ABSTRACT

Title of Thesis: BANK FUNDAMENTALS, BANK FAILURES AND MARKET DISCIPLINE: AN EMPIRICAL ANALYSIS FOR EMERGING MARKETS DURING THE NINETIES

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After the East Asian crisis, there has been a renewed interest in both academic and policy circles about the role that bank weaknesses play in contributing to systemic banking crisis. Even though, it has been recognized in the recent theoretical literature on banking crises that both macroeconomic and bank-level fundamentals have to be taken into account in the explanation of systemic banking crisis, to date, there is little cross-country empirical evidence for emerging markets on the role of bank weaknesses in contributing to both sudden deposit withdrawals and bank failures. In this context, my thesis analyzes the episodes of systemic banking crisis in Latin America (Argentina, 1995; Mexico, 1994; and Venezuela, 1994) and East Asia (Indonesia, Korea, Malaysia, Philippines, and Thailand in 1997) using bank-level data in order to answer the following questions. First, to what extent, did financial conditions of individual banks explain bank failures? Did only the weakest banks, in terms of their fundamentals, fail in the crisis countries? Second, did depositors in crisis countries discipline riskier banks by

withdrawing their deposits in such a way that deposit withdrawals could be considered an act of market discipline? The results for East Asia and Latin America show that bank-level fundamentals both affect significantly the likelihood of failure and explain a high proportion of the likelihood of failure of failed banks (around fifty percent). In East Asian crisis countries, there was little overlap in the distribution of logit propensity scores between failed and non-failed banks, implying that mainly the weakest banks failed. However, in Latin American crisis countries, there was a much clear overlap in the distribution of logit propensity scores, implying that banking system and macroeconomic shocks are relatively much more important in Latin America. Regarding market discipline, a stable model of bank-level fundamentals explains the growth rate of deposits in both regions even during the peak of the crisis periods. However, in both regions, the relative contribution of bank level fundamentals during the peak of the crisis periods declined. In this context, to some degree, the observed deposit withdrawals represented an informed market response to observable bank weaknesses.

BANK FUNDAMENTALS, BANK FAILURES AND MARKET DISCIPLINE: AN EMPIRICAL ANALYSIS FOR EMERGING MARKETS DURING THE NINETIES

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Dedication

I dedicate the good things of this work to my mother Ruth Duffoo.

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List of Abbreviations

EA: East Asia.

EMs: Emerging Markets.

FIs: Financial Institutions.

GDP: Gross Domestic Product.

GMM: Generalized Method of Moments.

LA: Latin America.

M&A: Merge and Acquisition

Chapter 1: Introduction

In the last two decades, developed and developing countries have experienced significant episodes of systemic banking crises, which have been more costly in developing areas than in industrial economies; thus, the prevention of such recurrent episodes has become a priority of policy[1]. The most acute among the recent experiences are the financial problems in some emerging markets (EMs) during the nineties. These episodes have renewed the interest in academic and policy circles about both the role that individual financial institutions' weaknesses play in contributing to bank failures, and the role that market discipline --the ability of depositors, stockholders, or creditors at large to penalize banks for bad (poor) performance by withdrawing their deposits or by requiring higher interest rates-- can play in prudential regulation by encouraging proper risk management by banks. In this context, my dissertation contributes to this debate by empirically addressing two main questions: (i) To what extent, did financial conditions of individual banks explain bank failures? Did only the weakest banks, in terms of their fundamentals, fail in the crisis countries? (ii) Did depositors in crisis countries discipline riskier banks by withdrawing their deposits in such a way that deposit withdrawals could be considered an act of market discipline?

[1] See Caprio and Klingebiel (1996, 1999). Regarding the definition of banking crisis, I follow that given by Sundararajan and Baliño (1991): "… financial crisis is defined as a situation in which a significant group of financial institutions have liabilities exceeding the market value of their assets, leading to runs and other portfolio shifts, collapse of some financial firms, and government intervention".

There are two main reasons to address these questions empirically. First, recent theoretical research on banking has stressed the role of bank-level fundamentals to explain both bank failures and depositor discipline. However, there is little cross-country empirical research at the bank-level that aims to test these hypotheses for EMs. Second, the answers to these questions are relevant for policy regarding financial regulation and supervision.

During the last fifteen years, in particular after the East Asian crisis, there has been a significant increase in the theoretical literature on banking emphasizing that microeconomic factors related to bank-level fundamentals have to be taken into account in the explanation of the waves of bank failures and deposit withdrawals that characterize systemic banking crisis. One stream of this literature argues that the main source of bank failures rests on bank vulnerabilities due to bad managerial practices reflected in the deterioration of their portfolio and capital structure prior to the onset of the crisis,[2] while unexpected systemic or macroeconomic shocks just unveil the underlying weakness of the financial institutions. Another stream in this literature argues that sharp deposit contractions reflect an act of market discipline, i.e., sudden deposit withdrawals during the crisis periods represent an informed market response to observable weaknesses in individual financial institutions (traceable to ex-ante bank characteristics).[3]

[2] Corsetti, Pesenti, and Roubini (1998), Chinn and Kletzer (2000), and Dekle and Kletzer (2001).

[3] Jacklin and Battacharya (1988), Chari and Jagannathan (1988), Calomiris et al. (1991), Calomiris and Gorton (1991), and Jacklin (1993).

However, even though there is an extensive theoretical literature on bank failures and depositor discipline, there is little cross-country empirical evidence using bank-level data on EMs to test the implications of these hypotheses.[4] Most studies that analyze bank failures and depositors' discipline at the bank level focus on the experience of the US commercial banking industry, even though most of the recent episodes of systemic banking crisis have not occurred in developed countries.[5]

Understanding the causes or origins of bank failures and sudden deposit contractions has important policy implications. If bank failures reflect fundamental weaknesses rather than

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[4] There are some exceptions. The study by Bongini, Claessens and Ferri (2001) investigates the occurrence of distress and closure decisions in the five East Asian crisis countries (Indonesia, Korea, Malaysia, Philippines and Thailand) in order to assess the role of bank's "connections"- with industrial groups or influential families- in causing and resolving bank failures. Rojas-Suarez (2001) evaluates an alternative set of indicators based on "markets that work" rather than just relying on accounting figures in four episodes of systemic banking crisis: East Asia (1997-1998), Mexico (1994-1995), Venezuela (1994) and Colombia (1982). Martinez-Peria and Schmukler (2001) evaluate the presence of market discipline for the individual experiences of Argentina, Chile and Mexico.

[5] Whalen (1991), Cole and Gunther (1997), Calomiris (1995, 1997, 1998 and 2000), and Gonzalez-Hermosillo (1999) develop an empirical analysis of the role of bank fundamentals in different episodes of banking system problems in the U.S. [Great Depression (1930-1933), Southwest (1986-1992), Northeast (1991-1992), and California (1992-1993)]. The common methodology has been the use of multivariate logit analysis and proportional hazard models.

depositor confusion in the face of asset value shocks, then policy should strengthen the financial regulation and supervision system, with emphasis on the set of financial ratios that reveals conditions conductive to bank failure, forming the basis of an early warning system. Regarding depositor discipline, if sudden deposit withdrawals are the result of market discipline actions where depositors assess bank specific risks, then the policy recommendation is to make banks' financial information available to depositors both before and during the run, and to rely more on private market discipline rather than on full deposit insurance schemes, which reduce depositors' incentives for bank monitoring and exacerbate the moral hazard problems reflected in excessive bank risk taking. However, if sudden deposit withdrawals are unrelated to banks' portfolio risks then deposit insurance and other forms of liquidity provision might be considered as useful instruments to avoid the collapse of the banking system.

The goal of my thesis is to fill the gap between theoretical hypotheses and empirical testing on bank failures and depositor discipline. I develop the first comparative study at the micro or bank-level of the recent episodes of systemic banking crisis in East Asia and Latin America. This allows me to identify and compare underlying patterns not only across countries but also across regions. My thesis goes beyond and complements existing empirical macro structural factors present at the origin of crisis.[6]

[6] Kaminsky and Reinhart (1999), Corsetti et al. (1998), Radelet and Sachs (1998), and Demigurc-Kunt and Detragiache (1997, 1999, 2000). One exception is Honohan (1997), who analyze systemic banking crisis using aggregate balance sheet indicators.

I assemble a comprehensive database of banks gathering, information on balance sheets and income statements on an annual basis for 14 EMs from the BankScope database and countries' Financial Supervisory Agency Reports. As part of the contribution of the thesis, in the case of Latin America, I assemble a novel database gathering financial statements directly from Supervisory Financial reports. My dataset include eight countries from East Asia: Indonesia, Korea, Malaysia, Philippines, Thailand, Singapore, Hong Kong and Taiwan; and six countries from Latin America: Argentina, Chile, Colombia, Mexico, Peru and Venezuela. The time span of the data covers the years from 1994 to 1999 for the East Asia sample and from 1992 to 1996 for the Latin America sample. These samples include the latest episodes of bank runs and failures in both East Asia and Latin America.

After presenting a review of the existence of the theoretical and empirical literature on bank failures, Chapter 2 answers the first empirical question; to what extent the waves of bank failure in the recent episodes of systemic banking crisis in EMs during the nineties reflected a fundamental deterioration in bank-level conditions. First, I assess if bank-level heterogeneity is important for explaining cross-country bank failures, i.e., if crisis countries had weaker banks ex-ante than non-crisis countries rather than just had worse shocks ex-post. Second, based on the previous results, I evaluate the relative contribution of bank-level fundamentals in the likelihood of failure, which allow us to determine if only the weakest banks, in terms of their fundamentals, failed in the crisis countries.

In order to perform the first task, given a definition of bank failure, I perform a descriptive analysis to examine whether failed financial institutions were similar ex-ante to non-failed financial institutions. Mean tests of bank-level fundamentals are performed, including market-based indicators such as the rate of decline in bank's deposits, the implicit interest rate paid on deposits and loans, and interest rate spreads prior to the onset of systemic crisis. Then, I estimate the probability of bank failure using a cross-sectional multivariate logit model for East Asia and Latin America separately, including crisis and non-crisis countries. Finally, to evaluate the robustness of the cross-sectional logit results, I relax the assumption that the information used in the logit estimation accurately reflects unchanging cross-sectional differences in bank condition during the crisis periods by estimating a survival duration model separately for East Asia and Latin America for a window of time, using the same set of bank-level fundamentals, and also aggregate banking and macroeconomic variables, i.e., I include the time dimension in the estimation.

Regarding the second task, I compute propensity scores, based on the cross-sectional logit results for individual financial institutions, using only bank-level fundamentals for failed and non-failed financial institutions to determine their relative contribution to the likelihood of failure. A distributional analysis of these scores will allow us to evaluate the degree of overlap between the distribution for failed and non-failed banks in the crisis countries in order to assess if only the weakest banks failed in the crisis countries.

After presenting a review of the existent theoretical and empirical literature on depositor discipline, and stylized facts surrounding the episodes of sudden deposit withdrawals in EMs during the last decade, Chapter 3 answers the second empirical question; did depositors react to bank level fundamentals in such a way that deposit withdrawals could be considered an action of market discipline in the crisis countries? I conduct panel-data analysis to test both if riskier banks attract fewer deposits, and if they pay higher interest rates. The null hypothesis is that deposit withdrawals and deposit interest rates did not respond to observable weaknesses in individual financial institutions, traceable to ex-ante bank characteristics, and that deposit runs in the crisis countries were instead episodes of pure contagion (random withdrawals hypothesis). In addition, I also evaluate the contribution of bank's fundamentals relative to banking system and macroeconomic variables. As a robustness test, I perform GMM estimations to correct for the presence of potential endogenous effects.

Chapter 4 summarizes the conclusions and policy recommendations. On the whole, my thesis shows that bank-level fundamentals related to bank asset risk, solvency, liquidity and profitability explain significantly the probability of bank failure in East Asia and Latin America. This result support the view that failed banks in the recent systemic crisis in Emerging Markets during the nineties suffered from fundamental weaknesses in their asset quality, liquidity, and capital structures. Regarding the relative contribution of bank-level fundamentals, as opposed to aggregate factors, bank-level fundamentals explain around fifty percent of the probability of failure of failed banks in the crisis countries in East Asia and Latin America, which implies that there were many fragile financial

institutions with particular ex-ante characteristics that made them more vulnerable to failure ex-post, i.e., failed banks were predictable weaker ex-ante relative to non-failed banks.

In the case of East Asian crisis countries, there was little overlapping in the distribution of propensity scores between failed institutions and non-failed institutions. This result implies that mainly the weakest institutions failed in the crisis countries, suggesting that the social costs of the unwarranted closure of solvent institutions (if any) must have been small. However, in the case of Latin American crisis countries, there was a much clear overlap in the distribution of aggregate scores between failed institutions and non-failed institutions, implying that banking system and macroeconomic shocks are relatively more important in Latin America than in East Asia.

In terms of policy recommendation, my thesis suggests that financial system supervision should be strengthened, putting emphasis not only on traditional financial ratios associated with to the CAMEL-rating system, but also on market-based indicators (deposit interest rates), forming the basis of an early warning system. In addition, given that macroeconomic and banking system variables affect the probability and timing of bank failure, financial regulators could rely on stress testing analysis as part of a financial assessment program in order to assess the vulnerability of a portfolio to major changes in the macroeconomic environment, making risks more transparent by estimating the potential losses on a portfolio.

Regarding depositor discipline, my thesis shows that a stable model of bank-level fundamentals explains the growth rate of real deposits in East Asia and Latin America even during the peak of the crisis periods. This result suggests that depositors attempted to sort among ex-ante solvent and insolvent banks in the presence of asymmetric information regarding the effect of shocks to the value of bank assets. However, in both regions, the relative contribution of bank level fundamentals during the peak of the crisis periods declined, implying that banking system and macroeconomic shocks played an important role in the episodes of sudden deposit withdrawals, in particular in Latin America. In this context, to some degree, the observed deposit withdrawals represented an informed market response to observable weaknesses in individual financial institutions

In terms of policy recommendation, financial regulators could rely more on elements of private market discipline (disclosure) as a complement to deposit insurance schemes, implying that the coverage of such schemes have to be limited in order to maintain or increase depositors' incentives for bank monitoring and reduce moral hazard problems reflected in excessive bank risk taking. Financial institutions should be required to release general types of public information, including the capital held as a buffer against losses, risk exposures (credit, market, and operational), risk assessment and management processes, and the capital adequacy of the institutions, in order to allow market participants (e.g. depositors) to assess banks' ability to absorb aggregate shocks and remain solvent.

Chapter 2: Bank Fundamentals and Bank Failures

2.1 Review of the Theoretical and Empirical Literature

2.1.1 Review of the Theoretical Literature

Economic downturns could bankrupt a proportion of borrowers putting banks in distress. Oviedo (2003) presents a model of business cycles in a small open economy in which aggregate risk produces sporadic bank failures in a world where banks intermediate inflows of capital, diversify away idiosyncratic firm risks, issue debt among international investors, and are subject to capital-adequacy regulation. In this context, economic downturns trigger a large ratio of poor project returns, reducing the value of the bank's portfolios. Under some circumstances, recessions are severe enough that they produce insolvency of the banking system. On the other hand, aggregate liquidity shocks may provoke bank failures due to the inability of banks to honor their short-term debts. Chang and Velasco (1999, 2001) argue that if the banking system's potential short-term obligations (demand deposits and foreign short-term debt) exceed its liquidation value, then a bank run equilibrium exists. In this model, runs may occur only if the banking system is illiquid; adverse expectations are not, by themselves, sufficient for a run to occur. In their framework, the more illiquid the banking system, the more vulnerable (fragile) it will be to exogenous shocks and shifts in expectations.[7]

[7] Potential contagion effects are also considered in this view. Diamond and Rajan (2002) argue that contagion effects could be caused not only by contractual or asymmetric information links,

However, Gavin and Hausmann (1996) argue that aggregate shocks undermine the viability of financial institutions and create a crisis, but they do not completely explain banking crises. Bank failures result from the interaction of vulnerability and aggregate shocks.[8] In their argument, "a bank is vulnerable when relatively small shocks to income, asset quality, or liquidity make the bank either insolvent or illiquid so that its ability to honor short term debts is brought into doubt" (p. 48).

Why do banks become vulnerable? Alternative hypotheses have been proposed to explain bank failures putting emphasis on micro-level fundamentals. One major stream of the literature emphasizes that the main cause of bank failures rests on bad managerial practices, reflected in the deterioration of banks' portfolio and capital structures before the onset of the crisis.

Chinn and Kletzer (2000) and Dekle and Kletzer (2001) present a model of financial crises in EMs where the source of the financial crisis is found in the interaction between the microeconomics of private financial intermediation and government macroeconomic policies. The emphasis on vulnerability of the banking sector bears much in common

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but also because bank failures could lead to a contraction in the common pool of liquidity, and this negative spillover effect raises the likelihood of failure of other banks.

[8] In Oviedo's model, there is not a relative deterioration of banks portfolios and capital structures before the aggregate productivity shock.

with the description and analysis of the East Asian crisis by Corsetti et al. (1998).[9] Their model is based on agency problems in domestic financial intermediation of international capital flows that originate in an informational advantage for domestic banks in domestic intermediation, and government provision of guarantees and insurance. Under this framework, banks intermediate lending to firms, which are subject to idiosyncratic productivity shocks, implying that firms will become insolvent with positive probability, in which event banks have the incentives to renegotiate the firm's debt. Banks not only accumulate increasingly risky assets, but also become progressively more indebted through foreign borrowing; under implicit guarantees, this constitutes a contingent liability for the government. In this context, the crisis evolves endogenously as banks become increasingly fragile not only because of portfolio deterioration, but also because of the reduction of the total equity value of the banking sector, in absolute terms and in proportion to the equity value of the borrowing firms.

On the other hand, as mentioned above, the liquidity crisis hypothesis considers the degree of bank's illiquidity as the main source of bank failure. Panics, reflected in runs by domestic depositors and/or foreign lenders, first articulated by Diamond and Dybvig

[9] Corsetti, Pesenti, and Roubini (1998) argue that the East Asian financial crisis was triggered by fundamental structural and policy distortions. The latter include not only weak macroeconomic policies, but also weak microeconomic policies, which increased the vulnerability of the banking sector through the deterioration of banks' portfolios. In particular, the authors have emphasized that implicit guarantees led banks to engage in moral hazard lending (the "over-borrowing syndrome" that was modeled by McKinnon and Pill, 1997).

(1983), trigger the crisis, forcing even solvent but illiquid banks to fail because their liquidation value is lower than its implicit liabilities. Under this hypothesis, liquidity at the bank level is also a micro-level bank fundamental related to the risk of failure. In this sense, the liquidity crisis hypothesis involves not only aggregate measures of liquidity in the system, but also idiosyncratic measures of liquidity at the bank level.

2.1.2 Review of the Empirical Literature

After the East Asian crisis, most of the empirical studies trying to identify the nature and origins of systemic banking crisis in EMs have focused mainly on macroeconomic factors and institutional variables.[10] At the micro-level, the majority of empirical studies on banking failures have focus mainly on the U.S. commercial banking industry. Among the

[10] See Kaminsky and Reinhart (1999), and Demirguc-Kunt and Detragiache (1997, 1999, and 2000). Some of the explanatory variables used in these studies are the rate of growth of GDP per capita, the change in terms of trade, the rate of change of the exchange rate, the real interest rate, the rate of change of the GDP deflator, the ratio of central government budget surplus to GDP, the ratio of M2 to foreign exchange reserves of the central bank, the ratio of domestic credit to the private sector to GDP, the ratio of bank liquid reserves to bank assets, the rate of change of the ratio of bank assets to GDP, a dummy variable for the presence of an explicit deposit insurance scheme, and an index of the quality of law enforcement. One exception is Honohan (1997) who performs a systematic evaluation of alternative indicators based on aggregate balance sheet indicators and indicators of macro-cycles: loan to deposit ratio, foreign borrowing to deposit ratio, growth rate of credit, share of reserves to deposits, level of lending to the government and of central bank lending to the banking system.

recent contributions in the last decade, Thomson (1991), Whalen (1991), Cole and Gunther (1995, 1997), and Gonzalez-Hermosillo (1999) develop empirical analyses of the contribution of bank fundamentals, systemic and macroeconomic factors in different episodes of banking system problems in the U.S. [Southwest (1986-1992), Northeast (1991-1992), and California (1992-1993)]. The common methodology used by these authors has been the use of multivariate logit analysis and proportional hazard models, and their main findings are that measures of bank solvency and risk, *proxied* by CAMEL-rating variables, explain the incidence of bank failures after controlling for aggregate factors. [11] Calomiris and Mason (2000) provide the first comprehensive econometric analysis of the causes of bank distress during the Depression. The authors construct a model of survival duration and investigate the adequacy of bank fundamentals (measures of bank solvency and risk, related to the CAMEL-rating system) for the period 1930-1933, after controlling for the effects of county, state, and national-level economic characteristics. They find that bank fundamentals explain most of the incidence of bank failure and argue that "contagion" or "liquidity crises" were a relatively unimportant influence on bank failure risk prior to 1933.[12]

[11] Earlier contributions are Sinkey (1975), Martin (1977), Barth et al. (1985), and Benston (1985). These studies seek to identify changes in bank-specific variables, related to the CAMEL-rating analysis, that lead to bank difficulties, and that therefore could be part of an early warning system of banking problems.

[12] Calomiris and Mason (1997) analyze the banking failures during the Chicago panic of June 1932 using the same methodology as in the paper of 2000. The authors conclude that failures

However, to date, there is little cross-country empirical evidence that evaluates the relative contribution of micro-level bank fundamentals in the context of the recent systemic banking crisis in EMs during the nineties. The main contributors to the literature of bank failures in EMs are Gonzalez-Hermosillo (1999), Bongini, Claessens and Ferri (2000), and Rojas-Suarez (2001).

Gonzalez-Hermosillo (1999) analyzes the contribution of bank-level fundamentals and macroeconomic factors for the Mexican banking crisis in 1994-95. The author finds that all ex-post measures of risk, and the loan-to assets ratio are associated with the probability and timing of failure. Bongini, Claessens and Ferri (2001) investigate the occurrence of bank distress (the financial institution was recapitalized by the government, received liquidity support, was merged or acquired by other institution, or was intervened or closed by the government) and closure decisions in five East Asian countries (Indonesia, Korea, Malaysia, Philippines and Thailand) in order to assess the role of both bank's "connections"--with industrial groups or influential families-- and banks' micro-weaknesses in causing and resolving bank failures. Among the main findings, CAMEL-type variables, such as the ratios of loss loan reserves to capital and of net interest income to total income, help predict subsequent distress; and "connections" increase the probability of distress and make closure more likely. Rojas-Suarez (2001) evaluates an alternative set of indicators based on "markets that work" rather than just relying on accounting figures (CAMEL-type variables) in order to identify in advance impending

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during the panic reflected the relative weaknesses of failing banks in the face of a common asset value shock rather than contagion.

banking problems. Using bank-level data for six EMs countries (Korea, Malaysia, Thailand, Colombia, Mexico and Venezuela) and applying the "signal to noise approach" methodology, which was used in the study of currency crises by Kaminsky and Reinhart (1999). The author finds that the capital-to-asset ratio has performed poorly as an indicator of banking problems in Latin America and East Asia. On the other hand, interest rates on deposits and spreads have proven to be strong performers.

While extremely informative, the first two of these studies have a number of limitations as far as the objectives of this paper are concerned. First, case studies are interesting in their own right. However, one major goal of this paper is to find common ground across different episodes of systemic banking crises, i.e., to find systematic underlying patterns that will allow us to make comparisons not only across countries, but also across regions (Latin America and East Asia) about the relative contribution of micro-level bank fundamentals in the recent episodes of systemic banking crisis. This information can be used by policymakers and financial regulators to develop a set of indicators of financial soundness in order to assess banking systems' strengths and vulnerabilities.

Second, Bongini et al. (2001)'s analysis of the probability of distress does not include non-crisis countries in East Asia, which could introduce a bias in the results in the sense that crisis countries had more bank failures just because they were affected by adverse aggregate shocks and not because of differences in ex-ante bank fundamentals (crisis countries had weaker banks ex-ante than non-crisis countries). Also, only a limited number of bank fundamentals are included in the estimation, not taking into account

measures such as the capital-to-assets ratio, the loans-to-assets ratio, measures of liquidity, and market based indicators such as deposit interest rates, as mentioned by Rojas-Suarez (2001). This also could introduce a bias, because not all sources of risk (market, credit and liquidity) have been represented. The definition of distress includes institutions that were merged or acquired by other financial institutions. However, mergers and acquisitions could be due to strategic reasons rather than distress. In that sense, it is necessary to check the robustness of the results to the exclusion of this category of the definition of distress. A significant fraction of failures occurred in 1998 and 1999. In this sense, one could use financial information for 1997 and 1998 in order to analyze the financial condition of failed institutions in 1998 and 1999, in addition to the information as of the end of 1996. In addition, one should include not only bank-level variables, but also systemic and macroeconomic variables to account for differences across countries and periods. The authors mention the last two points, arguing that the use of financial information as of the end 1996 introduces a bias against finding strong results. Third, neither study calculates the relative contribution of micro-level bank fundamentals to the probability of bank failure.

2.2 Empirical Methodology

In order to assess whether the waves of bank failure in the recent episodes of systemic banking crisis in EMs during the nineties reflected a fundamental deterioration in bank-level conditions, first, I assess if bank-level heterogeneity is important for explaining cross-country bank failures, i.e., if crisis countries had weaker banks ex-ante than non-crisis countries rather than just had worse shocks ex-post. Second, based on the previous

results, I evaluate the relative contribution of bank-level fundamentals in the likelihood of failure, which allow us to determine if only the weakest banks, in terms of their fundamentals, failed in the crisis countries and if cross-sectional differences in bank-level fundamentals are sufficient or not to explain bank failures.

In order to perform the first task, given a definition of bank failure, I perform a descriptive analysis to examine in a univariate context whether failed financial institutions were similar ex-ante to non-failed financial institutions. Mean tests of bank-level fundamentals are performed, including market-based indicators such as the rate of decline in bank's deposits, the implicit interest rate paid on deposits and loans, and interest rate spreads prior to the onset of systemic crisis. Then, I estimate the probability of bank failure using a cross-sectional multivariate logit model for East Asia and Latin America separately, including crisis and non-crisis countries. Finally, to evaluate the robustness of the cross-sectional logit results, I relax the assumption that the information used in the logit estimation accurately reflects unchanging cross-sectional differences in bank condition during the crisis periods by estimating a survival duration model separately for East Asia and Latin America for a window of time, using the same set of bank-level fundamentals, and also aggregate banking and macroeconomic variables, i.e., I include the time dimension in the estimation.

Regarding the second task, I compute propensity scores, based on the cross-sectional logit results for individual financial institutions, using only bank-level fundamentals for failed and non-failed financial institutions to which determine their relative contribution

to the likelihood of failure. In addition, a distributional analysis of these scores will allow us to evaluate the degree of overlapping between the distribution for failed and non-failed banks in the crisis countries to assess if only the weakest banks failed in the crisis countries.

2.2.1 Definition of Failure

Most empirical studies of banking failures consider a financial institution to have failed if it either has received external support or was directly closed. Failure will be identified as one of the following categories (Bongini, et al., op.cit; and Gonzalez-Hermosillo, 1999):

1. The financial institution was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis; and/or required a liquidity injection from the Monetary Authority,
2. The financial institution's operations were temporally suspended ("frozen") by the Government,
3. The Government closed the financial institution,
4. The financial institution was absorbed or acquired by another financial institution.

Under this definition, these categories involve a broader concept of economic failure than the more restrictive concept of *de jure* failure (closure). One potential limitation is that category (4) could include financial institutions that were merged or absorbed for strategic reasons during the crisis period and not due to insolvency reasons. For this

reason, in our statistical tests we will perform a sensitivity analysis excluding this category.[13]

In the empirical implementation, a financial institution is considered as failed if it falls in any of the above categories between 1997 and 1999 in the case of East Asia, between December 1994 and December 1996 in the case of Argentina and Mexico, and between January 1994 and December 1995 in the case of Venezuela.[14] Thirty one percent of the sample failed in East Asia and Latin America respectively.

[13] This classification was done by looking at Central Banks' annual reports and daily review of newspapers, in particular the Asian Wall Street Journal from March 1997 to August 1999. In addition, I cross my information with two alternative databases assembled by Bongini et al. (2001) and Laeven (1999).

[14] The crisis period is defined since the onset of the crisis (time T): January 1997 (East Asia), January 1994 (Venezuela), and December 1994 (Argentina and Mexico) up to two more years (time T+1 and T+2).

2.2.2 Stylized facts: Characteristics of Failed and Non-Failed Financial Institutions

First, I examine whether failed institutions were similar ex-ante to non-failed institutions.[15] In this context, mean tests of financial ratios are implemented separately prior to the onset of the crisis for both regions. Both CAMEL-type variables, which reflect the market, credit, operational and liquidity risk faced by the financial institutions, and market-based indicators (deposit interest rates and spreads) are analyzed. This analysis only reveals if there were statistical differences between failed and non-failed financial institutions; it does not isolate the contribution of particular variables to the probability or time of failure.

2.2.3 Probability of Failure: Cross-Sectional Logit estimation

Next, I estimate a cross-sectional multivariate logit model using CAMEL-type variables (that proxy for bank-level fundamentals), market-based indicators, and country dummies. The dependent variable takes the value of 1 if the financial institution is identified in any of the categories of failure during the periods specified in section 2.2.1. I use as explanatory variables CAMEL-type variables associated with asset quality (the loan loss provisions to total loans ratio and the total loans to assets ratio), solvency (the total equity to total assets or liabilities ratio), liquidity (the liquid assets to total liabilities ratio), and profitability (return on assets). Also, I include the deposit interest rate and spread

[15] Given the definition of failure, we classify the financial institutions into failed and non-failed and conduct the mean and median test over the different financial ratios in the two years prior to the onset of the crisis.

between the loan and deposit interest rate, and the logarithm of total assets to proxy for the size of the financial institution. See Appendix I, section A, for a detail presentation of the logit model. CAMEL-type variables and market-based indicators, are measured as of the end of 1996 for East Asia (Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand), as of the end of 1993 for Venezuela, as of September 1994 for Argentina and Mexico, and as of December 1994 for Chile, Colombia and Peru.[16]

2.2.4 Conditional Probability of Failure: Survival Duration Analysis

Under the logit approach discussed above, I estimate the unconditional probability of failure, under the assumption that bank-level fundamentals (as of the end of 1993, September 1994, December 1994, and December 1996) accurately reflect unchanging cross-sectional differences in bank conditions throughout the period January 1997-December 1999 for East Asia, January 1994-December 1995 for Venezuela, December 1994-December 1996 for Argentina and Mexico. This assumption is not correct, because the crisis periods in East Asia and Latin America witnessed a continuous deterioration in asset values, implying that the failure threshold for banks was shifting over that period,

[16] Non-crisis countries in East Asia (Hong Kong, Singapore and Taiwan) and Latin America (Chile, Colombia, and Peru) are included in the estimation to examine the degree of overlap in bank-level fundamentals between crisis and non-crisis countries. In the case of Latin America, I performed a robustness check by including only Chile as a non-crisis country, given that Colombia and Peru were implementing structural reforms at that period of time. No significant qualitative differences arise. For this reason, I present the results including Colombia and Peru.

Declining fundamentals can explain the quality difference between early and late bank failures during the crisis periods (Calomiris and Mason, 1997).

To evaluate the robustness of the cross-sectional logit results, I estimate a survival duration model separately for both regions during the periods 1996-1999 for East Asia and 1993-1996 for Latin America, using the same set of CAMEL-type variables that proxy for bank level fundamentals, and also I include banking system and macroeconomic variables, which also could explain early and late bank failures during the crisis periods according to one stream of the literature on banking crisis reviewed before.[17] The survival duration model allows for changes in the underlying transition probabilities during the crisis period.

[17] Given that I have an exact record of the specific dates of each bank failure, I model each financial institution's monthly failure as a function of bank-level fundamentals, banking system and macroeconomic variables, which are measured annually. I use the same set of CAMEL-type variables, market-based indicators, and size of the financial institutions as in the cross-sectional logit estimation. In addition, I include banking system variables, liquidity outside the financial institution and net foreign liabilities; and macroeconomic variables, the real exchange rate volatility, GDP growth, and a measure of the stock market. Banking system and macroeconomic variables are defined in the next section. See Appendix I, section B, for a detailed presentation of the survival duration model.

2.2.5 Calculation of Propensity Scores: Measure of the Relative Contribution of Bank-Level Fundamentals

Finally, based on the cross-sectional logit results for individual financial institutions, I compute propensity scores, using only bank-level fundamentals related to asset quality, solvency, liquidity and profitability for failed and non-failed financial institutions to determine their relative contribution to the likelihood of failure. In addition, a distributional analysis of these scores will allow us to evaluate the degree of overlap between the distribution for failed and non-failed banks in the crisis countries to assess if only the weakest banks failed in the crisis countries.

2.3 Data Sources

In the case of East Asia,[18] financial statements for a sample of 444 financial institutions have been gathered from BankScope, a comprehensive database of balance sheet and income statement data for individual financial institutions across the world. This information covers the period 1995-1999 on annual basis. BankScope collects annual reports and financial statements from individual financial institutions, which are prepared according to the various national accounting standards, and adjusts the reported data to make them comparable across countries as much as possible.

[18] Indonesia, Korea, Malaysia, Philippines, and Thailand represent the crisis countries, and Hong Kong, Singapore, and Taiwan represent the non-crisis countries.

The breakdown of data by countries is as follows: (i) 86 commercial banks and 3 other financial institutions in Indonesia; [19] (ii) 27 commercial banks and 28 other financial institutions in Korea; (iii) 41 commercial banks and 33 other financial institutions in Malaysia; (iv) 31 commercial banks and 5 other financial institutions in Philippines; (v) 15 commercial banks and 26 other financial institutions in Thailand; (vi) 43 commercial banks and 96 other financial institutions in Hong Kong; (vii) 18 commercial banks and 39 other financial institutions in Singapore; (viii) 36 commercial banks and 10 other financial institutions in Taiwan.

Coverage of the national financial sector in terms of total assets is high for all five countries and substantial in terms of the number of commercial banks for Malaysia and Thailand. In terms of total assets, the coverage of the total commercial banking system in our sample varies between 80% and 100%. The coverage of other financial institutions is between 47% and 90%. The coverage in terms of number of commercial banks (local and foreign) is 35% in Indonesia, 34% in Korea, 100% in Malaysia, 63% in Philippines, and 100% in Thailand. In the case of other financial institutions, the coverage is 3% in Indonesia, 49% in Korea, 55% in Malaysia, 5% in Philippines and 27% in Thailand.

In the case of Latin America, I assemble a novel database by gathering annual balance sheets and income statements for a sample of 307 banks from official publications of the

[19] Other financial institutions include finance companies in the case of Thailand; saving and investment banks, and merchant banks in the case of Korea and Malaysia; saving banks in the case Philippines; Islamic and investment banks in the case of Indonesia.

national financial supervisor offices of each crisis country (Argentina, Mexico, and Venezuela), and for non-crisis countries (Chile, Colombia, and Peru) for the period 1992-1996.[20] The coverage of the financial information in terms of total assets is over 80 percent for all the countries due to the fact the banking sector covers a very high share of the financial system in Latin American countries. As of the end of 1994, the coverage in terms of total assets is 98 percent in Argentina, over 80 percent in Mexico, and 84 percent in Venezuela. The breakdown of data by countries is as follows: (i) 171 commercial banks in Argentina; (ii) 27 commercial banks in Chile; (iii) 21 commercial banks in Colombia; (iv) 20 commercial banks in Mexico; [21] (v) 21 commercial banks in Peru; and (vi) 47 commercial banks in Venezuela.[22]

[20] BankScope does not report financial information of banks that failed in Argentina, Mexico and Venezuela during their respective crisis periods. For this reason, I gathered the information separately for each crisis country. In this context, the coverage in terms of commercial banks is basically 100 percent.

[21] As of end 1994, there were 32 banks in Mexico. However, 12 banks report information since 1994. For this reason, I only take banks that have al least one year of information previous to September 1994.

[22] See Appendix II for a complete description of the data sample, and Appendix III for the presentation of the list of failed banks use in the estimations.

2.4 Variables

2.4.1 Bank-Level Fundamentals

The theoretical models that stress the role of bank level fundamentals at the root of banking failures (Kletzer and Chinn and Deckle and Kletzer) establish that as a consequence of a bad management, the probability of failure is an increasing function of bank asset risk and solvency (leverage). Chang and Velasco (1999, 2001) stress the role of bank liquidity. I thus need bank-level variables that proxy for bank asset risk, liquidity, and solvency.

According to Sinkey (1975), bank financial ratios reflect the variation in bank asset risk and leverage because they capture the market, credit, operational and liquidity risk faced by financial institutions. In this sense, bank balance sheets and income statements convey information about the ex-post consequences of management's decisions, i.e., they provide an indirect measure of the managerial performance.

The financial ratios used extensively in the empirical literature for the U.S. commercial banking industry are those related to the CAMEL-rating system. Regarding asset risk, ratios of loan loss reserves and loan loss provisions over both total loans and capital are ex-post measures of asset quality, and the ratio of total loans to total assets represents an ex-ante measure of asset risk.[23] All of these ratios are expected to be positively related to

[23] The ratio of non-performing loans over total loans is another traditional measure of asset quality, but it is not used here because it cannot be found consistently for all the selected countries, and because this measure varies widely across countries due to different accounting

the risk of bank failure. Bank profitability is also considered an ex-ante measure of asset risk (FDIC, 1997). Sustained levels of profitability allow the financial institution to increase its capital base and improve its viability, so profitability is negatively related to the risk of bank failure.[24]

Solvency is related to the ability to withstand shocks, i.e., how well a financial institution can absorb losses. However, an operative concept of solvency (positive net worth) is difficult to measure in practice because of the presence of non-marketable assets or the absence of liquid markets for some categories of bank assets that make it difficult to obtain a consistent measure of bank's asset value. In this context, solvency has been proxied by the extent of leverage, where the ratio of total capital (total equity plus loss loan reserves) over total assets is the traditional measure of solvency used in the empirical literature. [25]

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standards. On the other hand, ratios of bank's portfolio concentration, which are related to ex-ante bank asset risk, are not included due to data availability constraints.

[24] However, exceptionally risky projects could be associated with huge rates of return so it is possible that for some threshold a high degree of profitability could be associated positively with the risk of failure (Gonzalez-Hermosillo, 1997).

[25] In particular, the risk-adjusted capital asset ratio has been the traditional proxy for solvency. In 1988, the Basel Committee on Banking Supervision established a minimum standard of 8 percent for this ratio.

I introduce two additional measures of bank solvency: the ratio of total capital over total liabilities and over total liabilities plus off-balance sheet items. The measure of the extent of leverage using liabilities instead of assets provides a more sensible measure of the bank buffer stock that will serve as a cushion to absorb losses, particularly since the latest episodes of banking crisis witnessed not only shocks to bank assets, but also to the deposit base. In addition, the explicit inclusion of off-balance sheet positions produces a more accurate measure of bank leverage and exposure (Breuer, 2000). Moreover, this measure accounts for the fact that "the rapid unwinding of positions, as all counter parties run for liquidity, is characterized by creditors demanding payment, selling collateral, and putting on hedges, while debtors draw down capital and liquidate other assets. This can result in extreme market volatility" (IMF, 2002).

Regarding liquidity risk, the traditional indicator of bank liquidity has been the ratio of liquid assets (cash and reserves, government bonds, and other marketable securities) over total assets as a measure of the maturity structure of the asset portfolio, which can reflect excessive maturity mismatches. On the other hand, given that liquid assets allow financial institutions to meet unexpected deposit withdrawals, the liquidity of assets relative to liabilities is also a factor affecting the risk of bank failure (Calomiris and Mason, 2000). For this reason, both ratios, which are negatively related to the risk of bank failure, are included in the empirical analysis.

In addition, following Rojas-Suarez (2001), I include two additional measures of the riskiness of individual financial institutions based on market prices rather than accounting

figures. I analyze the effect of interest rates (for loans and deposits) and spreads[26] on the probability of bank failure, because such prices are a direct measure of bank default risk (Calomiris and Mason, op. cit.). An aggressive bidding for deposits could be associated with a higher likelihood of bank failure, because depositors demand high rates from banks they perceive as risky, i.e., depositors could have information about bank vulnerability not captured by CAMEL-type variables, that cause equilibrium deposit rates to be higher for institutions perceive as risky by depositors.

Even though bank size, measured by total assets, is not considered by the existing theoretical literature as a bank level fundamental, it is included in the analysis to account for the fact that larger banks are better able to diversify their loan portfolio, reducing their asset risk (Calomiris and Mason, op. cit.), and also because "too big to fail" policies could extend the survival time (reduce the probability of failure) of larger banks.

The use of financial ratios as proxies of fundamental bank attributes provides information about the symptoms rather than the causes of financial difficulty, in the sense that they provide leading indicators of incipient crisis (Johnston, et al., 1998). In this sense, I focus on the near-term fragility (vulnerability) of the financial institutions and not on medium-to-longer-term vulnerabilities, which requires the identification and evaluation of potential structural weaknesses that can affect incentives to screen and monitor risks. At

[26] The spread equals the difference between the loan interest rate and the implicit deposit interest rate. The loan interest ate is calculated as the ratio between interest income and total loans. The deposit interest rate is calculated as the ratio between interest expenses and total deposits.

the operational level, this involves a review of the institutional structure, the legal and regulatory system, corporate governance, the nature of implicit and explicit guarantees, and the effect of financial reform or liberalization (Johnston, et al. 2000).

2.4.2 Banking System Variables

Banking variables capture potential contagion effects that the banking system (banks and other financial institutions) as a whole could transmit to individual financial institutions at the domestic and international level. On the one hand, there is domestic liquidity risk, where depositor runs from some banks reduce the pool of liquidity over total deposits in the system and spread negative externalities (spillovers) on other banks under asymmetric information on the part of the depositors regarding the solvency of the financial institutions (Diamond and Rajan, 2002). [27] On the other hand, there is international liquidity risk, where a higher ratio of the financial system's foreign liabilities over

[27] Diamond and Rajan (2002) argue that contagion effects could be caused not only by contractual or asymmetric information links, but also because bank failures could lead to a contraction in the common pool of liquidity, and this negative spillover effect raises the likelihood of failure of other banks. In this context, domestic liquidity risk is proxied by the total amount of liquidity relative to total deposits outside the bank, i.e., the amount of cash in vaults in the rest of banks in the system (the summation over the n-1 banks) over the total amount of deposits in the rest of banks in the system (the summation over the n-1 banks) as a measure of liquidity in the banking system.

international reserves increases its vulnerability to exogenous shocks and shifts in expectations of international investors (Chang and Velasco, 2001). [28]

2.4.3 Macroeconomic Variables

Unexpected macroeconomic shocks undermine the viability of financial institutions (Hausmann and Gavin, op. cit. and Oviedo, op. cit.). The macroeconomic variables included in the empirical implementation not only capture the effect of real exchange rate volatility[29], but also the effects of economic activity and stock markets. With respect to economic activity, I use the annual growth rate of gross domestic product (GDP). Regarding stock markets, a decline in the total value of bank equities relative to the overall market value suggests that the aggregate portfolio of the banking system is deteriorating and becoming increasingly vulnerable in a context of foreign capital inflows, imperfect prudential regulation, implicit guarantees, and renegotiation of firm

[28] International liquidity risk is proxied by the ratio of Bank and Other Financial Institutions' Net Foreign Liabilities to Net International Reserves. The data is obtained from the International Monetary Fund (IMF), International Financial Statistics (IFS). Lines 21, 26c, 41, 41c, and 11c.

[29] Real exchange rate volatility is calculated as the monthly average of the standard deviation of the real effective exchange rate reported by the IMF, IFS. Line rec.

debts (Dekle and Kletzer, op. cit.). In this context, a decline in this ratio would be associated with an increase in the probability of failure (higher financial fragility).[30]

2.5 Empirical Evidence

2.5.1 Characteristics of Failed and Non-Failed Financial Institutions

Tables 2.1 and 2.2 report mean tests for differences in the bank-level fundamentals between failed and non-failed financial institutions over two years prior to the onset of the crisis for East Asia (EA) and Latin America (LA) respectively. In the case of EA, Table 1 presents the results for the whole sample of financial institutions (FIs) and for commercial banks only; results are similar for both samples. This table suggests that failed FIs showed early signs of vulnerability before the onset of the crisis.

Regarding asset risk, failed FIs showed a higher ratio of loss loan reserves and provisions to total equity, and a higher ratio of loans to total assets, than non-failed FIs, i.e., it is not only high lending but bad lending that characterizes failed institutions. With respect to solvency, failed FIs showed a lower ratio of capital to total assets and total liabilities (also including off-balance sheet items), i.e., higher leverage makes FIs less able to absorb negative shocks.

[30] This ratio is calculated using the stock market index of the banking sector and the general stock market index. Both variables are averaged over the year using daily information coming from Bloomberg.

Regarding liquidity, failed FIs showed not only a lower ratio of liquid assets to total assets but also to total liabilities, which made these institutions less able to withstand unexpected deposit withdrawals. In addition, failed FIs showed lower profitability (return on assets), which made these institutions less able to increase their capital base and improve their viability.

With respect to market-based indicators, the results indicate that up to two years before the onset of the crisis, the implicit deposit interest rate (spread) was higher (lower) for failed FIs than for non-failed FIs, while there were not statistical differences in the implicit loan interest rate. The growth rate of real deposits is insignificantly lower for failed than for non-failed institutions one year before the onset of the crisis. These facts suggest that failed banks were bidding aggressively to attract deposits, which could also be consistent with a higher degree of risk taking activities. Regarding spreads, Rojas-Suarez (op. cit.) argues that narrow spreads should be interpreted differently in emerging markets than in industrial-country financial markets; in the latter, narrow spreads reflect efficiency, but in emerging markets they can indicate increased bank risk taking.

In the case of LA, the results in Table 2.2 resemble those for EA regarding asset risk, solvency, and profitability. Failed banks showed lower liquidity ratios than non-failed banks only in the period immediately before the onset of the crisis. With respect to market-based indicators, the results show that in the pre-crisis period the implicit deposit interest rate was higher for failed banks than for non-failed banks, while there were not

statistical differences in the growth rate of deposits.[31] This suggests that failed banks had to offer higher returns in order to obtain financing for high risk taking activities before the onset of the crisis. In addition, the results show no statistical differences in spreads for the whole sample[32], but a higher implicit interest rate on loans for failed banks than for non-failed banks in the period prior to the onset of the crisis, suggesting that failed banks made investments in riskier projects than non-failed banks.

2.5.2 Probability of Failure: Cross-Sectional Logit Estimation

Table 2.3 reports explanatory variables' marginal effects in the cross-sectional multivariate logit model for East Asia. According to the results, higher capital relative to assets or liabilities (also including off-balance-sheet items) is negatively associated with the probability of failure. A higher level of liquid assets relative to total liabilities and a higher return on assets reduce the probability of failure. A higher ratio of loans to total assets has a positive impact on failure. However, the measures of asset quality, loan loss

[31] In the case of Venezuela, the rate of deposit growth was lower than the implicit deposit interest before the onset of the crisis, which implies a transfer problem, i.e., banks were transferring net resources to the depositors reducing their profitability.

[32] In the period previous to the onset of the crisis, spreads in Mexico and Venezuela are lower for failed banks than for non-failed banks, which are consistent with the results of Rojas-Suarez (2001), and give support to the hypothesis that lower spreads reflect mainly risk taking activities in the context of EMs. However, spreads in Argentina are higher for failed banks.

reserves and loan loss provisions over total loans, are not significant.[33] The latter suggests that lagging indicators of bank soundness are not good predictors of bank failures under lax standards for loan classification and loan loss provisioning. In the East Asian crisis countries, loans were classified as bad loans only if they had been in arrears for six months or more, and in addition, banks would frequently restructure such loans to reduce the size of reported portfolio problems (IMF, 1999). The marginal effect of the deposit interest rate is positive and significant, which implies that banks that bid aggressively for deposits increase their likelihood of failure. Finally, the logarithm of total assets has the right sign (negative), but is not significant.

Table 2.4 reports results for LA, which resemble those obtained for EA; bank fundamentals have the correct sign and explain significantly the probability of failure. However, the ex-post measure of asset quality (loan loss provisions over total loans) is marginally significant. As in the case of EA, the marginal effect of the deposit interest rate is positive and significant. In addition, the size of the bank is negatively associated with the probability of failure, which would give support the "too big to fail" hypothesis.[34] In this sense, failed financial institutions had particular characteristics in

[33] In addition, an estimation using the ratio of loan loss reserves to total loans was performed, and there were not qualitative differences.

[34] This result also could be related to the fact that larger banks are better able to diversify their loan portfolio, reducing their asset risk (Calomiris and Mason, op. cit).

both regions prior to the onset of their respective systemic banking crisis, and bank-level heterogeneity is important for explaining the variation in failure rates, i.e., banks that failed during the episodes of bank distress in EMs were observably weaker ex ante (more vulnerable to negative asset-value shocks) than to banks that survived the crisis.[35]

Regarding spreads, in the case of EA, the marginal effect of the spread variable is negative and insignificant. Even though the sign is negative, this result does not support the hypothesis that lower spreads increase the probability of failure in EMs (Rojas-Suarez, 2001). For LA, the marginal effect is positive and significant giving, support to the traditional hypothesis that high spreads increase banks' fragility.[36] As in the case of deposit interest rate, measures of liquidity, solvency and ex-ante risk (loans-to-assets ratio) are significant, while the loss loans reserves and loan loss provisions ratios are not significant.

[35] An additional exercise was done for both regions including an ownership dummy (foreign or domestic). Foreign ownership was negatively associated with the probability of failure.

[36] However, this result could be driven by the inclusion of Argentina, because spreads of failed institutions in Mexico and Venezuela were lower than those of non-failed banks. Only in the case of Argentina, do we have the usual result obtained in developed economies that failed institutions had higher spreads than non-failed banks.

2.5.3 Conditional Probability of Failure: Survival Duration Analysis

Table 2.5 presents the results of the survival duration model for the period 1996-1999 for East Asia. After controlling for aggregate banking and macroeconomic variables, the coefficients of bank-level fundamentals are of predicted sign and significant. Higher lending relative to assets is positively associated with the timing of failure. Higher capitalization (relative to assets and liabilities) is negatively associated with the timing of failure. Higher profitability and higher liquid assets relative to total assets are negatively associated with the timing of failure. Larger banks are associated with longer survival, consistent with the "too big to fail" hypothesis. The ex-post measure of asset quality, the ratio of loan loss provisions to total loans, is marginally significant.

Regarding the aggregate banking and macroeconomic variables, the measure of system liquidity, which captures potential contagion effects, is positively associated with survival time in all specifications, i.e., higher liquidity relative to deposits outside the bank gives positive spillovers, increasing the survival time of the bank. A higher volatility of the real effective exchange rate index is associated with a lower survival time. As expected, increases in the economic activity of the sectors in which financial institutions concentrate their loans are positively associated with the time of survival. The higher the value of bank stocks relative to the total stock market, the longer the time of survival**.**

Table 2.6 presents the results for LA. As in the case of EA, after controlling for aggregate banking and macroeconomic variables, coefficients of bank-level fundamentals related to asset quality (total loans over total assets), solvency, liquidity and profitability are of

predicted sign and significantly explain the time of survival. Results for the banking system liquidity, the real exchange rate and economic activity are similar to those of EA. The ex-post measure of asset quality is not significant. Overall, the results show that measures of (ex-ante) bank asset risk, solvency, liquidity and profitability significantly affected the survival time of financial institutions in both regions after controlling for the presence of potential contagion effects in the banking system as a whole, and for shocks to the macroeconomic environment.[37]

2.5.4 Calculation of Propensity Scores: Measure of the Relative Contribution of Bank-Level Fundamentals

I calculate propensity scores for failed and non-failed FIs across crisis and non-crisis countries based on the individual cross-sectional estimated probabilities of failure, which allow us to estimate the relative contribution bank-level fundamentals to bank failure for each group of institutions.[38] Table 2.7 shows three main results for EA. First, the average aggregate degree of vulnerability of non-failed institutions in crisis countries was higher

[37] In addition, I performed the survival analysis including spreads. Spreads have a negative sign but they are not significant in the case of EA. For LA, spreads affect positively the time of failure.

[38] The bank-level fundamentals used in the calculations are those related to asset quality (loan loss provisions ratio, and the total loans to assets ratio), solvency (the ratio of total equity over total assets or liabilities), liquidity (liquid assets to total liabilities ratio), and profitability (return on assets).

than that of non-failed institutions in non-crisis countries.[39] This result suggests that the differences in the regulatory and supervisory environment in crisis countries could have given "incentives" to bank managers for high risk taking activities relative to non-crisis countries.[40] Second, the average degree of vulnerability of failed institutions in crisis countries was higher than that of non-failed institutions in non-crisis countries; only bank-level fundamentals explain fifty percent of the probability of crisis. This result implies that there were many fragile FIs with particular ex-ante characteristics that made them more vulnerable to failure ex-post. Third, in the crisis countries, there is little overlap in the distribution of aggregate scores between failed institutions and non-failed institutions. This result implies that mainly the weakest institutions failed in the crisis countries, suggesting that the social costs of the unwarranted closure of solvent institutions (if any) must have been small.

[39] The average degree of vulnerability for non-failed FIs in crisis countries is even higher if Philippines is removed from the sample of crisis countries. Philippines was the country least affected by the crisis in East Asia.

[40]In addition, mean tests were performed among non-failed FIs between crisis and non-crisis countries. Non-failed institutions in crisis countries showed lower capitalization, profitability, liquidity, and spreads; and a higher ratio of loans over total assets than non-distress financial institutions in non-crisis countries up to two years before the onset of the crisis. This result suggests that non-failed FIs in crisis countries had a higher degree of vulnerability than non-failed FIs in non-crisis countries.

Table 2.7 also shows the distribution of the propensity scores for LA. As in the case of EA, the degree of vulnerability of failed institutions in crisis countries was higher than that of non-failed institutions in non-crisis countries; bank-level fundamentals explain forty-nine percent of the probability of crisis. However, the aggregate degree of vulnerability of non-failed institutions in crisis countries was similar to that of non-failed institutions in non-crisis countries,[41] and there is an overlapping in the distribution of aggregate scores between failed institutions and non-failed institutions in the crisis countries. These results imply that aggregate factors affecting the banking system are relatively more important in Latin America than in East Asia, in such a way that a fraction of healthy institutions may be forced to fail in the context of unexpected aggregate shocks to the system.[42] The latter is consistent with the finding of Kaminsky

[41] In the case of LA, non-failed institutions in crisis countries showed similar ratios of capitalization, profitability, liquidity, but a higher ratio of loans over total assets than non-failed financial institutions in non-crisis countries prior to the onset of the crisis. This result suggests that non-failed banks in crisis countries had a similar degree of vulnerability to non-failed banks in non-crisis countries.

[42]The previous results are based on a broad definition of failure that includes mergers and acquisitions (M&A), which could be done for strategic reasons and need not imply a form of failure. For this reason, I perform a sensitivity analysis excluding from our broad definition of failure cases in which the financial institution was absorbed or acquired by another financial institution. The cross-sectional multivariate logit model for both regions showed in tables 3 and 4 is distorted, in particular those results related to asset risk, where a higher ratio of loan loss provisions to loans is now negatively associated with the probability of failure, in the East Asian

and Reinhart (1998) that East Asia and Latin America have different regional patterns for banking crisis. Systemic banking crises in Latin America have been more volatile and severe than those in East Asia.

According to these results, bank-level fundamentals are important, but they are not sufficient to explain cross-countries differences in crisis outcomes because there is some overlap in the propensity score distributions of financial institutions in non-crisis countries versus failed institutions in crisis countries, especially for Latin America.

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case, and the ratio of total loans to total assets is now not significant (see Appendix IV, Tables IV.2 and IV.3). In addition, I performed mean tests between Non-Failed Financial Institutions and Financial Institutions that were Mergered or Acquired (M&A), which show that there were statistical differences in measures of asset risk, solvency, liquidity, and profitability, suggesting that M&A banks had higher vulnerability than other non-failed banks (see Appendix IV, Table IV.1). All together, these results imply that being merged or acquired was part of a bail out policy rather than a strategic decision during the peak of the crisis period.

Chapter 3: Bank Fundamentals and Market Discipline

3.1 Stylized Facts and Review of the Theoretical and Empirical Literature

3.1.1 Stylized Facts

Emerging markets in East Asia and Latin America experienced significant episodes of sharp deposit contraction during the systemic banking crises that occurred in the nineties. As we can observe in Table 3.1 and Figure 1, sharp deposit contractions were preceded by bank asset-value shocks related to abrupt devaluations; sharp increases in interest rates; and declines in equity and housing prices.[43]

[43] In the case of EA, the first vertical line in the graphs of stock market indexes represents the official onset of the crisis (the July 2nd devaluation of the bath in Thailand). Subsequent lines mark the onset of sharp deposit contractions in each country (note that some countries experience multiple contractions). For LA, the vertical line marks the beginning of the Mexican crisis (December 1994) and Venezuelan crisis (January 1994). The vertical lines in the graphs of deposits represent the timing of sudden deposit withdrawals as shown in Table 3.1.

Table 3.1 Total Deposit Contraction in Crisis Countries

Country	Exchange Rate Devaluation (%)	Contraction in the Total Deposit Base
Thailand	Jul. 97: 17.6 Jan. 98: 18.8	Aug. 97 (3.7%) Feb.98 - Apr. 98 (4.4%)
Indonesia	Aug. 97 - Oct. 97: 43.6 May 98 - Jun. 98: 70.3	Nov. 97 (3.7%) Jul. 98 - Aug. 98 (1.8%)
Korea	Dec. 97: 44.7 Jan. 98 : 14.7	Jan. 98 (3%) (6.5 % in local currency)
Malaysia	Dec. 97 - Jan. 98: 29.0 May 98 - Aug. 98: 12.6	Jan. 98 - May 98 (3.3%) Oct. 98 - Nov. 98 (1.8%)
Philippines	Dec. 97 - Jan. 98: 22.5	Feb.98 - May. 98 (7.4%) Feb. 98 (5.0%)
Mexico	Dec. 94: 14.2 Jan. 95 : 40.3 Mar. 95 : 17.9	Jan. 95 - Feb. 95 (4.9%) Apr. 95 - Jul. 95 (1.1%)
Argentina		Dec. 94 - Feb. 95 (7%) Mar. 95 (9.9%) Apr. 95 - mid May 95 (2.5%)
Venezuela	 May 94: 17.3 Jun 94 : 27.1	Jan. 92 - Dec. 93 (27.9%) Jun. 93- Dec. 93 (20.3%) Apr. 94 - Jun 94 (11.5%)

Author's calculations based on Central Bank statistical reports, and International Financial Statistics.

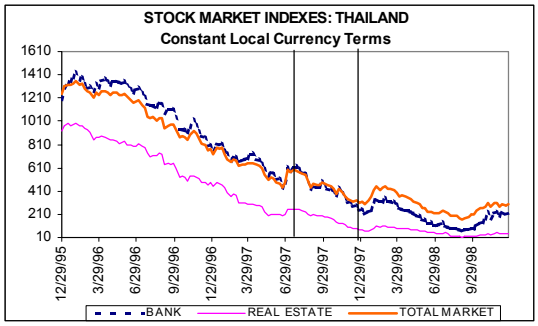
Among the crisis countries, Thailand and Korea showed a continuous decline in stock values in real estate, the banking sector and the general index one year prior to the onset of the crisis. On the one hand, the stock market decline presumably reduced the quality and liquidity of banks' assets and capital base, increasing their vulnerability to aggregate shocks. On the other hand, the equity decline may also have reduced depositors' confidence about whether banks would be able to handle the negative impact of the equity decline, in a context of asymmetric information about bank conditions. In addition, both countries faced a decline in economic activity prior to the onset of the crisis, putting more pressure on banks' asset quality and liquidity due to borrowers' difficulty repaying loans. In Indonesia and Malaysia, stock values were driven down by the sharp asset price declines and devaluations coming from Thailand and Korea, showing a continuous decline in equity values affecting not only banks' asset value and capital base, but also

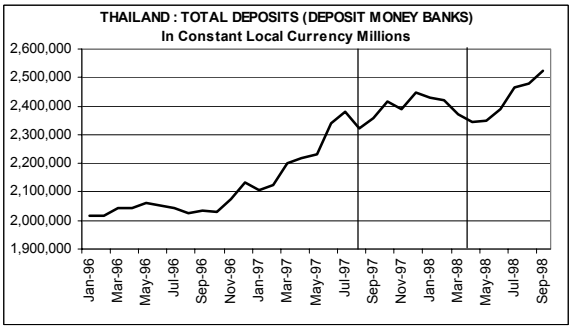
depositors' confidence. In this context, deposit runs in Indonesia and Malaysia also occurred in an environment characterized by sharp declines in asset prices.

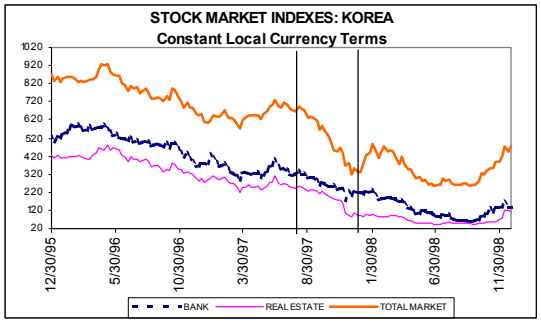
In the case of LA, Venezuela showed both a continuous decline in its stock market index and an increase in real interest rates prior to the onset of the crisis (January 1994). In addition, there was a decline in the rate of growth of GDP two years prior to the onset of its crisis. All together, these facts affected directly not only the banking system, increasing its vulnerability to unexpected aggregate shocks, but also the confidence of depositors, who began to withdraw their deposits in 1992. Mexico showed a decline in its stock market in early 1994 due to political instability and an increase in real interest rates of Government instruments (Cetes and Tesobonos), which were held by banks in important amounts.[44] However, Argentina did not show signs of equity declines or an increase in interest rates before December 1994. In this sense, the beginning of the crisis was driven mainly by a contagion effect from the Mexican crisis, due to the risk of currency devaluation and convertibility.

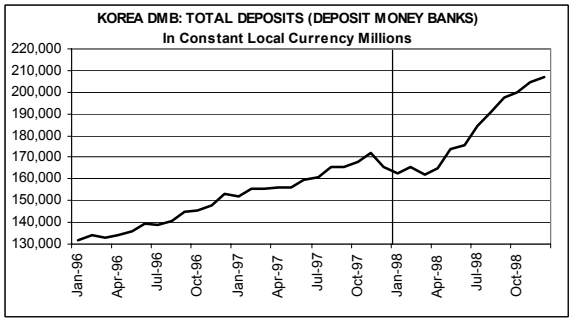
[44] As of December 1994, 50 percent of the commercial banking financial portfolio investment was in the form of Cetes and Tesobonos.

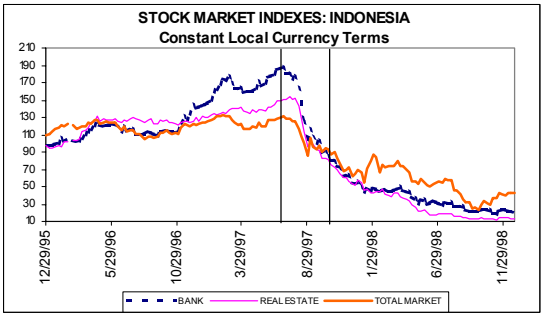
Figure 2.1 Stock Markets and Total Deposits in Crisis Countries

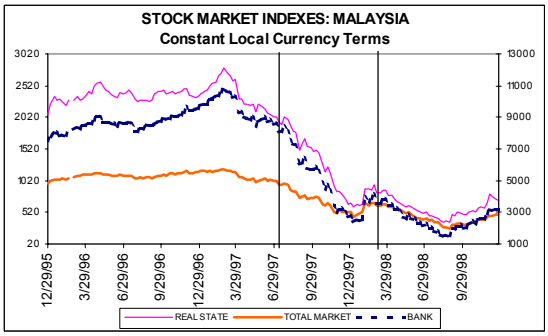












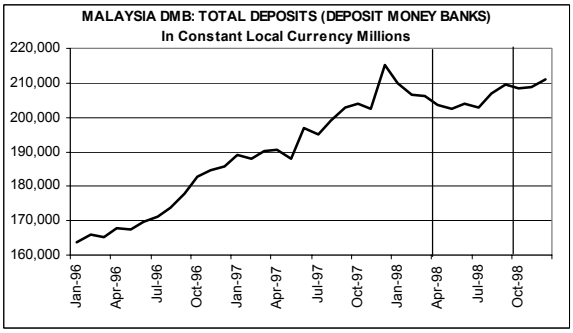
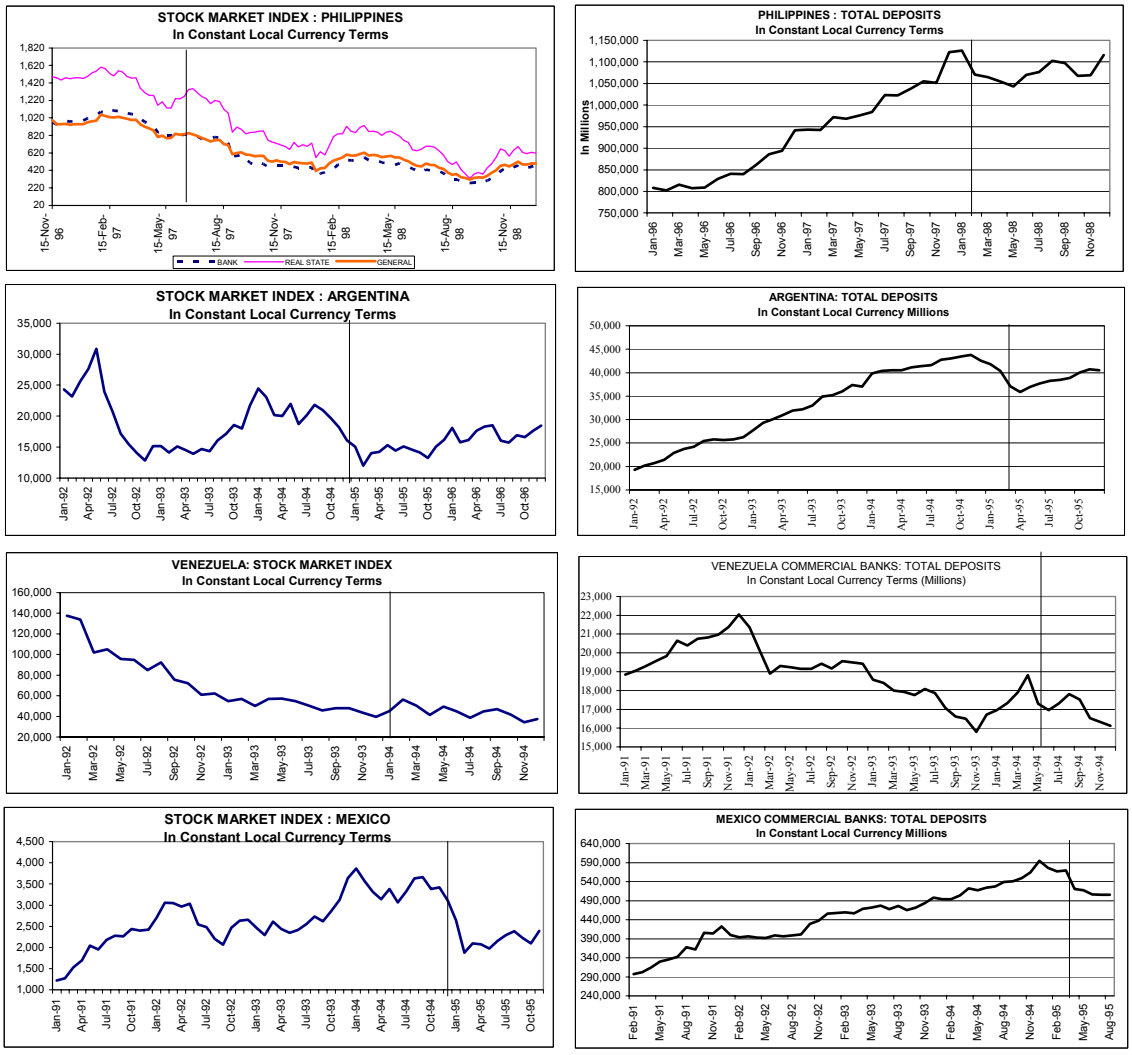


Figure 2.2 Stock Markets and Total Deposits in Crisis Countries (concluded)



Although there was an abrupt decline in the total deposit base in the crisis countries, which could imply a generalized panic by depositors, the deposit contraction was not the same for failed and non-failed banks during the peak of the crisis periods. Table 3.2 reports mean tests of the deposit growth rate during the peak of the crisis periods for failed and non-failed banks:

Table 3.2 Mean Tests of Deposit Growth Rates in Crisis Countries

COUNTRY	PERIOD	NON-FAILED	FAILED
EA crisis countries	1997-1998	-15.6	-28.2***
Indonesia	1997-1998	-17.5	-36.6***
Korea	1997-1998	-4.7	-18.9*
Malaysia	1998	-11.6	-12.4
Thailand	1997-1998	-2.5	-32.4**
Argentina	1995 (as of June)	-15.3	-28.7***
Mexico	1995 (as of June)	-7.9	-16.7**
Venezuela	1994	26.3	-8.1***

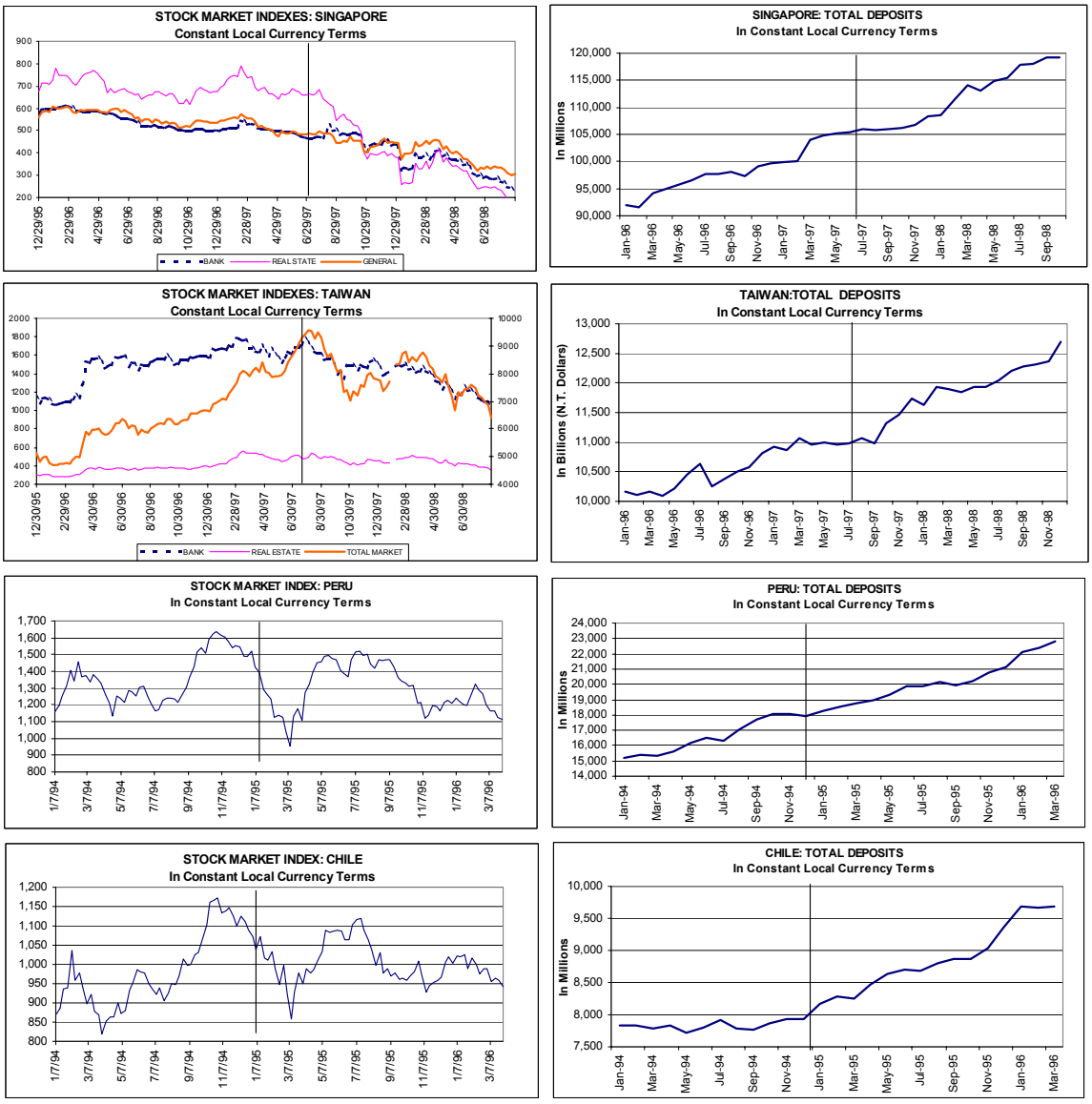
***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent respectively.
Source: Author's calculations.

Failed banks had a higher rate of deposit decline during the peak of the crisis periods than non-failed banks, with the exception of Malaysia.[45] This asymmetry in depositors' response to bank asset-value shocks would give preliminary support to the proposition that depositors sorted among banks during the periods of sudden deposit withdrawals, i.e., depositors reassessed bank specific risks in such a way that ex ante weaker banks were considered less prepared to absorb shocks affecting assets value.

[45] During the pre-crisis period there were not statistical differences in the growth rate of deposits between failed and non-failed banks in Latin America and East Asia. However, there were statistical differences in the deposit interest rate between failed and non-failed banks in both regions. Failed banks paid higher interest rates to compensate depositors for the higher risk undertaken. This result is still consistent with the market discipline hypothesis: "Rationing is a possible but not a necessary result for market discipline. If deposit allocations before the crisis do not reflect differences between both types of banks it should be the case that the interest rates paid by failing and merging banks should be higher" (Schumacher, 1996. p.134).

In addition, even though Singapore, Taiwan, Colombia, Chile and Peru experienced a decline in stock values, there were not episodes of sharp deposit contractions in these countries (see Figure 2). The latter provides us with additional significant information regarding bank-level heterogeneity to explain cross-country differences in the behavior of the growth rate of deposits and deposit interest rates.

Figure 2.3 Stock Markets and Total Deposits in Non-Crisis Countries



3.1.2 Market Discipline Hypothesis

Regarding deposit withdrawals, Saunders and Wilson (1994) distinguish among three situations: "pure" contagion, a mixture of contagion with informed depositors, and a non-contagious run. In the case of "pure" contagion, depositors are uninformed and unable to sort between solvent and insolvent banks, so deposit withdrawals occur against both types of banks.[46] In the case of non-contagious withdrawals, depositors reallocate their deposits from weak banks to healthy banks. Finally, in the case of a mixture, informed deposits, informed depositors at failing banks withdraw before failure, so the rate of withdrawals at failing banks are higher than that at non-failing banks.

The last two cases are consistent with the market discipline hypothesis (information based approach) as developed by Berger (1991), who defines market discipline as a situation in which economic agents face costs that increase with bank risk and take actions on the basis of these costs. In a principal-agent problem, the principal (depositor), by reacting to risk, disciplines the agent (bank manager), reducing in this way ex-ante excessive risk taking in the banking system, e.g., depositors withdraw their deposits or require higher interest rates when banks take more risk. [See Jacklin and Battacharya

[46]This view is related to the liquidity shock approach, as developed in Diamond and Dybvig (1983), Waldo (1985) and Donaldson (1992), where deposit withdrawals are made without any consideration of banks' asset quality and solvency. In this hypothesis, the focus is on bank's illiquidity. i.e., solvent but illiquid banks may be forced to fail. However, this approach could be extended by including heterogeneity in the degree of bank illiquidity in such a way that even a liquidity shock model would predict that ex-ante weaker banks would be most likely to fail in the presence of a bank run.

(1988), Chari and Jagannathan (1988), Calomiris et al. (1991), Calomiris and Gorton (1991), and Jacklin (1993)].

As long as there exits heterogeneity across banks in terms of asset quality, liquidity, and capital structure, depositors could attempt to sort among ex-ante healthy and weak banks in the context of asymmetric information regarding the effect of aggregate shocks to both the quality and liquidity of banks' assets and capital structure. In this sense, deposit runs could reflect an episode of market discipline, i.e., depositors respond to measures of bank risk (asset quality, liquidity, and solvency) by withdrawing their deposits and/or by requiring riskier banks to pay higher interest rates.

3.1.3 Review of the Empirical Literature

The majority of empirical studies on depositors' discipline focus on the U.S. commercial banking industry, even though the recent experiences of systemic banking crises have occurred in emerging markets. Flannery (1998) provides a detailed survey of this literature. Most of these studies examine market discipline by analyzing either how yields on uninsured deposits (Baer and Brewer (1986), Hannan and Hanweck (1988), Ellis and Flannery (1992)) or the level or growth of uninsured deposits (Goldberg and Hudgins (1996)) respond to measures of bank risk and solvency, as captured by balance sheets, income statements and market measures of risk.[47] The studies of Park (1995) and Park

[47] Measures of risk and solvency are related to the CAMEL-rating variables: non-performing loans as a ratio of total loans, loan loss provisions, the capital to assets ratio, the ratio of real estate loans to total loans, and return on assets.

and Peristiani (1998) analyze market discipline taking into account both yields and growth of uninsured deposits. The results of these studies support the information-based approach to bank runs, showing that riskier banks pay higher interest rates, but at the same time attract fewer uninsured deposits.[48]

However, the empirical evidence on depositors' discipline is not very extensive for EMs. The main contributors to the literature of depositors' discipline for EM's are Schumacher (1996), D'Amato, Grubisic, and Powell (1997), Barajas and Steiner (1999), and Schmuckler and Martinez-Peria (2001).

Schumacher (1996) examines the 1994-95 Argentine banking panic. Using a bank-level dataset, the author tests if cross-sectional differences in deposit withdrawals are explained by measures of bank risk and solvency. As a first step, the author estimates the probability of bank failures through a multivariate logit approach using accounting information as of November 1994, finding that the actual capital to required capital ratio, return on equity, and proxies for liquidity (interbank loans, dollar deposits over total deposits, and term deposits over total deposits) explain the probability of failure. Then, as a second step, the author finds that the estimated probability of failure is negatively

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[48] Cook and Spellman (1994) provide evidence that riskier banks pay higher interest rates even on insured deposits. In addition, studies of market discipline related to the period of the Great Depression, (Park (1991), Saunders and Wilson (1996), Calomiris and Mason (1997), and Calomiris and Mason (2000)) largely support the information-based approach to bank runs.

related to the growth rate of deposits, in particular during the peak of the crisis in March 1995. In addition, the author finds that implicit interest rates paid by failing banks (merged and closed institutions) were higher than those paid by surviving banks.

D'Amato, Grubisic, and Powell (1997) also examine the 1994-95 Argentine banking panic. The focus of their paper is to use daily deposit data to distinguish the effect of bank fundamentals from the importance of contagion and generalized macroeconomic shocks that affect banks simultaneously. Using daily deposit data for a sample of 120 banks, over a four-month period around the panic, the authors estimate a random effects model of daily changes in deposits as a function of bank fundamentals (as of November 1994) and macroeconomic variables (which vary across time but not across banks). Then, using a Breusch-Pagan Lagrange Multiplier test the authors indicate that there remain significant random time effects. As a second step, the authors include lagged deposits of other banks as a proxy for contagion effects and test again for residual co-movement. They cannot reject the hypothesis that there is no random time effect, interpreting this result as evidence of contagion in depositor behavior during the panic.

Barajas and Steiner (2000) study if depositors discipline bank behavior for the period 1986-1999 in Colombia. Using panel-data estimation with semi-annual data, the authors find that the growth rate of real deposits reacts to bank fundamentals (loss loan provisions, capital-to- asset ratio, and liquidity), and also to the interest rate paid on deposits as a measure of return. In addition, the authors analyze the response of banks to disciplining behavior by depositors, testing directly if bank fundamentals react to changes

in deposits, finding that only loss loan provisions behave in a manner consistent with market discipline.

Schmuckler and Martinez-Peria (2001) evaluate empirically both the interaction between market discipline and deposit insurance and the impact of banking crises on market discipline, focusing on the individual experiences of Argentina, Chile and Mexico during the eighties and nineties. Assembling a bank-level dataset that distinguishes between insured and uninsured deposits, and using panel data techniques, the authors find that depositors discipline banks by withdrawing deposits and requiring higher interest rates. In addition, the authors find that deposit insurance does not appear to diminish the extent of market discipline and that the depositors' responsiveness to bank risk is lower during periods of banking crisis compared to non-panic times.

Most of these empirical studies, with the exception of Martinez-Peria and Schmukler, are case studies focusing in particular on the Argentine experience. In this sense, while extremely informative, these studies have a limitation as far as the objectives of this paper. They do not provide evidence of common underlying patterns in depositors' discipline across not only countries but also regions, which would give policymakers and financial regulators more insights regarding the type of information about bank portfolios and capital structures that should be available to depositors, and for whether regulators should rely on private market discipline as one of the main components of the regulatory framework. I will fill this gap by extending the existing empirical evidence not only to the Mexican and Venezuelan crisis episodes, but also to the East Asian crisis episodes,

which have not been studied yet. Also, I include in the sample countries that experience asset-value shocks, but did not have sudden deposit withdrawals (non-crisis countries) in order to assess the role of bank-level heterogeneity across country experiences. In this context, I study to what extent deposit withdrawals constituted an act of market discipline in the recent episodes of banking problems in Latin America and East Asia.

3.2 Empirical Methodology

In order to assess if depositors react to bank level fundamentals in such a way that deposit withdrawals could be considered an action of market discipline in the crisis countries, I test if riskier banks attract fewer deposits. The null hypothesis is that deposit withdrawals and deposit interest rates did not respond to observable weaknesses in individual financial institutions, traceable to ex-ante bank characteristics, i.e., that deposit runs in the crisis countries were episodes of pure contagion (random withdrawals hypothesis). If bank level fundamentals explain significantly the growth rate of real deposits in the crisis countries, I interpret this as evidence in favor of the market discipline hypothesis, and reject the pure contagion hypothesis, which argues that deposit withdrawals are not related to bank level fundamentals. In order to implement the test, I estimate the following reduced form equation for the growth rate of real deposits in local constant currency terms for both regions separately, using the fixed-effect specification:

$$DEPGR_{i,j,t} = \alpha_i + \lambda_t + \beta' \, BANKFUND_{i,j,t-1} + \gamma' \, AGG.\,BANKING_{j,t} + \delta' \, MACRO_{j,t} + V_{i,j,t}$$

Such that i=1,…,N; j=1,…,J; and t=1,…,T

DEPGR represents individual bank deposits of bank i at time t in country j. N is the number of banks in each country. The panel is unbalanced, so T --the number of observations per bank-- varies across banks. AGG. BANKING represents aggregate banking variables, which capture potential contagion (spillover) effects of the banking system on individual institutions, while MACRO is a vector of macroeconomic variables, which vary across countries and time. BANKFUND is a vector of bank-level fundamentals. This vector is included with a lag, to account for the fact that balance sheet information is available to the public with a certain delay. α stands for each bank's fixed effect and λ stands for time dummies. Thus, according to the equation, bank deposits are determined by three main factors: the behavior of deposits in the overall banking system, the developments in the macro economy, and the evolution of bank-level fundamentals. In addition, I calculate the contribution of bank-level fundamentals relative to banking system and macroeconomic variables, using variance decompositions before and during the crisis period.

In order to evaluate if depositors' behavior during crisis times responds to bank level fundamentals as suggested by the market discipline hypothesis, I introduce a dummy variable for both regions, which takes the value of 1 during the crisis (panic) period: 1997-98 for East Asia and 1994-1995 for Latin America. Then, I interact this dummy with the bank-specific fundamentals and evaluate if there are statistical differences in the coefficients between crisis and non-crisis periods. In the case of EA, the crisis dummy also captures the period where blanket guarantees (full protection for depositors and creditors) were implemented in Indonesia, Korea, Malaysia and Thailand. In the case of

LA, Mexico has an implicit deposit insurance scheme covering the total amount of deposits; Venezuela has an explicit limited deposit insurance scheme covering up to US$ 7,309; and Argentina introduced a limited deposit insurance scheme in April 1995 covering up to US$ 20,000, which was extended up to US$ 30,000 in September 1998. In this sense, the crisis dummy for LA also evaluates depositors' discipline in the presence of deposit insurance schemes. Before the onset of the crisis in East Asia, only Korea, Singapore and Taiwan had an explicit deposit insurance scheme. In order to capture this effect, a dummy variable that take the value of one for these countries for the whole estimation period (since 1996 for Korea) was interacted with bank-level fundamentals.

As a robustness check, I perform generalized method of moments (GMM) estimations (Arellano-Bover, 1995) to correct for potential endogeneity effects. If bankers are forward looking, they could anticipate that bank fundamentals at time t-1 affects deposits at time t . In this sense, banks may try to adjust their risk characteristics to prevent future deposit withdrawals, which would imply an endogeneity problem (Marinez-Peria and Schmukler, op.cit.). Also, I will consider as weakly exogenous banking and macroeconomic variables, even though we could assume that banking system and macroeconomic variables do not react to individual bank deposits.[49] The data sources and variables are exactly the same as those used in chapter I.

[49] See Appendix V for a detail presentation of the GMM estimator, in particular what are the instruments that will be used in the estimation, and the specification tests used to check if the assumptions made to calculate the GMM estimators are valid.

A second way to approach market discipline is to analyze if depositors discipline bank risk taking by requiring higher interest rates. However, I will not pursue this approach due to the lack of adequate data on interest rates paid by each bank on deposits. I can only generate an implicit interest rate calculated as the share of interest rate expenses over the total amount of deposits, and not a market interest rate.

3.3 Empirical Evidence

Table 3.3 reports results from estimating the fixed-effects model of deposit growth for EA. Regarding bank specific fundamentals, FIs with higher ratios of capital, liquidity, profitability, and lower ratios of loan loss provisions and total loans to total assets, attract more deposits. [50] In this sense, depositors reassess bank specific risks given asset-value shocks. The variables that capture potential spillover effects, the measure of banking liquidity outside the FI and the ratio of net foreign liabilities to total international reserves, have the right sign and are significant in all specifications, implying that depositors were sensitive to the total amount of cash in the rest of the financial system relative to total deposits, and to the ability of the country to repay international investors.

[50] Using another measure of ex-post asset quality, the ratio of loan loss reserves to total loans, FIs with higher ratios of capital, liquidity, profitability, and lower ratios of total loans to total assets, attracts more deposits. This result provides a robustness test to our previous estimation results. F-tests indicate that not only bank-level fundamentals, but also aggregate banking and macroeconomic are jointly significant.

Regarding the macroeconomic variables, real exchange volatility has the right sign (negative) and is highly significant in all specifications. Economic activity has the right sign (positive) and is also significant in all specifications. F-tests indicate that not only bank-level fundamentals, but also potential contagion and macroeconomic variables, are jointly significant.[51]

In addition, I analyze depositors' discipline during the peak of the crisis period (1997-1998) in order to assess whether bank fundamentals explain deposit changes at a time when all crisis countries implemented blanket guarantees in order to prevent bank runs. Table 3.5 reports the interaction terms between bank fundamentals and a crisis dummy that takes the value of 1 in the period 1997-1998. According to the results, there are changes in the coefficients related to the ratios of total loans and liquidity to total assets. These coefficients have a higher absolute value during crisis years, implying that depositors care more about bank exposure in the loan market and the bank's ability to repay deposits. There is no change in the coefficients related to solvency and profitability, implying that depositors show a stable behavior regarding these

[51] In order to capture the effect of the explicit deposit insurance scheme in Korea, Singapore and Taiwan, a dummy variable that took the value of one for these countries for the whole estimation period (since 1996 for Korea) was interacted with bank-level fundamentals. There were not significant differences in the coefficients of the loan to asset ratio, solvency, liquidity, and profitability measures. However, the loan loss provisions ratio was not significant for the countries with deposit insurance. This result would suggest that the presence of an explicit deposit insurance scheme did not preclude a risk assessment by part of the depositors.

fundamentals. However, the coefficient on the loan loss provisions ratio is only marginally significant during the crisis period, which suggests that lagging variables related to bank asset quality do not convey relevant information to depositors during the peak of the crisis period. This may be a consequence of lax accounting practices in EA regarding loan loss provisioning and classification.

The contribution of bank-level fundamentals relative to banking system and macroeconomic variables is shown in Table 3.6.[52] The percentage of the variance generally explained by fundamentals is around 35 percent over the whole estimation period. However, during the peak of the crisis, the percentage of the variance explained by fundamentals drops to around 21 percent, reflecting the importance of aggregate shocks in the crisis period.

Table 3.4 reports results from estimating the fixed-effects model for deposit growth for LA. Regarding bank specific fundamentals, FIs with higher ratios of capital and liquidity, and lower ratios of loss loan provisions and total loans to total assets, attract more deposits. As in the case of EA, depositors reassess bank specific risks given asset-value shocks. In addition, the variables that capture potential spillover effects have the right sign and are significant in all specifications. Real exchange volatility has the right sign

[52] In order to calculate the percentage of the adjusted R-squared explained by specific fundamentals, once the fixed effects and time dummies have been removed, I run a regression with macroeconomic and potential contagion variables, then I add specific fundamentals and compute the percentage increase in the adjusted R-squared.

(negative) and is highly significant in all specifications. Economic activity has the right sign (positive) and is significant in all specifications. F-tests indicate that not only bank-level fundamentals, but also potential contagion and macroeconomic variables, are jointly significant.

Table 3.5 reports the interaction terms between bank fundamentals and a crisis dummy that takes the value of 1 in 1994 for Venezuela and 1995 for Argentina and Mexico. According to the results, there are changes in the coefficients related to solvency, liquidity, and the ratio of total loans over total assets, which continue to be significant, with the exception of solvency, with a higher absolute value in the case of the ratio of total loans and liquidity, implying that depositors care about bank exposure in the loan market and about the bank's ability to repay deposits during the crisis. There is no change in the coefficients related to asset quality and profitability, implying that depositors show a stable behavior regarding these fundamentals.

The contribution of bank-level fundamentals to the variance of deposit growth is shown in Table 3.6. The percentage of variance explained by fundamentals is between 31 and 42 percent over the whole estimation period, depending on specification. However, the percentage of the variance explained by fundamentals averages 22 percent during the peak of the crisis, reflecting an increase in the relative importance of aggregate shocks in the crisis period, as in the case of EA. Table 3.7 reports the results of the GMM

estimation for both regions. Bank-level fundamentals individually and jointly explain the growth rate of real deposits after correcting for potential endogenous effects.[53]

[53] In the case of East Asia, the coefficients of the loan loss provisions and return on assets variables are not significant, and in the case of Latin America, the return on assets is not significant. This could be related to the reduction of sample size, given that lags of the variables are used in order to generate the instruments in the estimation. However, the reduction in the number of observations, the results obtained in the fixed-effect estimation proved to be robust after correcting for potential endogenous effects.

Chapter 4: Conclusions

Bank-level fundamentals related to ex-ante bank asset risk, solvency, liquidity and profitability affected significantly the probability and time of bank failure in East Asia and Latin America. This result support the view that failed banks in the recent systemic crisis in Emerging Markets during the nineties suffered from fundamental weaknesses in their asset quality, liquidity, and capital structures prior to the onset of the crisis. In addition, macroeconomic and banking system variables explain the likelihood of failure, implying that aggregate shocks mainly unveiled prior bank weaknesses during the crisis episodes.

Regarding the relative contribution of bank-level fundamentals, as opposed to systemic and macroeconomic factors, bank-level fundamentals explain around fifty percent of the probability of bank failure in East Asia and Latin America, which implies that there were many fragile financial institutions with particular ex-ante characteristics that made them more vulnerable to failure ex-post. In the case of East Asian crisis countries, there was little overlapping in the distribution of aggregate scores between failed institutions and non-failed institutions. This result implies that mainly the weakest institutions failed in the crisis countries, suggesting that the social costs of the unwarranted closure of solvent institutions (if any) must have been small. However, in the case of Latin American crisis countries, there was some overlapping in the distribution of aggregate scores between failed institutions and non-failed institutions in the crisis countries. These results imply that aggregate factors, affecting the banking system, are relatively more important in Latin America than in East Asia, in such a way that a fraction of healthy institutions may

be forced to fail in the context of unexpected aggregate shocks to the system. The latter is consistent with the finding of Kaminsky and Reinhart (1998) that East Asia and Latin America have different regional patterns for banking crisis. Systemic banking crisis in Latin America had been more volatile and severe than those in East Asia.

In terms of policy recommendation, the results suggest that financial system supervision should be strengthened, putting emphasis on not only traditional financial ratios associated to the CAMEL-rating system, but also market-based indicators (deposit interest rates), forming the basis of an early warning system. In addition, given that macroeconomic and banking system variables affect the probability and time of bank failure, financial regulators could rely on stress testing analysis as part of an financial assessment program in order to assess the vulnerability of a portfolio to major changes in the macroeconomic environment, making risks more transparent by estimating the potential losses on a portfolio.

In East Asia and Latin America, a stable model of bank-level fundamentals explains the growth rate of real deposits even during the peak of the crisis periods. In this sense, this would suggest that depositors attempted to sort among ex-ante solvent and ex-ante insolvent banks in the presence of asymmetric information regarding the effect of shocks to the value of bank assets. However, in both regions, the relative contribution of bank level fundamentals during the peak of the crisis periods declined, implying that aggregate shocks played an important role in the episodes of sudden deposit withdrawals. In this

context, to some degree, the observed deposits withdrawals represented an informed market response to observable weaknesses in individual financial institutions.

In terms of policy recommendation, these results open the door to the discussion at the policymaker level of the relevance of financial information disclosure by financial regulators in order to build up a more effective market discipline as a component of the regulatory framework. Financial regulators could rely more on elements of private market discipline (disclosure) as a complement of deposit insurance schemes, implying that the coverage of that schemes have to be limited in order to reduce depositors' incentives for bank monitoring besides the moral hazard problems reflected in excessive bank risk taking. Financial institutions should release general types of public disclosure, including the capital held as a buffer against losses, risk exposures (credit, market, and operational risks), risk assessment and management processes, and the capital adequacy of the institutions, in order to allow market participants (e.g. depositors) to assess the bank ability to absorb aggregate shocks and remain solvent.

Table 2.1 Mean Tests for East Asia

I. Asset Quality

A. Full Sample[1/]

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Loan Loss Reserves / Total Equity	11.35	13.35*	11.07	13.12**
Loan Loss Provisions / Total Equity	4.33	5.51	3.82	5.14***
Loan Loss Reserves / Total Loans	0.66	0.74	0.60	0.66
Loan Loss Provisions / Total Loans	2.04	1.92	1.94	1.72
Loans / Total Assets	62.10	70.38***	63.47	69.74***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

B. Commercial Banks

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Loan Loss Reserves / Total Equity	10.59	14.49***	10.40	14.06***
Loan Loss Provisions / Total Equity	4.03	5.97***	3.97	5.59***
Loan Loss Reserves / Total Loans	0.60	0.82	0.62	0.76
Loan Loss Provisions / Total Loans	1.79	2.06	1.83	2.01
Total Loans / Total Assets	62.54	70.72***	64.97	71.07***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

II. Solvency

A. Full Sample

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Total Equity / Total Assets	12.37	9.17***	13.77	8.32***
Total Equity / Total Liabilities	13.39	10.44***	14.33	9.22***
Total Equity / (Total Liabilities + Off-Balance items)	11.55	9.34**	12.33	8.01***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

B. Commercial Banks

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Total Equity / Total Assets	12.59	8.45***	14.65	7.96***
Total Equity / Total Liabilities	13.84	9.36***	15.23	8.72***
Total Equity / (Total Liabilities + Off-Balance items)	11.92	8.30***	13.23	7.60***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

The sample of countries for East Asia includes Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand.

The sample of financial institutions (FIs) is divided between failed and non-failed FIs. A financial institution is considered to have failed if it falls in any of the following categories: (i) The financial institution was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis or by a strategic investor; and/or required a liquidity injection from the Monetary Authority, (ii) The financial institution's operations were temporally suspended ("frozen") by the Government, (iii) The Government closed the financial institution, and (iv) The financial institution was absorbed or acquired by another financial institution.

˜ Commercial banks and Other Financial Institutions (Finance companies, Merchant Banks, Saving Banks, and Islamic Banks), totalling 444 financial institutions (304 commercial banks and 140 other financial institutions).

Table 2.2 Mean Tests for East Asia (concluded)

III. Liquidity

A. Full Sample[1/]

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Liquid Assets / Total Assets	23.31	16.93***	22.23	17.46***
Liquid Assets / Total Liabilities	26.98	18.70***	24.43	19.01***
Due to Banks / Total Deposits	24.29	29.59	18.77	29.06***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

B. Commercial Banks

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Liquid Assets / Total Assets	23.58	18.08***	23.13	18.74***
Liquid Assets / Total Liabilities	26.89	19.78***	25.25	20.34***
Due to Banks / Total Deposits	22.78	26.42	17.74	26.99**

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

IV. Earnings and Profitability

A. Full Sample

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Net Interest Margin	4.06	3.44***	4.11	3.38***
Return on Assets	1.62	1.07***	1.60	1.01***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

B. Commercial Banks

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Net Interest Margin	4.52	3.87***	4.47	3.68***
Return on Assets	1.62	1.06***	1.68	1.07***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

V. Interest Rates and Deposits

A. Full Sample

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Growth Rate of Deposits	19.34	18.05	18.24	17.48
Loans Interest Rate	14.73	15.01	14.81	15.57
Deposit Interest Rate	9.05	11.16***	9.19	11.67***
Spread	7.19	4.96***	6.93	5.64***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

B. Commercial Banks

VARIABLE	Dec. 1995		Dec. 1996	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Growth Rate of Deposits	20.31	18.38	18.24	17.75
Loans Interest Rate	14.88	15.29	14.89	15.69
Deposit Interest Rate	8.67	11.18***	8.96	11.80***
Spread	7.19	4.94***	6.99	4.99***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

The sample of countries for East Asia includes Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand.

The sample of financial institutions (FIs) is divided between failed and non-failed FIs. A financial institution is considered to have failed if it falls in any of the following categories: (i) The financial institution was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis or by a strategic investor; and/or required a liquidity injection from the Monetary Authority, (ii) The financial institution's operations were temporally suspended ("frozen") by the Government, (iii) The Government closed the financial institution, and (iv) The financial institution was absorbed or acquired by another financial institution.

[2/] Commercial banks and Other Financial Institutions (Finance companies, Merchant Banks, Saving Banks, and Islamic Banks), totalling 444 financial institutions (304 commercial banks and 140 other financial institutions).

Table 2.3 Mean Tests for Latin America

Commercial Banks [1/2/ 3/]

I. Asset Quality

VARIABLE	T-2		T-1	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Loan Loss Provisions / Total Equity	8.58	8.61	7.32	9.69*
Loan Loss Provisions / Total Loans	2.05	1.35	1.92	1.70
Loans / Total Assets	47.21	54.14***	48.62	55.46***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

II. Solvency

VARIABLE	T-2		T-1	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Total Equity / Total Assets	14.65	13.49	14.86	12.56**
Total Equity / Total Liabilities	17.18	16.52	18.89	15.16**

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

III. Liquidity

VARIABLE	T-2		T-1	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Liquid Assets / Total Assets	23.99	22.29	24.13	20.33**
Liquid Assets / Total Liabilities	27.78	25.82	26.38	23.26*

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

IV. Profitability

VARIABLE	T-2		T-1	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Return on Assets	1.31	1.01	1.07	0.14***

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

V. Interest Rates and Deposits

VARIABLE	T-2		T-1	
	NON-FAILED	FAILED	NON-FAILED	FAILED
Growth Rate of Deposits	18.01	19.94	15.02	14.01
Loans Interest Rate	18.32	23.89***	18.99	21.44**
Deposit Interest Rate	9.92	12.02**	10.51	13.03**
Spread	11.19	14.43***	11.42	13.97**

***, **, * indicate significant differences between failed and non-failed financial institutions at 1, 5 and 10 percent.

[1/] The sample of countries for Latin America includes Argentina, Chile, Colombia, Mexico, Peru, and Venezuela.

[2/] The sample of financial institutions for Latin America only includes commercial banks because they cover a very high proportion (over 80 percent) of the financial system in terms of assets. There are 307 commercial banks in the sample.
The sample of commercial banks is divided between failed and non-failed banks. A commercial bank is considered to have failed if it falls in any of the following categories: (i) The commercial bank was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis or by a strategic investor; and/or required a liquidity injection from the Monetary Authority, (ii) The commercial bank's operations were temporally suspended ("frozen") by the Government, (iii) The Government closed the commercial bank, and (iv) The commercial bank was absorbed or acquired by another financial institution.

[3/] T-1 represents Dec. 93 for Venezuela, Sep. 94 for Argentina and Mexico, Dec, 94 for Chile, Colombia, and Peru. T-2 represents Dec. 92 for Venezuela, and Dec. 93 for Argentina, Chile, Colombia, Mexico, and Peru.

Table 2.4 Cross-Sectional Logit Estimation for East Asia

(Marginal Effects) [1/] [2/]

	(1)	(2)	(3)	(4)	(5)	(6)
Loan Loss Provisions / Total Loans	-0.014	-0.014	-0.046	-0.008	-0.009	-0.028
	0.860	*0.868*	*0.635*	*0.884*	*0.883*	*0.619*
Total Loans / Total Assets	0.012 **	0.012 **	0.010 **	0.014 **	0.014 **	0.014 **
	0.023	*0.022*	*0.043*	*0.009*	*0.008*	*0.007*
Total Equity / Total Assets	-0.030 **			-0.028 *		
	0.052			*0.087*		
Total Equity / Total Liabilities		-0.022 *			-0.020	
		0.073			*0.139*	
Total Equity / (Total Liab. + OBS.)			-0.002 *			-0.001
			0.090			*0.922*
Liquid Assets / Total Liabilities	-0.009 *	-0.009 *	-0.009 *	-0.009 *	-0.009 *	-0.010 *
	0.066	*0.067*	*0.075*	*0.087*	*0.086*	*0.067*
Return on Assets	-0.145 **	-0.148 **	-0.201 **	-0.153 **	-0.158 **	-0.217 **
	0.055	*0.051*	*0.006*	*0.044*	*0.041*	*0.004*
Deposit Interest Rate	0.016 **	0.016 **	0.019 **			
	0.018	*0.018*	*0.013*			
Spread				-0.001	-0.002	-0.007
				0.932	*0.903*	*0.451*
Log (Total Assets)	-0.094	-0.088	0.038	-0.182 *	-0.174 *	-0.083
	0.393	*0.428*	*0.773*	*0.058*	*0.074*	*0.451*
Indonesia	0.639 ***	0.640 ***	0.737 ***	0.608 ***	0.611 ***	0.699 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Korea	0.736 ***	0.738 ***	0.768 ***	0.770 ***	0.772 ***	0.791 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Malaysia	0.614 ***	0.618 ***	0.717 ***	0.565 ***	0.571 ***	0.680 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Philippines	0.507 ***	0.499 ***	0.410 ***	0.591 ***	0.583 ***	0.535 ***
	0.000	*0.002*	*0.000*	*0.000*	*0.000*	*0.000*
Thailand	0.641 ***	0.639 ***	0.662 ***	0.690 ***	0.688 ***	0.690 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
No. Obs.	385	392	387	385	392	387
Wald Chi2	60.16	60.75	62.03	69.33	70.57	72.86
Prob > Chi2	0.00	0.00	0.00	0.00	0.00	0.00
Overall Predicted Power	80.87%	80.28%	82.55%	79.38%	79.66%	79.38%

[1/] The estimation was done including crisis and non-crisis countries in East Asia: Hong Kong, Indonesia, Korea,Malaysia, Philippines, Singapore, Taiwan, and Thailand. The dependent variable takes the value of 1 if the financial institution (FI) falls in the definition of failure given in Table 1 during the period Jan. 97-Jun. 99, and zero otherwise. Micro-level bank fundamentals, including the size of the FI, are measured as of December 1996. A constant term was included in the initial estimation so the marginal effects of country dummies have to be interpreted relative to non-crisis countries.

[2/] Marginal effects are reported rather than the coefficients. The significance level is reported in italics below the marginal effects. The Z-stat are based on robust (Huber and White) standard errors which account for correlated observations in grouped data. ***, **, * indicate significance levels at 1, 5 and 10 percent.

Table 2.5 Cross-Sectional Logit Estimation for Latin America

(Marginal Effects) [1/] [2/]

	(1)	(2)	(3)	(4)
Loan Loss Provisions / Total Loans	0.024	0.023	-0.030	-0.031
	0.342	*0.353*	*0.511*	*0.493*
Total Loans / Total Assets	0.007 ***	0.007 ***	0.006 **	0.006 **
	0.002	*0.003*	*0.029*	*0.033*
Total Equity / Total Assets	-0.019 ***		-0.017 ***	
	0.001		*0.004*	
Total Equity / Total Liabilities		-0.012 ***		-0.011 ***
		0.001		*0.004*
Liquid Assets / Total Liabilities	-0.010 **	-0.010 **	-0.014 ***	-0.014 ***
	0.016	*0.012*	*0.000*	*0.000*
Return on Assets	-0.107 **	-0.106 **	-0.131 ***	-0.128 ***
	0.013	*0.011*	*0.000*	*0.000*
Log (Total Assets)	-0.103 ***	-0.103 ***	-0.089 ***	-0.089 ***
	0.000	*0.000*	*0.000*	*0.000*
Deposit Interest Rate	0.034 ***	0.033 ***		
	0.003	*0.003*		
Spread			0.017 ***	0.017 ***
			0.006	*0.007*
Argentina	0.644 ***	0.641 ***	0.647 ***	0.644 ***
	0.000	*0.000*	*0.000*	*0.000*
Mexico	0.773 ***	0.782 ***	0.853 ***	0.859 ***
	0.000	*0.000*	*0.000*	*0.000*
Venezuela	0.630 ***	0.649 ***	0.893 ***	0.898 ***
	0.000	*0.000*	*0.000*	*0.000*
No. Obs.	275	276	275	276
Wald Chi2	43.12	44.23	38.65	39.58
Prob > Chi2	0.00	0.00	0.00	0.00
Overall Predicted Power	76.92%	76.58%	74.65%	74.77%

[1/] The estimation was done including crisis and non-crisis countries in Latin America: Argentina, Chile, Colombia, Mexico, Peru, and Venezuela. The dependent variable takes the value of 1 if the financial institution (FI) falls in the definition of failure given in Table 1 during the period Jan. 94-Dec. 95 for Venezuela, Dec. 94 - Dec.96 for Argentina and Mexico; and zero otherwise. Micro-level bank fundamentals, including the size of the FI, are measured as of December 1993 for Venezuela, as of September 1994 for Argentina and Mexico, and as of December 1994 for Chile, Colombia, and Peru. A constant term was included in the initial estimation so the marginal effects of country dummies have to be interpreted relative to non-crisis countries.

[2/] Marginal effects are reported rather than the coefficients. The significance level is reported in italics below the marginal effects. The Z-stat are based on robust (Huber and White) standard errors which account for correlated observations in grouped data. ***, **, * indicate significance levels at 1, 5 and 10 percent.

Table 2.6 Survival Duration Model for East Asia

Estimation Period: 1996-1999, Annual data[1/ 2/]

	(1)	(2)	(3)
Loan Loss Provisions / Total Loans	-0.358 *	-0.360 *	-0.528 *
	0.079	*0.077*	*0.060*
Total Loans / Total Assets	0.030 ***	0.030 ***	0.031 ***
	0.006	*0.006*	*0.006*
Total Equity / Total Assets	-0.116 ***		
	0.002		
Total Equity / Total Liabilities		-0.093 ***	
		0.002	
Total Equity / (Total Liab. + OBS.)			-0.040 **
			0.019
Liquid Assets / Total Liabilities	-0.032 **	-0.032 **	-0.030 **
	0.016	*0.017*	*0.024*
Return on Assets	-0.380 **	-0.382 **	-0.528 **
	0.021	*0.020*	*0.001*
Deposit Interest Rate	0.018 **	0.018 **	0.018 **
	0.425	*0.407*	*0.412*
Log (Total Assets)	-0.526 *	-0.527 *	-0.365 *
	0.075	*0.074*	*0.101*
Liquidity outside the bank [3/]	-0.077 ***	-0.078 ***	-0.083 ***
	0.001	*0.001*	*0.000*
Real Exchange Rate volatility [4/]	0.377 ***	0.374 ***	0.343 ***
	0.003	*0.003*	*0.001*
GDP growth	-0.162 **	-0.159 **	-0.211 **
	0.033	*0.037*	*0.007*
Banking Sector Index Ratio [5/]	-0.220 ***	-0.217 ***	-0.260 ***
	0.008	*0.009*	*0.002*
No. Obs.	868	860	860
Wald Chi2	136.38	134.07	118.81
Prob > Chi2	0.00	0.00	0.00
p-Weibull [6/]	2.09	2.09	2.07

[1/] The financial institution's time of failure is estimated by fitting a parametric (time-varying) Weibull distribution with monotone hazard rates for the period 1996-1999. The Huber-White robust estimator of variance is used to calculate corrected standard errors. The Table reports estimated coefficients. If the sign of the coefficient is positive (negative), the variable is positively (negatively) associated with the financial institution's time of failure.

[2/] The estimation includes crisis (Indonesia, Korea, Malaysia, Philippines, and Thailand) and non-crisis countries (Hong Kong, Singapore, and Taiwan).

[3/] Total amount of liquidity relative to total deposits outside the bank, i.e., the amount of cash in vaults in the rest of banks in the system (the summation over the n-1 banks) over the total amount of deposits in the rest of banks in the system (the summation over the n-1 banks)

[4/] The standard deviation of the monthly percentage variation of the real exchange rate index.

[5/] The ratio of the banking sector stock index to the general stock market index.

[6/] An exponential distribution was not estimated because the maximum-likelihood estimator of p in the Weibull function is not close to 1.

***, **, * indicate significance levels at 1, 5 and 10 percent.

Table 2.7 Survival Duration Model for Latin America

Estimation Period: 1992-1996, Annual data[1/ 2/]

	(1)	(2)
Loan Loss Provisions / Total Loans	-0.191 **	-0.197 **
	0.026	*0.026*
Total Loans / Total Assets	0.055 ***	0.059 ***
	0.000	*0.000*
Total Equity / Total Assets	-0.017 *	
	0.094	
Total Equity / Total Liabilities		-0.012 **
		0.033
Liquid Assets / Total Liabilities	-0.057 **	-0.051 **
	0.011	*0.023*
Return on Assets	-0.162 **	-0.162 **
	0.012	*0.013*
Deposit Interest Rate	0.071 ***	0.072 ***
	0.008	*0.007*
Log (Total Assets)	-0.401 ***	-0.402 ***
	0.002	*0.002*
Liquidity outside the bank [3/]	-0.137 *	-0.132 *
	0.076	*0.094*
Real Exchange Rate volatility [4/]	0.073 ***	0.074 ***
	0.000	*0.000*
GDP growth	-0.028 ***	-0.028 ***
	0.006	0.007
Banking Sector Index Ratio [5/]		
No. Obs.	594	587
Wald Chi2	67.71	74.48
Prob > Chi2	0.00	0.00
p-Weibull [6/]	2.88	2.90

[1/] The financial institution's time of failure is estimated by fitting a parametric (time-varying) Weibull distribution with monotone hazard rates for the period 1996-1999. The Huber-White robust estimator of variance is used to calculate corrected standard errors. The Table reports estimated coefficients. If the sign of the coefficient is positive (negative), the variable is positively (negatively) associated with the financial institution's time of failure.

[2/] The estimation includes crisis (Argentina,Mexico, and Venezuela) and non-crisis countries (Chile, Colombia, and Peru).

[3/] Total amount of liquidity relative to total deposits outside the bank, i.e., the amount of cash in vaults in the rest of banks in the system (the summation over the n-1 banks) over the total amount of deposits in the rest of banks in the system (the summation over the n-1 banks)

[4/] The standard deviation of the monthly percentage variation of the real exchange rate index.

[5/] This ratio is not included due to data availability. Most commercial banks in Latin American countries are not listed in the stock market such that the banking sector index (if generated) only captures a narrow group of banks. The variation of the general stock market index was not included because of their high correlation with the variation of GDP, which is around 75 percent for the selected Latin American countries.

[6/] An exponential distribution was not estimated because the maximum-likelihood estimator of p in the Weibull function is not close to 1.

***, **, * indicate significance levels at 1, 5 and 10 percent.

Table 2.8 Distributional Analysis of Logit Propensity Scores for Failed and Non-Failed FIs

	EAST ASIA [2/]				LATIN AMERICA [3/]			
	25th	Median	75th	Average	25th	Median	75th	Average
Non-Failed FIs								
(Non-Crisis countries)								
Bank Fundamentals [4/]	0.003	0.018	0.231	**0.130**	0.192	0.321	0.502	**0.344**
(Crisis countries)								
Bank Fundamentals	0.141	0.271	0.384	**0.270**	0.165	0.340	0.481	**0.338**
Failed FIs								
Bank Fundamentals	0.385	0.472	0.582	**0.468**	0.362	0.484	0.586	**0.491**
ADDENDUM (scores without Philippines)								
Non-Failed FIs								
(Crisis countries)								
Bank Fundamentals	0.182	0.304	0.408	**0.302**				

The propensity scores are constructed based on the cross-sectional logit multivariate model used to the generate the results in Table 1.3 and 1.4 (specification 2). I calculated the probability of failure using only CAMEL-types variables: the loan loss provisions ratio, the total loans to assets ratio, the total equity to total liabilities ratio, the liquid assets to total liabilities ratio, and the return on assets.

[2/] Indonesia, Korea, Malaysia, Philippines, and Thailand (crisis counties). Hong Kong, Singapore and Taiwan (non-crisis countries).

[3/] Argentina, Mexico and Venezuela (crisis countries). Chile, Colombia, and Peru (non-crisis countries).

[4/] Loan loss provisions over total assets, total loans over total assets, total equity over total assets, liquid assets over total liabilities, and return on assets.

[5/] The effect of country dummies is added together with the micro-level bank fundamentals considered in (3). In the case of non-crisis countries, I add the constant term of the cross-sectional logit regression used to generate the results in Table 3 and 4. In the case on non-crisis countries, I add the country dummies of Indonesia, Korea, Malaysia, Philippines and Thailand for East Asia; and the country dummies of Chile, Colombia and Peru for Latin America.

Table 3.3 Fixed-Effects Estimation for East Asia (1994-1999)

Dependent Variable: Growth Rate of Real Deposits[1/]

	(1)	(2)	(3)	(4)	(5)	(6)
Lag (Loss Loan Provisions / Total Loans)	-0.011 **	-0.011 **	-0.011 **	-0.013 ***	-0.013 ***	-0.013 ***
	0.014	*0.013*	*0.011*	*0.004*	*0.003*	*0.003*
Lag (Total Loans / Total Assets)	-0.009 ***	-0.008 ***	-0.008 ***	-0.007 ***	-0.007 ***	-0.007 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Lag (Total Equity / Total Assets)	0.008 **			0.006 *		
	0.031			*0.071*		
Lag (Total Equity / Total Liabilities)		0.005 **			0.004 *	
		0.036			*0.088*	
Lag (Total Equity / Total Liabilities + Off-Balance)			0.005 *			0.005 *
			0.068			*0.094*
Lag (Liquid Assets / Total Liabilities)	0.013 ***	0.013 ***	0.013 ***	0.012 ***	0.012 ***	0.011 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Lag (Return on Assets)	0.018 ***	0.019 ***	0.020 ***	0.030 ***	0.030 ***	0.032 ***
	0.007	*0.005*	*0.004*	*0.000*	*0.000*	*0.000*
Lag (Total Assets)	-0.781 ***	-0.782 ***	-0.786 ***	-0.757 ***	-0.759 ***	-0.753 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Liquidity outside the Bank [2/]	0.007 **	0.007 **	0.007 **			
	0.048	*0.047*	*0.050*			
Net Foreign Liabilities [3/]				-0.108 ***	-0.108 ***	-0.124 ***
				0.005	*0.005*	*0.001*
Real Exchange Rate volatility [4/]	-0.009 ***	-0.009 ***	-0.009 ***	-0.009 ***	-0.009 ***	-0.009 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
GDP growth	0.002 ***	0.002 ***	0.002 ***	0.004 **	0.004 **	0.004 **
	0.027	*0.027*	*0.025*	*0.013*	*0.013*	*0.012*
No. Obs.	1108	1105	1105	1108	1105	1105
R-Squared	0.495	0.495	0.494	0.497	0.497	0.500
F-Model	80.69***	80.64***	80.40***	81.57***	81.49***	82.14***
F- Bank-Fundamentals / excluding bank size	21.08***	21.02***	20.78***	23.35***	23.27***	23.54***
F- (Macro & Agg. Banking variables)	58.97***	59.19***	58.97***	60.63***	60.68***	61.84***

[1/] Significance levels are below the coefficients in italics. Robust standard errors-White correction for heteroskedasticity are calculated.
***, **, * indicate significance levels at 1, 5 and 10 percent. The countries included are: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand.

[2/] Total amount of liquidity relative to total deposits outside the bank, i.e., the amount of cash in vaults in the rest of banks in the system (the summation over the n-1 banks) over the total amount of deposits in the rest of banks in the system (the summation over the n-1 banks).

[3/] International liquidity risk is proxied by the ratio of Bank and Other Financial Institutions' Net Foreign Liabilities / Net International Reserves.

[4/] The standard deviation of the monthly percentage change of the real exchange rate index.

Table 3.4 Fixed-Effects Estimation for Latin America (1992-1996)

Dependent Variable: Growth Rate of Real Deposits [1/]

	(1)	(2)	(3)	(4)
Lag (Loss Loan Provisions / Total Loans)	-1.973 **	-2.060 **	-1.613 *	-1.686 *
	0.057	*0.048*	*0.097*	*0.084*
Lag (Total Loans / Total Assets)	-0.540 ***	-0.556 ***	-0.326 *	-0.339 *
	0.003	*0.002*	*0.067*	*0.058*
Lag (Total Equity / Total Assets)	1.239 ***		0.836 **	
	0.004		*0.044*	
Lag (Total Equity / Total Liabilities)		0.824 ***		0.536 **
		0.004		*0.050*
Lag (Liquid Assets / Total Liabilities)	0.006 *	0.011 *	0.079 *	0.089 *
	0.098	*0.095*	*0.066*	*0.063*
Lag (Return on Assets)	0.282	0.342	0.199	0.254
	0.296	*0.212*	*0.444*	*0.336*
Lag (Total Assets)	-0.271 ***	-0.280 ***	-0.246 ***	-0.256 ***
	0.000	*0.000*	*0.000*	*0.000*
Liquidity outside the Bank [2/]	0.710 ***	0.706 ***		
	0.002	*0.002*		
Net Foreign Liabilities [3/]			-0.826 ***	-0.823 ***
			0.000	*0.000*
Real Exchange Rate volatility [4/]	-0.240 *	-0.243 *	-0.373 ***	-0.374 ***
	0.078	*0.075*	*0.002*	*0.003*
GDP growth	0.245 ***	0.243 ***	0.157 ***	0.155 ***
	0.000	*0.000*	*0.000*	*0.000*
No. Obs.	596	592	596	592
R-Squared	0.456	0.456	0.505	0.505
F-Model	21.24***	22.01***	26.65***	26.43***
F- Bank-Fundamentals / excluding bank size	4.99***	5.11***	2.56**	2.61**
F- (Macro & Agg. Banking variables)	21.94***	21.42***	32.73***	32.02***

[1/] Significance levels are below the coefficients in italics. Robust standard errors-White correction for heteroskedasticity are calculated.
***, **, * indicate significance levels at 1, 5 and 10 percent. The countries included are Argentina, Mexico, Chile, Colombia, Peru, and Venezuela.

[2/] Total amount of liquidity relative to total deposits outside the bank, i.e., the amount of cash in vaults in the rest of banks in the system (the summation over the n-1 banks) over the total amount of deposits in the rest of banks in the system (the summation over the n-1 banks).

[3/] International liquidity risk is proxied by the ratio of Bank and Other Financial Institutions' Net Foreign Liabilities to Net International Reserves.

[4/] The standard deviation of the monthly percentage change of the real exchange rate index.

Table 3.5 Stability of Parameters During the Crisis Period

Lag (Bank-level fundamentals) * Crisis Dummy [1/]	East Asia	Latin America
Loss Loan Provisions / Total Customer Loans	0.449 0.013	-0.038 *0.982*
Total Loans / Total Assets	-0.004 *0.000*	-0.271 *0.000*
Total Equity / Total Liabilities	0.000 *0.918*	-0.521 *0.013*
Liquid Assets / Total Assets	-0.003 *0.033*	-0.445 *0.004*
Return on Assets	-0.003 *0.844*	1.422 *0.414*
Ho: All Interactions are equal to zero		
F-Test	31.08	14.13
Prob.	*0.000*	*0.000*
MEMO: COEFFCIENTS DURING THE PEAK OF THE CRISIS AW7 [2/]		
Lag (Loss Loan Provisions / Total Customer Loans)	**0.030** *0.105*	
Lag (Total Loans / Total Assets)	**-0.010** *0.000*	**-0.591** *0.001*
Lag (Total Equity / Total Liabilities)		**0.051** *0.887*
Lag (Liquid Assets / Total Assets)	**0.014** *0.000*	**0.413** *0.006*

Bank-level fundamentals are interacted with a crisis dummy that takes the value of 1 for the years 1997 and 1998 in the case of East Asia, and the value of 1 for the year 1994 (Venezuela) and 1995 (Argentina and Mexico) in the Latin American case.

[1/] The regressions used in this analysis are specification (2) form Table 1 for East Asia, and specification (2) from Table 4 for Lattin America. There were not qualitative changes using other specifications.

[2/] Linear combination of the coefficient and the coefficient interacted with the crisis dummy.

Table 3.6 Percentage of Variance Explained by Bank-Level Fundamentals

East Asia	ALL ESTIMATION PERIOD			PEAK OF THE CRISIS		
	Total Equity /			Total Equity /		
Specification including:	**Total Assets**	**Total Liabilities**	**Total Liab. + OBS**	**Total Assets**	**Total Liabilities**	**Total Liab. + OBS**
Net Foreign Liabilities	**39.02**	**38.20**	**35.46**	**21.55**	**21.41**	**20.77**
Liquidity outside the FI	**34.72**	**34.16**	**30.45**	**21.55**	**21.49**	**20.83**
AVERAGE	***36.87***	***36.18***	***32.96***	***21.55***	***21.45***	***20.80***

Latin America	ALL ESTIMATION PERIOD			PEAK OF THE CRISIS		
	Total Equity /			Total Equity /		
Specification including:	**Total Assets**	**Total Liabilities**		**Total Assets**	**Total Liabilities**	
Net Foreign Liabilities	**32.02**	**31.87**		**22.18**	**23.06**	
Liquidity outside the FI	**41.15**	**41.04**		**21.89**	**22.77**	
AVERAGE	***36.59***	***36.46***		***22.03***	***22.92***	

Figures indicate the percentage of the adjusted R-squared explained by specific fundamentals, once the fixed effects and time dummies have been removed. A first regression is run with macroeconomic and potential contagion variables, then I add specific fundamentals and compute the percentage increase in the adjusted R-squared.

Table 3.7 GMM Estimation (EA: 1994-1999; LA: 1992-1996)

Dependent Variable: Growth Rate of Real Deposits[1/]

	East Asia			Latin America	
	(1)	(2)	(3)	(4)	(5)
Lag (Growth Rate of Real Deposits)	-0.548 ***	-0.546 ***	-0.543 ***	-0.323 ***	-0.310 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*
Lag (Loss Loan Provisions / Total Loans)	0.000	0.000	0.000	-2.316 ***	-2.030 ***
	0.928	*0.970*	*0.981*	*0.000*	*0.005*
Lag (Total Loans / Total Assets)	-0.008 ***	-0.008 ***	-0.008 ***	-0.124 **	-0.044 *
	0.000	*0.000*	*0.000*	*0.021*	*0.064*
Lag (Total Equity / Total Assets)	0.010 ***			0.459 **	
	0.000			*0.015*	
Lag (Total Equity / Total Liabilities)		0.008 ***			0.244 **
		0.000			*0.017*
Lag (Total Equity / Total Liabilities + Off-Balance)			0.008 ***		
			0.000		
Lag (Liquid Assets / Total Liabilities)	0.012 ***	0.012 ***	0.012 ***	0.368 **	0.459 ***
	0.000	*0.000*	*0.000*	*0.012*	*0.000*
Lag (Return on Assets)	0.002	0.003	0.005	0.104	0.117
	0.713	*0.593*	*0.309*	*0.150*	*0.129*
Lag (Total Assets)	-0.013 ***	-0.013 ***	-0.013 ***	0.037 ***	0.319 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*
Liquidity outside the Bank [2/]	0.003	0.003	0.004	*1.793* ***	*1.690* ***
	0.455	*0.380*	*0.285*	*0.000*	*0.000*
Real Exchange Rate volatility [3/]	-0.001 **	-0.001 ***	-0.001 ***	-0.229 ***	-0.207 ***
	0.014	*0.008*	*0.009*	*0.005*	*0.009*
GDP variation [4/]	0.011 ***	0.011 ***	0.011 ***	0.335 ***	0.338 ***
	0.000	*0.000*	*0.000*	*0.000*	*0.000*
No. Obs.	760	760	760	493	493
F-Model	205.33***	207.70***	216.92***	255.44***	273.02***
F- Bank-Fundamentals / excluding bank size	59.42***	60.35***	65.88***	18.75***	29.07***

[1/] Significance levels are below the coefficients in italics. Robust standard errors-White correction for heteroskedasticity are calculated.
***, **, * indicate significance levels at 1, 5 and 10 percent. Regressions include only crisis countries in East Asia and Latin America.

[2/] Total amount of liquidity relative to total deposits outside the bank, i.e., the amount of cash in vaults in the rest of banks in the system (the summation over the n-1 banks) over the total amount of deposits in the rest of banks in the system (the summation over the n-1 banks).

[3/] The standard deviation of the monthly percentage variation of the real exchange rate index.

Appendices

Appendix I: Description of the Logit and Survival Time Model

A. Logit Model

A qualitative response model is used in order to estimate the unconditional probability of the occurrence of distress as a function of a vector of explanatory variables, X, and a vector of unknown parameters, θ. The specific model is:

$$Pr(Y_i=1) = F[H(X_i, \theta)]$$

Where:

Y is the dependent variable which takes the value of one if the financial institution has experienced distress and zero otherwise;

F is the probability function, which has a logistic functional form, giving rise to the logit model:

$$H = \theta_0 + \Sigma_{j=1} \theta_j X_{ij}$$

X is the vector of explanatory variables for the i-th individual financial institution; and θ is the vector of parameters to be estimated. The basic equation of the logit model to be estimated can be written as:

$$Pr(Y=1) = F[H(X, \theta)] = \frac{e^{\beta' x}}{1 + e^{\beta' x}}$$

I use as explanatory variables CAMEL-type variables associated with asset quality (the loan loss provisions to total loans ratio and the total loans to assets ratio), solvency (the total equity to total assets or liabilities ratio), liquidity (the liquid assets to total liabilities ratio), and profitability (return on assets). Also, I include the logarithm of total assets to proxy for the size of the financial institution. These variables are measured as of December 1996 for East Asia, September 1994 for Argentina and Mexico, December 1993 for Venezuela, and December 1994 for Chile, Colombia and Peru. In addition, I include country dummies.

B. Survival Time Model

Given the question, what is the likelihood that an event will end the "next period"? The central concept is occupied not by the unconditional probability of an event taking place, but of its conditional probability. Survival time analysis allows us to determine the factors that explain the duration of a given state-in our case, the state of no distress. This duration is subject to random variations, and they form a distribution, which is generally characterized by three mathematically equivalent functions: the survival function, the probability density function, and the hazard function.

The probability distribution of duration can be specified by the distribution function $F(t)= Pr(T<t)$. The corresponding density function is $f(t) = dF(t)/dt$. In this context, the survivor function is given by:

$$S(t) = 1 – F(t) = Pr(T \geq t)$$

Giving the upper tail area of the distribution. The hazard function is:

$$\Lambda(t) = f(t) / S(t)$$

Which is the instantaneous rate of leaving the state of no-distress per unit of period at t[54]. The common distributions used in order to derive the hazard function are: exponential, Weibull, log-logistic and log-normal.

When we introduce explanatory variables, the effect of regressors is to multiply the hazard function itself by a scale factor (proportional hazard specification). The interpretation of the coefficients of the explanatory variables depends on the specification, and the sign of the coefficients indicates the direction of their effect on the conditional probability.

In the proportional hazard specification, the hazard function, which depends on a vector of explanatory variables X with unknown coefficients β and Λ_0 λ, is factored as:

$$\Lambda (t, X, \beta, \Lambda_0) = \Phi (X, \beta) \Lambda_0(t)$$

[54] A precise definition in terms of probabilities is:

$\Lambda(t) = \lim \Pr(t \leq T < t + h \mid T \geq t) / h$, as h goes to 0. i.e., the conditional probability that a FI that has occupied the state of no-distress for a time t leaves it in the short interval of length dt after t.

Where Λ_0 is the "baseline" hazard corresponding to $\Phi(.) = 1$[55]. In this specification the effect of explanatory variables is to multiply the hazard Λ_0 by a factor Φ which does not depend on duration t.

A general specification of Φ is:

$$\Phi (X, \beta) = \exp(X'\beta)$$

So, the hazard function takes the following form:

$$\Lambda (t, X, \beta, \Lambda_0) = \exp(X'\beta)\, \Lambda_0(t)$$

In the case of a Weibull distribution, which is used in our estimations, the "baseline" hazard assumes that $\Lambda_0(t) = pt^{p-1}$, where p is the shape of the parameter to be estimated from the data. A particular case of the Weibull function is the exponential hazard in which $p=1$.

I use the same set of CAMEL-type variables, market-based indicators, and size of the financial institutions as in the cross-sectional logit estimation. In addition, I include banking system variables, liquidity outside the financial institution and net foreign liabilities, and macroeconomic variables, the real exchange rate volatility, GDP growth,

[55] "It is common, and sensible, practice to measure the regressors so that $\Phi(.) = 1$ at the mean value of the regressors. Then Λ has an interpretation as the hazard function for the mean individual in the sample" (Kiefer, 1988, p. 664).

and a measure of the stock market. Banking system and macroeconomic variables are defined in the next section.

Appendix II: Description of Data Sample

Table II.1 BankScope Sample as of end 1996: Overview of the Financial System

Category	Indonesia	Korea	Malaysia	Philippines	Thailand
Commercial Banks	86 (20)	27 (1)	41 (14)	31 (7)	15 (0)
Other Financial Institutions	3 (0)	28 (0)	33 (0)	5 (0)	26 (1)
Total	89 (20)	55 (1)	74 (14)	36 (7)	41 (1)

Numbers in (.) indicate the number of foreign-owned financial institutions.
Source: BankScope.

Table II.2 Coverage of the BankScope Sample as of end 1996: In terms of Assets (%)

Category	Indonesia	Korea	Malaysia	Philippines	Thailand
Commercial Banks	94.7	99.0	100	88.0	100
Other Financial Institutions	58.0	58.7	62.5	60.2	89.6

Source: BankScope and countries' Central Bank statistics.

Table II.3 Coverage of the BankScope Sample as of end 1996: In terms of Number of Financial Institutions (%)

Category	Indonesia	Korea	Malaysia	Philippines	Thailand
Commercial Banks	86 (35%)	27 (34%)	37 (100%)	31 (63%)	15 (100 %)
Other Financial Institutions	3 (2%)	28 (49%)	31 (55%)	5 (5%)	26 (27%)

Source: BankScope and countries' Central Bank statistics.

Table II.4 Sample Frequency Distribution of Failed Banks

East Asia

	Sample	Percent
Non-Failed	306	68.9
Failed	138	31.1
Total	444	100

Latin America

	Sample	Percent
Non-Failed	201	68.7
Failed	96	31.3
Total	307	100

Table II.5 Distribution of Failed Banks across Crisis Countries

East Asia

Category	Indonesia	Korea	Malaysia	Philippines	Thailand
Failed	46	39	17	2	27
Commercial Banks	44	21	7	1	10
Other Financial Institutions	2	18	10	1	17

Latin America

Category	Argentina	Mexico	Venezuela
Failed	65	13	18
Non-Failed	106	7	29

Appendix III: List of Failed Financial Institutions

Failure Code:

1. The financial institution was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis; and/or required a liquidity injection from the Monetary Authority.

2. The financial institution's operations were temporally suspended ("frozen") by the Government;

3. The Government closed the financial institution.

4. The financial institution was absorbed or acquired by another financial institution;

Date of Failure	Failure Code	Bank Name	Country
Nov-97	3	Andromeda Bank	INDONESIA
Mar-99	3	Bank Arya Panduarta	INDONESIA
Mar-99	3	Bank Asia Pacific - ASPAC Bank	INDONESIA
Mar-99	3	Bank Bahari	INDONESIA
Mar-99	4	Bank Bali	INDONESIA
Mar-99	3	Bank BIRA - Bank Indonesia Raya	INDONESIA
Mar-99	1	Bank Bukopin	INDONESIA
Jan-98	4	Bank Bumi Daya (Persero) PT	INDONESIA
Aug-98	2	Bank Central Asia	INDONESIA
Mar-99	3	Bank Central Dagang	INDONESIA
Mar-99	3	Bank Dagang Dan Industri	INDONESIA
Jan-98	4	Bank Dagang Negara (Persero)	INDONESIA
Aug-98	2	Bank Danamon Indonesia Tbk	INDONESIA
Mar-99	2	Bank Duta	INDONESIA
Apr-98	2	Bank Ekspor Impor Indonesia - BankExim	INDONESIA
Mar-99	3	Bank First Indonesian Finance and Investments Corporation - Ficorinvest Bank	INDONESIA
Mar-99	1	Bank Internasional Indonesia Tbk	INDONESIA
Mar-99	3	Bank Lautan Berlian	INDONESIA
Mar-99	1	Bank Lippo Tbk.	INDONESIA
Mar-99	3	Bank Mashill Utama	INDONESIA
Aug-98	3	Bank Modern	INDONESIA
Apr-98	2	Bank Nasional	INDONESIA
Dec-98	1	Bank Negara Indonesia (Persero) - Bank BNI	INDONESIA
Apr-98	2	Bank Nusa Internasional	INDONESIA
Mar-99	3	Bank Papan Sejahtera	INDONESIA
Dec-98	4	Bank Pembangunan Indonesia (Persero) - BAPINDO	INDONESIA
Mar-99	1	Bank Prima Express	INDONESIA
Mar-99	3	Bank Putra Surya Perkasa	INDONESIA
Dec-98	1	Bank Rakyat Indonesia	INDONESIA
Mar-99	2	Bank Rama	INDONESIA
Mar-99	3	Bank Sahid Gajah Perkasa	INDONESIA
Apr-98	3	Bank Subentra	INDONESIA
Apr-98	3	Bank Surya	INDONESIA
Aug-98	2	Bank Tiara Asia	INDONESIA
Aug-98	3	Bank Umum Nasional	INDONESIA
Mar-99	3	Bank Umum Servitia	INDONESIA
Mar-99	1	Bank Universal	INDONESIA
Mar-99	3	Hastin Internasional Bank	INDONESIA
Mar-99	2	JayaBank International	INDONESIA
Mar-99	3	Kharisma Bank	INDONESIA
Mar-99	1	PT Bank Niaga Tbk	INDONESIA
Nov-97	3	Sejahtera Bank Umum - Bank SBU	INDONESIA
Mar-99	2	Tamara Bank	INDONESIA
Apr-98	3	Bank Pelita	INDONESIA
Aug-98	2	Privat Development Finance Company of Indonesia - Bank PDFCI	INDONESIA

Date of Failure	Failure Code	Bank Name	Country
Jan-99	4	Boram Bank	KOREA REP. OF
Apr-99	4	Chohung Bank	KOREA REP. OF
Jun-98	3	Chung Chong Bank Ltd. (The)	KOREA REP. OF
Apr-99	4	Chungbuk Bank Ltd	KOREA REP. OF
Jan-99	4	Commercial Bank of Korea	KOREA REP. OF
Jun-98	3	Daedong Bank	KOREA REP. OF
Jun-98	3	Donghwa Bank	KOREA REP. OF
Jun-98	3	Dongnam Bank	KOREA REP. OF
May-99	1	H&CB	KOREA REP. OF
May-99	1	Hana Bank	KOREA REP. OF
Jan-99	4	Hanil Bank	KOREA REP. OF
Jun-99	1	Industrial Bank of Korea	KOREA REP. OF
Sep-99	4	Kangwon Bank	KOREA REP. OF
May-99	1	Kookmin Bank (Old)	KOREA REP. OF
May-99	1	Koram Bank	KOREA REP. OF
Jan-98	2	Korea First Bank	KOREA REP. OF
Dec-98	4	Korea Long Term Credit Bank	KOREA REP. OF
Jan-98	3	Kyungki Bank Ltd.	KOREA REP. OF
Jan-98	2	Seoul Bank	KOREA REP. OF
May-99	1	Shinhan Bank	KOREA REP. OF
Dec-97	3	Coryo Merchant Bank	KOREA REP. OF
Dec-97	3	Daehan Investment Banking Corp.	KOREA REP. OF
Jun-99	1	Export-Import Bank of Korea	KOREA REP. OF
Dec-97	3	Gyongnam Merchant Banking Corporation	KOREA REP. OF
Dec-97	3	H&S Merchant Banking Corporation	KOREA REP. OF
Dec-97	3	Hansol Merchant Bank	KOREA REP. OF
Dec-97	3	Hanwha Merchant Bank	KOREA REP. OF
Feb-99	4	Hyundai International Merchant Bank HIMB	KOREA REP. OF
1999	4	Hyundai Securities Co. Ltd.	KOREA REP. OF
Jun-99	1	Korea Development Bank	KOREA REP. OF
Dec-98	4	Korea International Merchant Bank	KOREA REP. OF
Jul-99	4	LG Merchant Banking Corporation - LGMB	KOREA REP. OF
Dec-97	3	Nara Banking Corporation	KOREA REP. OF
Jul-99	3	National Livestock Cooperatives Federation	KOREA REP. OF
Dec-97	3	Saehan Merchant Banking Corp.	KOREA REP. OF
Dec-97	3	Samyang Merchant Bank	KOREA REP. OF
Dec-97	3	Shinhan Investment Bank	KOREA REP. OF
Oct-98	1	AmBank Group	MALAYSIA
Jun-99	4	Bank Bumiputra Malaysia Berhad	MALAYSIA
Nov-98	1	BSN Commercial Bank (Malaysia) Berhad	MALAYSIA
Jun-97	4	Chung Khiaw Bank (Malaysia) Bhd	MALAYSIA
Oct-98	1	Oriental Bank Berhad	MALAYSIA
Nov-98	1	RHB Bank Berhad	MALAYSIA
Nov-98	1	Sabah Bank Berhad	MALAYSIA
Nov-98	4	AMFB Holdings Berhad	MALAYSIA

Date of Failure	Failure Code	Bank Name	Country
Nov-98	1	AMMB Holdings Berhad	MALAYSIA
Nov-98	1	Arab-Malaysian Merchant Bank Berhad	MALAYSIA
Dec-99	4	BSN Merchant Bank BHD	MALAYSIA
Jun-99	4	Hock Hua Finance Berhad	MALAYSIA
Jan-99	4	Multi-Purpose Finance Berhad	MALAYSIA
Jan-98	4	RHB Finance Berhad	MALAYSIA
Nov-98	1	Southern Investment Bank Berhad	MALAYSIA
1999	4	TA Enterprise Berhad	MALAYSIA
Nov-98	1	United Merchant Group Bhd.	MALAYSIA
Nov-98	1	Utama Merchant Bank Berhad	MALAYSIA
Jun-99	4	Philippine Commercial International Bank - PCIBank	PHILIPPINES
Jul-98	3	Mindanao Development Bank	PHILIPPINES
Aug-98	3	Bangkok Bank of Commerce Public Company Limited	THAILAND
Jan-98	2	Bangkok Metropolitan Bank Public Company Limited	THAILAND
Dec-98	1	Bank of Asia Public Company Limited	THAILAND
Aug-98	2	Bankthai Public Company Limited	THAILAND
Jan-98	4	DBS Thai Danu Bank Public Company Limited	THAILAND
Feb-98	2	First Bangkok City Bank	THAILAND
Feb-98	2	Siam City Bank Public Company Limited	THAILAND
Dec-98	1	Siam Commercial Bank Public Company Limited	THAILAND
Apr-99	4	Standard Chartered Nakornthon Bank	THAILAND
Aug-98	2	UOB Radanasin Bank Public Company Limited	THAILAND
Apr-99	1	Asia Credit Public Company Limited	THAILAND
Jun-97	3	CMIC Finance and Security PCL	THAILAND
Aug-98	2	Dhana Siam Finance & Securities	THAILAND
Jun-97	3	Finance One Public Company Limited	THAILAND
Jun-97	3	General Finance and Securities Ltd.	THAILAND
Aug-98	2	IFCT Finance and Securities PCL	THAILAND
Jun-97	3	ITF Finance and Securities PCL	THAILAND
Aug-98	4	Krungthai Thanakit PCL	THAILAND
Aug-97	3	Multi-Credit Corporation of Thailand PCL	THAILAND
May-98	2	Nava Finance & Securities Public Company Limited	THAILAND
Aug-97	3	SCF Finance and Securities PCL	THAILAND
Aug-97	3	Siam City Credit Finance and Securities PCL	THAILAND
May-99	1	Siam Industrial Credit Public Company Limited (The)	THAILAND
Aug-97	3	SITCA Investment and Securities PCL	THAILAND
Aug-97	3	SRI Dhana Finance and Securities PCL	THAILAND
Aug-97	3	Union Asia Finance Public Co. Ltd.	THAILAND
Aug-97	3	Wall Street Finance and Securities PCL	THAILAND

Date of Failure	Failure Code	Bank Name	Country
Dec-95	4	Banesto Banco Shaw	ARGENTINA
Jul-96	4	Banco Popular Argentina SA	ARGENTINA
Jan-97	4	Banco Frances del Rio de la Plata SA	ARGENTINA
Dec-96	4	Banco Cooperativo de Caseros Limitado	ARGENTINA
Jul-96	4	The Chase Manhatten Bank, NA	ARGENTINA
Aug-96	4	Banco de San Juan SA	ARGENTINA
Sep-96	4	Banco Tornquist SA	ARGENTINA
May-95	4	Banco Cooperativo de la Plata Ltdo.	ARGENTINA
Dec-97	3	Banco Credito Provincial	ARGENTINA
Dec-96	4	Banco de Credito Comercial SA	ARGENTINA
Feb-95	4	Banco de Entre Rios SEM	ARGENTINA
Jul-96	4	Banco de la Provincia de Tucumán.	ARGENTINA
Jul-95	4	Banco Monserrat SA	ARGENTINA
Aug-98	4	Banco Rio de la Plata SA	ARGENTINA
Aug-96	4	Banco de Prevision Social SA	ARGENTINA
Nov-95	4	Banco Municipal de Parana SEMICFAI	ARGENTINA
Apr-96	4	Banco Commercial del Tandil SA	ARGENTINA
May-95	4	Banco Cooperativo del Este Argentino Ltdo.	ARGENTINA
Mar-95	4	Banco de Coronel Dorrego SA	ARGENTINA
Jul-95	4	Banco de Junin SA	ARGENTINA
Nov-95	4	Banco de Olavarria SA	ARGENTINA
Mar-95	4	Banco Rural (Sunchales) CL	ARGENTINA
May-97	2	Nuevo Banco de Azul SA	ARGENTINA
Jul-96	4	Banco Popular Financiero SA	ARGENTINA
Apr-97	4	Banco Union Commercial e Industrial CL	ARGENTINA
May-95	2	Banco del Noroeste CL	ARGENTINA
Jul-95	3	Banco Federal Argentino	ARGENTINA
Mar-96	4	Banco Interfinanzas SA	ARGENTINA
Feb-95	3	ACISO Banco CL	ARGENTINA
May-97	4	Banco Platense SA	ARGENTINA
May-95	4	Banco San Jose CL	ARGENTINA
Jul-95	4	Banco Cooperative Nicolas Levalle Ltdo	ARGENTINA
Apr-95	4	Banco del Ibera SA	ARGENTINA
Apr-95	4	Banco Coinag CL	ARGENTINA
May-95	4	Banco Nucleo CL	ARGENTINA
May-95	4	Banco de las Comunidades CL	ARGENTINA
Apr-95	4	Banco Noar CL	ARGENTINA
Jul-95	4	Banco Horizonte CL	ARGENTINA
Jun-95	4	Banco Aliancoop CL	ARGENTINA
Feb-95	4	Banco Nueva Era CL	ARGENTINA
Jun-95	4	Banco VAF CL	ARGENTINA
Apr-95	4	Banco Independcia CL	ARGENTINA
Aug-95	3	Banco Integrado Departmental CL	ARGENTINA
Jun-95	4	Banco C.E.S CL	ARGENTINA
Feb-95	3	Banco de la Ribera CL	ARGENTINA
Jul-95	4	Banco Meridional CL	ARGENTINA
Apr-95	4	Banco de los Arroyos CL	ARGENTINA

Date of Failure	Failure Code	Bank Name	Country
Jun-95	4	Banco Carlos Pelligrini CL	ARGENTINA
Jun-95	4	Banco Nordecoop CL	ARGENTINA
Jun-95	4	Banco Local CL	ARGENTINA
Mar-97	4	Banco Coopesur CL	ARGENTINA
Mar-95	3	Banco Feigin SA	ARGENTINA
May-95	4	Banco Asfin SA	ARGENTINA
May-95	4	Banco Provencor SA	ARGENTINA
Feb-97	4	Banco Liniers Sudamericano SA	ARGENTINA
Feb-96	4	Banco Baires	ARGENTINA
Mar-96	4	Banco UNB SA	ARGENTINA
Jul-95	4	Banco Caudal SA	ARGENTINA
Jul-95	4	Banco del Fuerte SA	ARGENTINA
Feb-95	3	Banco Multicredito SA	ARGENTINA
Apr-95	3	Banco Austral SA	ARGENTINA
Nov-94	3	Banco Extrader SA	ARGENTINA
Nov-96	4	Banco de la Cuenca del Plata	ARGENTINA
Nov-94	4	Banco del Chaco SEM	ARGENTINA
Dec-95	4	Banco de la Provincia de Formosa	ARGENTINA
Jan-96	4	Banco de la Provincia de Missiones	ARGENTINA
Mar-96	4	Banco de la Provincia de Rio Negro	ARGENTINA
Mar-96	4	Banco Provincial de Salta.	ARGENTINA
Aug-96	4	Banco de la Provincia de San Luis	ARGENTINA
Sep-96	4	Banco de la Provincia de Santiago del Estero	ARGENTINA
Nov-96	4	Banco de Mendoza SA	ARGENTINA
1995	2-4	COMERMEX	MEXICO
1995	2-4	Mexicano	MEXICO
1995	2-4	M. Probursa	MEXICO
1995	2-4	Centro	MEXICO
1995	2-4	Confia	MEXICO
1995	2-4	Banpais	MEXICO
1995	2-4	Oriente	MEXICO
1995	2-4	Obrero	MEXICO
Jun-94	3	Maracaibo	VENEZUELA
Aug-94	2	Venezuela	VENEZUELA
Feb-95	1	Union	VENEZUELA
Jan-94	3	Latino	VENEZUELA
Jun-94	3	Metropolitano	VENEZUELA
Feb-95	3	Italo Venezolano	VENEZUELA
Jun-94	3	La Guaira	VENEZUELA
Jun-94	3	Construccion	VENEZUELA
Sep-94	2	Consolidado	VENEZUELA
Jun-94	3	Bancor	VENEZUELA
Dec-94	3	Progreso	VENEZUELA
Feb-95	3	Principal	VENEZUELA
Nov-95	3	Andino Venezolano	VENEZUELA
Jun-94	3	Barinas	VENEZUELA
Jun-94	3	Amazonas	VENEZUELA
Feb-95	3	Profesional	VENEZUELA
Jan-95	3	Empresarial	VENEZUELA

Appendix IV: Robustness Check Excluding Mergers and Acquisitions of the Definition of Failure

Table IV.1 Mean Tests between Non-Failed FIs and FIs Mergered or Acquired

I. Asset Quality

VARIABLE	East Asia		Latin America	
	NON-FAILED	M&A	NON-FAILED	M&A
Loan Loss Provisions / Total Equity	3.66	4.90**	6.85	7.81
Loan Loss Provisions / Total Loans	0.61	0.54	1.76	1.08
Loan Loss Reserves / Total Equity	15.17	21.32**		
Loan Loss Reserves / Total Loans	2.39	2.38		
Loans / Total Assets	62.53	68.22*	53.37	69.23***

***, **, * indicate significant differences between non-failed and M&A financial institutions at 1, 5 and 10 percent.

II. Solvency

VARIABLE	East Asia		Latin America	
	NON-FAILED	M&A	NON-FAILED	M&A
Total Equity / Total Assets	13.77	8.37***	19.78	15.24**
Total Equity / Total Liabilities	14.33	9.45***	19.74	17.51
Total Equity / (Total Liabilities + Off-Balance items)	12.33	8.24***		

***, **, * indicate significant differences between non-failed and M&A financial institutions at 1, 5 and 10 percent.

III. Liquidity

VARIABLE	East Asia		Latin America	
	NON-FAILED	M&A	NON-FAILED	M&A
Liquid Assets / Total Assets	21.45	17.54*	26.08	16.62***
Liquid Assets / Total Liabilities	23.48	19.15*	24.43	19.45***

***, **, * indicate significant differences between non-failed and M&A financial institutions at 1, 5 and 10 percent.

IV. Profitability

VARIABLE	East Asia		Latin America	
	NON-FAILED	M&A	NON-FAILED	M&A
Return on Assets	1.60	0.99***	1.08	-0.18***

***, **, * indicate significant differences between non-failed and M&A financial institutions at 1, 5 and 10 percent.

V. Market Based Indicators

VARIABLE	East Asia		Latin America	
	NON-FAILED	M&A	NON-FAILED	M&A
Growth Rate of Deposits	16.28	17.68	13.03	14.19
Loans Interest Rate	14.81	12.62***	18.62	21.98**
Deposits Interest Rate	8.92	9.13	9.20	8.76
Spread	6.92	7.11	11.34	13.85***

***, **, * indicate significant differences between non-failed and M&A financial institutions at 1, 5 and 10 percent.

The sample of countries for East Asia includes Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand. For Latin America, the sample includes Argentina, Chile, Colombia, Mexico, Peru, and Venezuela.

Table IV.2 Cross-Sectional Logit Estimation for East Asia

(Marginal Effects) [1/]

	(1)	(2)	(3)
Loan Loss Provisions / Total Loans	-0.009 ***	-0.008 ***	-0.007 ***
	0.008	*0.011*	*0.023*
Total Loans / Total Assets	0.000	0.000	0.000
	0.959	*0.964*	*0.987*
Total Equity / Total Assets	-0.025 ***		
	0.000		
Total Equity / Total Liabilities		-0.019 ***	
		0.000	
Total Equity / (Total Liab. + OBS.)			-0.015 ***
			0.002
Liquid Assets / Total Liabilities	-0.005 *	-0.005 *	-0.004
	0.081	*0.079*	*0.124*
Return on Assets	-0.090 ***	-0.099 ***	-0.104 ***
	0.003	*0.002*	*0.001*
Log (Total Assets)	-0.053	-0.055	-0.024
	0.562	*0.562*	*0.806*
Indonesia	0.805 ***	0.806 ***	0.827 ***
	0.000	*0.000*	*0.000*
Korea	0.700 ***	0.700 ***	0.723 ***
	0.000	*0.000*	*0.000*
Malaysia	0.566 ***	0.569 ***	0.585 ***
	0.010	*0.000*	*0.013*
Philippines	0.525	0.527	0.452
	0.128	*0.121*	*0.201*
Thailand	0.863 ***	0.861 ***	0.856 ***
	0.000	*0.000*	*0.000*
No. Obs.	335	342	337
Wald Chi2	89.72	90.86	92.66
Prob > Chi2	0.00	0.00	0.00

The sample of financial institutions (FIs) is divided between failed and non-failed FIs. A financial institution is considered to have failed If it falls in any of the following categories: (i) The financial institution was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis or by a strategic investor; and/or required a liquidity injection from the Monetary, (ii) The financial institution's operations were temporally suspended ("frozen") by the Government, (iii) The Government closed the financial institution.

[1/] The estimation was done including crisis (Indonesia, Korea, Malaysia, Philippines, and Thailand) and non-crisis countries (Hong Kong, Singapore, and Taiwan) in East Asia. The dependent variable takes the value of 1 if the financial institution (FI) falls in the definition of failure given in (1) during the period Jan. 97-Jun. 99, and zero otherwise.

Micro-level bank fundamentals, including the size of the FI, are measured as of December 1996. A constant term was included in the initial estimation so the marginal effect of country dummies have to be interpreted relative to non-crisis countries.

[3/] Marginal effects are reported rather than the coefficients. The significance level is reported in italics below the marginal effects. The Z-stat are based on robust (Huber and White) standard errors which account for correlated observations in grouped data. ***, **, * indicate significance levels at 1, 5 and 10 percent.

Table IV.3 Cross-Sectional Logit Estimation for Latin America

(Marginal Effects) [1/]

	(1)	(2)
Loan Loss Provisions / Total Loans	0.009	0.009
	0.141	*0.150*
Total Loans / Total Assets	*0.000*	0.000
	0.771	*0.770*
Total Equity / Total Assets	*-0.005* **	
	0.026	
Total Equity / Total Liabilities		-0.004 **
		0.032
Liquid Assets / Total Liabilities	*-0.003* **	-0.003 **
	0.036	*0.042*
Return on Assets	*-0.022* ***	-0.023 ***
	0.009	*0.008*
Log (Total Assets)	*-0.013*	-0.012
	0.182	*0.189*
Argentina	*-0.030*	-0.276
	0.488	*0.536*
Mexico	*0.371* *	0.390 *
	0.066	*0.055*
Venezuela	*0.581* ***	0.594 ***
	0.001	*0.000*
No. Obs.	275	276
Wald Chi2	41.71	40.79
Prob > Chi2	0.00	0.00

The sample of financial institutions (FIs) is divided between failed and non-failed FIs. A financial institution is considered to have failed If it falls in any of the following categories: (i) The financial institution was recapitalized by either the Central Bank or an agency specifically created to tackle the crisis or by a strategic investor; and/or required a liquidity injection from the Monetary Authority, (ii) The financial institution's operations were temporally suspended ("frozen") by the Government, (iii) The Government closed the financial institution.

[2/] The estimation was done including crisis (Argentina, Mexico and Venezuela) and non-crisis countries (Chile, Colombia, and Peru). The dependent variable takes the value of 1 if the financial institution (FI) falls in the definition of failure given in (1) during the period Jan. 94-Dec. 95 for Venezuela, Dec. 94-Dec. 96 for Argentina and Mexico; and zero otherwise. Micro-level bank fundamentals, including the size of the FI, are measured as of December 1993 for Venezuela, as of September 1994 for Argentina and Mexico, and as of December 1994 for Chile, Colombia, and Peru. A constant term was included in the initial estimation so the marginal effect of country dummies have to be interpreted relative to non-crisis countries.

[1/] Marginal effects are reported rather than the coefficients. The significance level is reported in italics below the marginal effects. The Z-stat are based on robust (Huber and White) standard errors which account for correlated observations in grouped data.

***, **, * indicate significance levels at 1, 5 and 10 percent.

Appendix V: Description of the Generalized Methods of Moments (GMM) Estimation

Generalized-Method-of Moments dynamic panel estimators control for unobserved country-specific effects, the endogeneity of explanatory variables, time specific effects, and the use of lagged dependent variables. Consider the following regression equation,

$$y_{i,t} - y_{i,t-1} = (\alpha-1)\, y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (7)$$

Where y represents the growth rate of real total deposits of bank i, X represents the set of explanatory variables (bank level fundamentals lagged one period, banking system and macroeconomic variables), η is an unobserved country-specific effect, ε is the error term, and the subscripts i and t represent individual banks and time period, respectively. The dependent variable in equation (1) is the period's average growth rate. We can rewrite equation (7) as a lagged-dependent variable equation as follows,

$$y_{i,t} = \alpha\, y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (8)$$

The usual method of dealing with the country-specific effect in the context of panel data has been to first-difference the regression equation (Anderson and Hsiao 1981). In this way the specific-effect is directly eliminated from the estimation process. First-differencing equation (8), we obtain

$$y_{i,t} - y_{i,t-1} = \alpha\,(y_{i,t-1} - y_{i,t-2}) + \beta'\,(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad (9)$$

The use of instruments is again required to deal with two issues: first, the likely endogeneity of explanatory variables, X; and, second, the new error term, $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ is correlated with the differenced lagged dependent variable, $y_{i,t-1} - y_{i,t-2}$. This second issue arises by construction when we difference equation (8). To address this correlation and the endogeneity problem, Arellano and Bond (1991) propose using the lagged values of the explanatory variables in levels as instruments.

We would like to relax the assumption that all the explanatory variables are strictly exogenous (that is, that they are uncorrelated with the error term at all leads and lags). Relaxing this assumption allows for the possibility of simultaneity and reverse causality, which are very likely present in growth regressions. We adopt the assumption of weak exogeneity of the explanatory variables, in the sense that they are assumed to be uncorrelated with future realizations of the error term. This weaker assumption means that current explanatory variables may be affected by past and current growth rates but not by future ones.

Under the assumptions that (a) the error term, ε, is not serially correlated, and (b) the explanatory variables, X, are weakly exogenous, the following moment conditions apply to the lagged dependent variable and the set of explanatory variables:

$$E[y_{i,t-s} * (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \textit{for } s \geq 2;\ t = 3, \ldots, T \qquad (10)$$

$$E[X_{i,t-s} * (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \textit{for } s \geq 2;\ t = 3, \ldots, T \qquad (11)$$

Using these moment conditions, Arellano and Bond (1991) propose a two-step GMM estimator. In the first step, the error terms are assumed to be both independent and homoskedastic, across countries and over time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance-covariance matrix, thus relaxing the assumptions of independence and homoskedasticity. We refer to this estimator as the difference estimator.

There are, however conceptual and statistical shortcomings with this estimator. Conceptually, we would like to study not only the time-series relationship between bank-level fundamentals and the growth rate of real deposits but also their cross-sectional relationship, which is eliminated in the case of the simple difference estimator. Statistically, Alonso-Borrego and Arellano (1996) and Blundell and Bond (1997) show that when the lagged dependent and the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. The instruments' weakness has repercussions on both the asymptotic and small-sample performance of the difference estimator. As the variables' persistence increases, the asymptotic variance of the coefficients obtained with the difference estimator rises (that is, the asymptotic precision of this estimator deteriorates). Furthermore, Monte Carlo experiments show that the weakness of the instruments produced biased coefficients in small samples. This bias is exacerbated with the variables' over time persistence, the importance of the specific-effect, and the smallness of the time series dimension. To confront these conceptual and statistical concerns, we use alternative estimators.

Blundell and Bond (1997) suggest the use of Arellano and Bover's (1995) system estimator that-- based on asymptotic and small sample properties-- reduces the potential biases and imprecision associated with the usual difference estimator. Arellano and Bover (1995) present an estimator that combines, in a system, the regression in differences with the regression in levels. The instruments for the regression in differences are the same as above (i.e., the lagged levels of the corresponding variable), so that, the moment conditions in equations (10) and (11) apply to this first part of the system. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumption: although there may be correlation between the levels of the right-hand side variables and the country-specific effect in equation (8), there is no correlation between the differences of these variables and the country-specific effect. This assumption results from the following stationarity property,

$$E[y_{i,t+p} * \eta_i] = E[y_{i,t+p} * \eta_i] \qquad (12)$$

$$E[X_{i,t+p} * \eta_i] = E[y_{i,t+q} * \eta_i] \quad \textit{for all p and q}$$

Therefore, the additional moment conditions for the second part of the system (the regression in levels) are given by the following equations:

$$E[(y_{i,t-s} - y_{i,t-s-1}) * (\eta_i + \varepsilon_{i,t})] = 0 \quad \textit{for } s = 1 \qquad (13)$$

$$E[(X_{i,t-s} - X_{i,t-s-1}) * (\eta_i + \varepsilon_{i,t})] = 0 \quad \textit{for } s = 1 \qquad (14)$$

Thus, we use the moment conditions presented in equations (10), (11), (13), and (14) and employ a GMM procedure to generate consistent and efficient estimates of the parameters of interest (Arellano and Bond, 1991; Arellano and Bover, 1995).

The consistency of the GMM estimator depends on whether lagged values of the growth rate of real deposits and other explanatory variables are valid instruments in the growth regression. To address this issue, I consider two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1997). The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term $\varepsilon_{i,t}$ is not serially correlated. In the both the difference regression and the system difference-level regression we test whether the differenced error term is second-order serially correlated (by construction, it is likely that this differenced error term be first-order serially correlated even if the original error term is not).

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