclusions

In this paper, we examine various determinants of bank failure timing and merger using data from ten East Asian countries in 1999-2007, as well as using data from North American and West European countries in July 2008-September 2009. The major findings are as follows. First, for the East Asian countries, the logit model and the parametric survival time regressions (Weibull) show that individual bank factors, such as asset quality, liquidity, and earnings, as well as macroeconomic and financial characteristics, such as real interest rates, inflation and the ratio of M2 to foreign exchange reserves, are important in explaining the likelihood and timing of bank failure. Second, in the East Asia, using a split-population duration model, the evidence further demonstrates that relative timing had a significantly positive influence on the probability of bank failure during the 1999-2007 period. The study also finds that not all variables that explain failure probability are useful in explaining failure timing. Additionally, these results confirm that bank liquidity, earnings, and the macroeconomic environment significantly affect the likelihood and timing of bank failure.

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Table 1 Number of bank mergers and duration by country and year

Unit: Number, Years

Country name	Number of banks			Duration (in years)			
	Exited	Other	Total	Mean	Standard deviation	Min	Max
Taiwan	4	28	32	42.03	31.59	10	108
Japan	19	113	132	75.94	27.15	7	134
Hong Kong	5	20	25	58.76	17.87	25	95
Korea	3	14	17	45.94	21.34	24	110
Singapore	2	5	7	55.00	13.53	39	75
China	1	37	38	20.11	22.13	9	99
Indonesia	6	33	39	30.38	20.10	10	94
Malaysia	8	18	26	48.42	32.34	8	132
Philippines	3	17	20	50.60	32.00	10	156
Thailand	1	12	13	60.92	15.79	38	101
Total	52 (14.90%)	297 (85.10%)	349 (100%)	54.48	32.27	7	156

Note: Data come from author. The number in parentheses indicates the number of event banks as a fraction of the total number of sample banks.

Table 2 Descriptive Statistics

Variable name	Exit banks	Other banks	All Banks	t-Statistics (p-value)
Capital adequacy				
Tier 1 capital ratio	7.255	11.76	11.31	0.1896
	(5.295)	(18.01)	(17.23)	
Equity / total assets	5.778	8.253	7.884	0.0287**
	(7.556)	(7.480)	(7.532)	
BIS	12.09	15.15	14.75	0.2777
	(7.483)	(18.00)	(17.03)	
Asset quality				
Loan loss reserve/ (equity + loan loss reserve)	96.43	91.52	92.25	0.0013**
	(4.069)	(10.77)	(10.20)	
Loan loss reserve / total loans	6.833	2.927	3.509	0.0001***
	(10.03)	(5.581)	(6.570)	
Management				
Cost-to-income ratio	123.2	74.13	81.44	0.0000***
	(94.04)	(35.68)	(51.82)	
Operating expenses / total assets	4.176	2.200	2.495	0.0000***
	(6.778)	(1.950)	(3.235)	
Non-interest expense / average assets	3.913	2.268	2.513	0.0001***
	(5.734)	(1.678)	(2.749)	
Earnings				
Return on average assets	-0.871	0.660	0.431	0.0000***
	(4.791)	(1.278)	(2.247)	
Return on average equity	14.49	2.983	4.697	0.2055
	(94.58)	(52.23)	(60.40)	
Net interest margin	2.488	2.677	2.649	0.3957
	(1.110)	(1.530)	(1.475)	
Net interest Spread	4.348	-2.267	-1.281	0.6626
	(3.791)	(109.1)	(100.6)	
Liquidity				
Liquidity ratio	22.57	28.21	27.37	0.0297**
	(13.75)	(17.69)	(17.26)	
Loans/Deposits	84.42	270.5	242.8	0.6188
	(23.96)	(2690.9)	(2482.7)	
Growth				
Deposit Growth	0.450	9.868	8.464	0.0020***
	(14.96)	(20.92)	(20.40)	
Loan Growth	-1.515	12.830	10.692	0.0100***
	(16.60)	(39.27)	(37.13)	
Asset Growth	-1.501	11.295	9.389	0.0000***
	(13.14)	(20.73)	(20.29)	
Scale				
Log(total assets)	8.164	8.534	8.479	0.2892
	(2.165)	(2.345)	(2.320)	

Note: Numbers in parentheses are standard errors. ***,** and * indicate significant differences between failed and non-failed banks at the 1%, 5%, and 10% level, respectively.

Capital ratio is the book value of shareholder equity divided by total assets.

Table 3 Descriptive Statistics for macro data

Unit: %

	Taiwan	Japan	Hong Kong	Korea	Singapore	China	Indonesia	Malysia	Philippines	Thailand	Total
GDP per capita growth	3.681	2.073	5.816	4.738	3.637	10.020	3.879	3.935	3.203	4.449	4.009
	(2.71)	(0.62)	(1.74)	(0.86)	(4.05)	(0.40)	(1.31)	(0.66)	(0.69)	(0.57)	(2.70)
Inflation	-1.079	-0.934	-1.085	-0.061	0.425	3.560	13.890	3.336	5.533	4.728	2.157
	(0.14)	(0.21)	(2.00)	(0.97)	(1.64)	(0.25)	(1.75)	(1.65)	(0.88)	(1.02)	(4.83)
Real interest rates	2.699	2.667	8.779	6.285	5.013	2.465	2.703	3.499	4.229	2.409	3.455
	(0.35)	(0.33)	(2.32)	(0.69)	(1.62)	(0.21)	(2.84)	(2.50)	(0.29)	(0.64)	(2.20)
M2/ Reserves	3.043	11.900	3.895	2.719	1.233	4.162	3.459	2.662	2.941	3.269	6.543
	(0.31)	(5.85)	(0.20)	(0.36)	(0.05)	(0.90)	(0.19)	(0.56)	(0.10)	(0.20)	(5.55)
Credit growth	5.143	-0.651	1.280	13.550	8.326	14.260	8.753	4.118	7.065	6.484	4.628
	(2.41)	(0.92)	(1.81)	(7.60)	(2.29)	(0.47)	(18.68)	(2.94)	(3.18)	(7.02)	(8.54)
exchange rate	-0.326	4.464	-0.0691	-5.651	-2.433	-2.624	-5.936	-2.796	-6.091	-5.630	-0.387
	(1.48)	(4.22)	(0.16)	(5.21)	(3.65)	(0.44)	(5.58)	(0.99)	(2.35)	(0.66)	(5.47)

Note: Standards errors are in parentheses.

Table 4 Results of the test of multicollinearity diagnosis

	Equity / total assets	Loan loss reserve / (equity + loan loss reserve)	Loan loss reserve / total loans	Cost-to-income ratio	Return on average assets	Liquidity ratio	Deposit Growth	Loan Growth	Asset Growth	GDP per capita growth	Inflation	Real interest rates	M2/ Reserves	Credit growth	exchange rate	VIF value
Equity / total assets	1.00															3.29
Loan loss reserve/ (equity + loan loss reserve)	-0.54	1.00														2.39
Loan loss reserve / total loans	0.07	0.18	1.00													3.27
Cost-to-income ratio	-0.41	0.33	0.38	1.00												3.39
Return on average assets	0.51	-0.28	-0.55	-0.78	1.00											6.72
Liquidity ratio	0.38	-0.36	0.17	-0.18	0.20	1.00										2.01
Deposit Growth	0.29	-0.19	-0.02	-0.23	0.19	0.17	1.00									2.89
Loan Growth	0.05	-0.08	-0.12	-0.14	0.11	0.14	0.65	1.00								3.02
Asset Growth	0.15	-0.17	-0.20	-0.31	0.29	0.28	0.74	0.79	1.00							4.61
GDP per capita growth	0.18	-0.26	-0.11	-0.34	0.19	0.22	0.35	0.22	0.36	1.00						2.12
Inflation	0.26	0.01	0.31	-0.05	0.04	0.52	0.22	0.21	0.22	0.20	1.00					2.73
Real interest rates	0.10	-0.26	0.05	-0.06	0.12	0.07	-0.12	-0.04	-0.03	0.04	-0.23	1.00				1.96
M2/ Reserves	-0.28	0.19	-0.10	0.23	-0.17	-0.36	-0.20	-0.17	-0.26	-0.43	-0.38	-0.15	1.00			1.78
Credit growth	0.20	-0.09	-0.10	-0.24	0.13	0.19	0.37	0.28	0.39	0.59	0.31	-0.28	-0.38	1.00		2.14
exchange rate	-0.27	0.03	-0.23	0.11	-0.19	-0.39	-0.19	-0.13	-0.23	-0.31	-0.52	-0.28	0.33	-0.20	1.00	2.24

Table 5 Results of Logit estimation

	Including cost-to-income ratio					Including return on average assets				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-14.500***	-25.990***	-26.400***	-22.880***	-23.980***	-1.223***	-1.659***	-4.835***	-4.026***	-3.656***
	(2.60)	(3.76)	(4.06)	(3.61)	(3.51)	(3.62)	(3.48)	(5.64)	(4.74)	(4.52)
Total equity / total assets	0.059	0.040	0.048	0.024	0.033	0.028	-0.043	-0.0001	0.025	0.015
	(1.61)	(1.00)	(1.16)	(0.54)	(0.70)	(0.94)	(1.01)	(0.00)	(0.66)	(0.40)
Loan loss reserve/ (equity + loan loss reserve)	0.130**	0.226***	0.203***	0.178***	0.185***					
	(2.24)	(3.23)	(3.12)	(2.79)	(2.76)					
Loan loss reserve / total loans	0.027	0.006	0.005	0.034	0.035					
	(1.02)	(0.24)	(0.18)	(1.28)	(1.26)					
Cost-to-income ratio	0.008**	0.011**	0.011*	0.010**	0.010**					
	(2.21)	(2.51)	(1.93)	(2.00)	(2.06)					
Return on average assets						-0.319***	-0.426***	-0.458***	-0.346***	-0.297***
						(2.96)	(2.98)	(3.07)	(2.88)	(2.72)
Liquidity ratio	-0.026*	-0.044**	-0.046**	-0.016	-0.016	-0.020	-0.041**	-0.053**	-0.025	-0.018
	(1.83)	(2.32)	(2.16)	(0.84)	(0.83)	(1.50)	(2.25)	(2.55)	(1.46)	(1.10)
Deposit Growth	-0.037**	-0.029*	-0.030	-0.023	-0.026	-0.040***	-0.014	-0.027	-0.022	-0.016
	(2.46)	(1.73)	(1.48)	(1.15)	(1.26)	(2.71)	(0.91)	(1.52)	(1.20)	(0.94)
GDP per capita growth					0.041		-0.469***			-0.224*
					(0.33)		(3.41)			(1.94)
Inflation		0.095*	0.305***				0.198***	0.315***		
		(1.65)	(4.19)				(3.20)	(4.27)		
Real interest rates		0.661***	0.966***	0.696***	0.710***		0.686***	0.731***	0.451***	0.501***
		(5.96)	(6.31)	(5.42)	(5.44)		(6.03)	(6.33)	(4.87)	(5.48)
M2/ Reserves			0.189***	0.132***	0.146***			0.195***	0.160***	0.152***
			(3.19)	(2.92)	(3.32)			(3.69)	(3.01)	(3.04)
Credit growth			-0.066*	-0.015				-0.055	-0.032	
			(1.70)	(0.40)				(1.40)	(0.78)	
exchange rate				-0.007	0.007				-0.085*	-0.090*
				(0.16)	(0.14)				(1.73)	(2.01)
Log likelihood	-121.869	-94.766	-77.449	-85.966	-85.996	-131.346	-101.344	-90.449	-97.620	-95.742
χ^2	50.10***	104.30***	138.94***	121.90***	121.84***	31.14***	91.15***	112.94***	98.59***	102.35***
Pseudo R^2	0.1705	0.3550	0.4728	0.4149	0.4147	0.1060	0.3102	0.3844	0.3355	0.3483
AIC	257.738	207.532	176.898	193.933	193.992	272.691	218.687	198.897	213.241	209.484
Overall predicted power	86.82%	88.83%	94.56%	93.12%	93.41%	86.25%	91.40%	93.12%	91.69%	92.84%

Note: A t-statistic is reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The estimation software package used is STATA 10.0.

Table 6 Results of estimations of parametric survival model

Explanatory variables	Weibull		Exponential		Log-logistic		Log-normal	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Constant	11.127***	6.006***	17.999***	7.593***	11.009***	5.791***	11.992***	6.063***
	(4.95)	(20.33)	(4.17)	(15.47)	(5.08)	(19.14)	(5.02)	(16.77)
Total equity / total assets	-0.004	0.002	-0.008	0.003	-0.018	-0.011	-0.025	-0.017
	(0.21)	(0.11)	(0.26)	(0.09)	(1.14)	(0.62)	(1.43)	(0.85)
Loan loss reserve/ (equity + loan loss reserve)	-0.053**		-0.106**		-0.053**		-0.059**	
	(2.35)		(2.40)		(2.42)		(2.44)	
Loan loss reserve / total loans	-0.011		-0.015		-0.007		-0.004	
	(1.03)		(0.76)		(0.69)		(0.29)	
Cost-to-income ratio	-0.001		-0.002		-0.002		-0.003*	
	(0.49)		(0.78)		(1.34)		(1.77)	
Return on average assets		0.054*		0.091*		0.063**		0.078**
		(1.92)		(1.65)		(2.12)		(2.09)
Liquidity ratio	0.016**	0.016**	0.025*	0.026**	0.024***	0.023***	0.026***	0.028***
	(2.43)	(2.29)	(1.90)	(1.98)	(3.00)	(2.84)	(2.98)	(3.10)
Deposit Growth	0.007	0.007	0.012	0.014	0.007	0.007	0.008	0.008
	(1.31)	(1.30)	(1.10)	(1.23)	(1.32)	(1.25)	(1.15)	(1.18)
Inflation	-0.085***	-0.097***	-0.111***	-0.132***	-0.104***	-0.112***	-0.113***	-0.127***
	(4.34)	(4.84)	(2.77)	(3.29)	(4.70)	(5.12)	(4.55)	(5.24)
Real interest rates	-0.222***	-0.210***	-0.376***	-0.355***	-0.222***	-0.212***	-0.238***	-0.228***
	(7.18)	(6.62)	(6.99)	(6.32)	(6.56)	(6.18)	(5.62)	(5.44)
M2/ Reserves	-0.037***	-0.043***	-0.069***	-0.082***	-0.030***	-0.041***	-0.042***	-0.053***
	(4.14)	(4.63)	(4.04)	(4.88)	(2.72)	(3.62)	(3.02)	(3.75)
Credit growth	-0.017***	-0.01	-0.028**	-0.015	-0.008	-0.003	-0.011	-0.004
	(2.62)	(1.53)	(2.16)	(1.10)	(1.07)	(0.42)	(1.16)	(0.38)
Scale parameter(σ)	0.482***	0.485***			0.425***	0.435***	0.922***	0.948***
	(8.46)	(8.49)			(8.63)	(8.39)	(9.16)	(8.94)
Log likelihood	-111.995	-117.975	-126.319	-132.168	-114.457	-121.423	-119.054	-125.865
χ^2	99.06***	87.10***	83.00***	71.30***	93.61***	79.68***	85.55***	71.93***
AIC	247.990	255.950	274.638	282.337	252.913	262.845	262.108	271.730

Note: A t-statistic is reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The estimation software package used is STATA 10.0.

Table 7 Results of estimations of Split Population survival models

	(1)	(2)
Constant	14.751	6.013***
	(0.79)	(2.06)
Total equity / total assets	-0.552**	-0.827**
	(2.40)	(2.20)
Loan loss reserve/ (equity + loan loss reserve)	-0.041	
	(0.21)	
Loan loss reserve / total loans	-0.019	
	(0.08)	
Cost-to-income ratio	-0.054**	
	(2.25)	
Return on average assets		4.180*
		(1.73)
Liquidity ratio	0.102**	0.155*
	(2.04)	(1.71)
Deposit Growth	0.023	-0.001
	(0.49)	(0.02)
Inflation	-0.503*	-0.920**
	(1.75)	(2.14)
Real interest rates	-0.766**	-1.039**
	(2.53)	(2.19)
M2/ Reserves	-0.187	-0.197
	(1.27)	(1.60)
Credit growth	0.040	0.066
	(0.44)	(0.55)
Scale parameter(σ)	0.425***	0.467***
	(7.38)	(8.22)
Log likelihood	-98.459	-105.877
Average predict failure probability	36.68%	43.98%

Note: A t-statistic is reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The estimation software package used is Limdep .

Table 8 Financial Institution Specific Finance Variables(CAMELS)

Factors	Symbol	Variables
Capital Adequacy Index	C_1	BIS Capital Adequacy Tier 1 Ratio
	C_2	Equity / total assets
	C_3	Equity/total assets
	C_4	Equity / deposits & short-term funding

Factors	Symbol	Variables
	C_5	Capital Funds / total asset
	C_6	Equity / total assets & off balance sheet items
Asset Quality Index	A_1	Total problem loan / total Loan
	A_2	Loan loss reserve / impaired loans
	A_3	Total loans / total assets
	A_4	Loan loss provision/ net interest revenue
	A_5	Impaired loans / equity
	A_6	Unreserved impaired loans / equity
	A_7	Net loans/ Deposits and borrowing
Management Performance Index	M_1	Interest expense / deposits
	M_2	Operating expense/operating revenue
	M_3	Total non-interest expenses / total operating income
Earnings Index	E_1	Operating income / total revenue
	E_2	Return on average assets
	E_3	Net interest margin
	E_4	Net interest revenue / average assets
	E_5	Non operating items / net income
	E_6	Deposits / total non-interest expenses
	E_7	Interest income / pre-tax profit
	E_8	Total operating income / total assets
	E_9	Rate of average equity (ROAE)
	E_{10}	Income net of distribution / average equity
Liquidity Index	L_1	Liquidity ratio
	L_2	Acid ratio
	$L3$	Interbank ratio
Sensitivity Index	S_1	Interest sensitivity gap
Growth Index	G_1	Growth rate of loans
Subprime Index	R_1	Net gains (losses) on trading and derivatives
	R_2	Net charge-offs
	R_3	Off balance sheet items
	R_4	Risk assets
	R_5	Trading securities

Factors	Symbol	Variables
	R_6	Total securities
	R_7	Interest-bearing liability
	R_8	Unreserved impaired loans / equity

Table 9 Macroeconomic Variables

Factors	Symbol	Variables
Country Size	X_1	Log(Per capita GDP)
Financial Policies	X_2	Foreign Bank Competition
	X_3	Capital Regulatory Index
	X_4	Official Supervisory Power
	X_5	Declaring Insolvency Power
Financial Conditions	X_6	Private sector credit/GDP
Financial Conditions	X_7	the value of Stocks Traded relative to GDP
	X_8	Stock Market Growth
International Imbalances	X_9	Current account/GDP
	X_{10}	Foreign reserve/average monthly import
Macroeconomic Policy	X_{11}	Government budget surplus(deficit)/GDP

Table 10 Principal Component Analysis and CAMELS Factors

I 1 Capital Adequacy Index	0.5934*C2+0.6064*C3+0.5292*C6
I 2 Liquidity Index	0.7195*L1+0.4409*L2+0.1118*L3
I 3 Subprime Index	0.5712*R2+0.5732*R6+0.5875*R7
I 4 Earnings Index	0.3830*E2+0.6585*E9+0.6478*E10
I 5 Asset Quality Index	0.5168*A1+0.6098*A5+0.6009*A6
I 6 Growth Index	Loan growth rate
I 7 Sensitivity Index	Interest rate sensitivity index

Table 11 Results of CA(M)ELS+G+R Logit estimation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Capital Adequacy Index	-5.4085*** (1.3320)							-2.2557*** (0.8695)
Liquidity Index		0.1661 (0.1547)						0.0795 (0.3032)
Subprime Index			0.4223*** (0.0773)					0.2878*** (0.0711)
Earnings Index				-0.3916*** (0.1019)				-0.1599 (0.1021)
Asset Quality Index					0.5062*** (0.0947)			0.4131*** (0.0899)
Growth Index						-0.3693 (0.6226)		0.0016 (0.4826)
Sensitivity Index							-59.0009*** (14.5570)	-55.6114*** (20.2261)
Declaring Insolvency Power	0.1375** (0.053)	0.1522*** (0.051)	0.1280** (0.053)	0.1624*** (0.051)	0.1582 *** (0.053)	0.1502*** (0.051)	0.1595*** (0.0519)	0.1541** (0.0638)
Private sector credit/GDP	0.0256*** (0.009)	0.0271*** (0.009)	0.0293*** (0.009)	0.031671*** (0.009271)	0.0307*** (0.009)	0.0276*** (0.009)	0.0272*** (0.0092)	0.0339*** (0.0094)
log(Per capita GDP)	-2.4868 (1.635)	-3.1367* (1.633)	-2.7197 (1.667)	-4.097*** (1.531)	-5.3165*** (1.617)	-3.9123*** (1.490)	-0.3687 (1.7321)	-0.9545 (2.3281)
Pseudo-R^2	17.63%	6.42%	21.16%	13.73%	21.96%	6.23%	11.61%	42.99%

note：(.)standard error，*、**、***:10%、5%、1% are significance levels。

Table12 Results of Survival analysis model estimation

Variable		Weibull	Exponential	Cox	Aalen
I1	Capital Adequacy Index	-2.0440***	-2.6233***	-3.006***	3.31***
		(0.511)	(0.737)	(0.049)	
I2	Liquidity Index	0.2760*	0.3187	0.4256	2.62
		(0.164)	(0.250)	(1.531)	
I3	Subprime Index	0.0343	0.0788**	0.05543	1.79
		(0.025)	(0.0354)	(1.057)	
I4	Earnings Index	-0.0636*	-0.0845	-0.1024*	4.54*
		(0.035)	(0.0532)	(0.9026)	
I5	Asset Quality Index	0.1305***	0.185***	0.1875***	2.52***
		(0.028)	(0.0373)	(1.206)	
I6	Growth Index	-0.0019	-0.134	-0.003	1.72
		(0.376)	(0.5579)	(0.996)	
I7	Sensitivity Index	-22.7548*	-39.9311**	-33.42*	1.75*
		(12.469)	(18.181)	(0.000)	
X5	Declaring Insolvency Power	0.1207***	0.1479***	0.1863***	
		(0.023)	(0.034)	(1.205)	
X6	Private Sector Credit /GDP	0.0145***	0.0214***	0.02307***	
		(0.004)	(0.005)	(1.023)	
X1	log(Per capita GDP)	1.4033	0.903	2.329	1.81***
		(1.096)	(1.718)	(10.27)	
AIC		497.4894	504.4892	295.2476	-

note：*、**、***:10%、5%、1% are significance levels

Appendix

Table A Description of the Variables

Item	Variables name	Definition	Source	Expected Sign on Survival Time/ Failure Rate:
Capital adequacy	Tier 1 capital ratio	the ratio of a bank's core equity capital to total risk-weighted	BankScope	+/—

[8] Cox-Aalen puts those insignificant parameters in Cox model into Aalen nonparametric model.

		assets		
	Total equity / total assets	The ratio of total equity to total assets	BankScope	+/−
	BIS ratio (bank of international settlement ratio)	the rate of equity capital to risk-weighted assets	BankScope	+/−
Asset quality	(loan loss reserve/ (equity + loan loss reserve)	The rate of loan loss reserve to the sum of equity and loan loss reserve	BankScope	−/+
	loan loss reserve / total loans	The rate of loan loss reserve to total loans	BankScope	−/+
Management	Cost-to-income ratio	Overheads to net interest income plus other operating income.	BankScope	−/+
	Operating expenses / total assets	The rate of operating expenses to total assets	BankScope	−/+
	Non-interest expense / average assets	Non-Interest Expense as a percent of Average Assets	BankScope	−/+
Earnings	Return on average assets (ROAA)	the ratio of net income to Average assets	BankScope	+/−
	Return on average equity (ROAE)	the ratio of net income to shareholder equity	BankScope	+/−
	Net interest margin	Total interest income less total interest expense (annualized) as a percent of average earning assets.	BankScope	+/−
	Net interest spread	interest yield on earning assets minus interest rates paid on borrowed funds.	BankScope	+/−
Liquidity	Liquidity ratio	The liquid asset as a percentage of total assets.	BankScope	+/−
	Loans/Deposits	Total loans as a percentage of total deposit.	BankScope	−/+

Growth	Deposit Growth	The growth rate of total deposit.	BankScope	+/−
	Loan Growth	The growth rate of total loans.	BankScope	?/?
	Asset Growth	The growth rate of total assets.	BankScope	+/−
Scale	Log(total assets)	The logarithm of total assets	BankScope	?/?
Macroeconomic Variables	GDP per capita growth	The growth rate of real per cap GDP.	WDI	+/−
	Inflation	Rate of change of the GDP deflator.	WDI	−/+
	Real interest rate	Nominal interest rate minus the contemporaneous rate of inflation.	WDI	−/+
Financial Variables	M2/ foreign reserves	The ratio of M2 to foreign exchange reserves.	WDI	−/+
	domestic credit growth	Rate of growth of real domestic credit to private sector.	WDI	−/+
	the volatility of exchange rate	Change in the exchange rate.	WDI	−/+

Note: Data come from author.

Table B The Financial Institutions with Failure/ Acquisition/Bailout

No.	Financial Institution(FI)	Nation	FI type	Establli-shment date	Failue/ Acquisition/Bail out date	Asset Scale (Million US dollars)
1	Dexia	BELGIUM	Bank Holding & Holding Companies	1996	2008/9	905999
2	Fortis	BELGIUM	Bank Holding & Holding Companies	1990	2008/9	129246
3	Hypo Real Estate Holding AG	GERMANY	Bank Holding & Holding Companies	2003	2008/9	584028
4	Glitnir Bank	ICELAND	Commercial Banks	1990	2008/9	48852
5	Kaupthing Bank hf	ICELAND	Commercial Banks	1982	2008/9	83517
6	National Bank of Iceland Ltd-Landsbanki Islands	ICELAND	Commercial Banks	1886	2008/9	50213
7	Anglo Irish Bank Corporation Limited	IRELAND	Commercial Banks	1964	2008/12	144920
8	Abbey National Plc	UK	Real Estate / Mortgage Bank	1944	2008/9	337831
9	Bank of Scotland Plc	UK	Commercial Banks	1695	2008/10	938784
10	Barclays Bank Plc	UK	Commercial Banks	1896	2008/10	2992884
11	Bradford & Bingley Plc	UK	Commercial Banks	1964	2008/9	81523
12	HBOS Plc	UK	Bank Holding & Holding Companies	2001	2008/10	1005753
13	HSBC Bank plc	UK	Commercial Banks	1836	2008/10	1347334
14	Lloyds TSB Bank Plc	UK	Commercial Banks	1765	2008/10	635874
15	Nationwide	UK	Real Estate /	1848	2008/10	355988

No.	Financial Institution(FI)	Nation	FI type	Establli-shment date	Failue/ Acquisition/Bail out date	Asset Scale (Million US dollars)
	Building Society		Mortgage Bank			
16	Northern Rock Plc	UK	Commercial Banks	1965	2008/2	152114
17	Standard Chartered Bank	UK	Commercial Banks	1863	2008/10	434989
18	Bank of New York Mellon Corporation	USA	Bank Holding & Holding Companies	2007	2008/10	237512
19	BankUnited, FSB	USA	Savings Bank	NA	2009/5	13951
20	Citigroup Inc	USA	Bank Holding & Holding Companies	1998	2008/10	1938470
21	Colonial Bank	USA	Commercial Banks	1974	2009/8	25858
22	Corus Bank N.A.	USA	Commercial Banks	1913	2009/9	8387
23	Fannie Mae-Federal National Mortgage Association	USA	Real Estate / Mortgage Bank	1968	2008/9	912404
24	Freddie Mac	USA	Real Estate / Mortgage Bank	1970	2008/9	850963
25	Goldman Sachs Group, Inc	USA	Bank Holding & Holding Companies	1869	2008/10	884547
26	Guaranty Bank	USA	Savings Bank	1988	2009/8	15058
27	JP Morgan Chase & Co.	USA	Bank Holding & Holding Companies	NA	2008/10	2175052
28	Meridian Bank, National Association	USA	Commercial Banks	1978	2008/10	2090
29	Merrill Lynch & Co., Inc.	USA	Investment Banks	1914	2008/10	246024
30	Morgan Stanley	USA	Bank	1935	2008/10	658812

No.	Financial Institution(FI)	Nation	FI type	Establli-shment date	Failue/ Acquisition/Bail out date	Asset Scale (Million US dollars)
			Holding & Holding Companies			
31	Silverton Bank NA	USA	Commercial Banks	NA	2009/5	3155
32	State Street Corporation	USA	Bank Holding & Holding Companies	1792	2008/10	173631
33	TeamBank, National Association	USA	Commercial Banks	NA	2009/3	669
34	Vantus Bank	USA	Savings Bank	1923	2009/9	523
35	Wells Fargo & Company	USA	Bank Holding & Holding Companies	1852	2008/10	1309639