Abstract

The purpose of the paper is to evaluate and measure the e¤ect of …nancial liberalization (FL) on bank risk exposure. We pursue these questions by assessing the changes in market-based asset values and risk exposure measures for commercial banks (CB) before and during a FL program. We do this for a sample of three countries: Malaysia, Taiwan and Thailand. We use a model based on the options pricing theory. We obtain estimates of the …rst and second moment of bank returns using an asset pricing model in which these two moments are a linear projection of a set of conditioning variables. This model was estimated using a GMM statistical procedure. Then we perform regressions explaining the evolution of bank risk measure around the FL event. The analysis and statistical test indicate that risk exposure of banks increases following a FL program, and this as a result of macroeconomic policy as well as changes in management controlled variables. This is so even for banks operating in countries that have undertaken very cautious FL processes such as Thailand and Malaysia. The results tend to support the proposition that moral hazard and bank risk taking may increase following FL. The results also suggest that banking crisis that often have followed FL may be more due to the behavior of banks managers than previously reported in the FL literature.

Financial Liberalization: Commercial Bank's Blessing or Curse? [1]

Klaus P. Fischer, Jean-Pierre Gueyie* and Edgar Ortiz**

Working Paper No 97-2
Faculté des sciences de l' administration

Working Paper No 97-2
Centre de recherche en économie et …nance apliquées (CRÉFA)

February 15, 1997

[1] *CRÉFA and Faculté des sciences de l'administration, Université Laval, Ste-Foy, G1K 7P4, CANADA. Ph. 418-656-2131, X3679, Internet: Klaus.Fischer@fas.ulaval.ca. **Universidad Nacional Autónoma de Mexico. Apartado 21-712, Colonia Coyacan, Delegación Coyoacan, 04000 Mexico, D.F. Internet: EdgarO@servidor.unam.mx. This research was completed with the support of the program of economic analysis and research applied to international development (PARADI), …nanced by the Canadian International Development Agency (CIDA). The institutions a¢liated to the PARADI program are the Montreal University's Centre de recherche et de développement en économique (CRDE) and Laval University's Centre de recherche en économie et …nance appliquées (CREFA) . The purchase, installation and maintenance of the data used in this research was …nanced by research grants of PARADI, the Social Sciences and Humanities Research Council (SSHRC) of Canada and the Fond pour la Formation de Chercheurs et l'Aide à la Recherche (FCAR) of Canada. We thank the comments of Marie-Claude Beaulieu, René Garcia and Van Son Lai. All remaining errors are ours.

Financial Liberalization: Commercial Bank's Blessing or Curse?

"...a liberalization is a serious macroeconomic shock" Sussman [1992]

"few monetary authorities are prepared to accept as reasonable any interest rate level that is market determined." Pereira Leite and Sundararajan [1990]

1 Introduction

Assume you are a regulator or banking authority (BA) who receives instructions by the government to steer the banking system through a …nancial liberalization (FL) process. In particular, you are responsible for ensuring that the banking system rides through the FL process, suitably transformed, but in good health. Under the circumstances, institutional failures are to be avoided. How do you measure the risk exposure of banks or the probability of institutional failure as they go through the FL process? This is hard to do given the range of factors that can a¤ect the solvency of a bank, including: managerial factors; the solvency of the bank's major borrowers; the limited value of accounting information under changing conditions; macroeconomic factors; etc.

The issue is important for a successful execution of a FL programs. The best laid plans for a structural reform program that seeks to encourage capital ‡ows, savings and investment in a country, can stumble when one or more …nancial institutions face solvency problems provoking a panic in the system. The e¤ects of such panics can be devastating, ranging from sudden monetary contraction to widespread …nancial di¢culties in the productive sector and surges in unemployment. Bank solvency problems may originate from a number of sources: increased corporate failure by non-…nancial bank customers, run on deposits, imprudent lending activity by the banks, are just a few examples.[1] It is not unusual for economists planning and supervising national economic reform programs, to ignore the microeconomic e¤ects, specially in terms of risk exposure of business of all sort, of such programs. This is not surprising considering that the change in risk exposure is generally absent of most economic planning models guiding these programs. The link between some aspects of FL and solvability of the banking sector has been addressed by some researchers. Leite and Sundararajan [21] address the issue of interest rates liberalization and bank "soundness" in a study that proposes a set of policy tools for a safe FL process. However, nowhere in the literature do we …nd an e¤ort to measure bank risk exposure under FL.

[1] The 1995 Argentina …nancial crisis is a case in point. It was predominantly –if not only–a crisis of con…dence in the banking sector. In the four months following the Mexican crisis, over 4 billion dollars (around 10% of the total deposit base in the country) left the banking sector, most of it not to leave the country, but –as the minister of economy D. Cavallo remarked– to be stu¤ed "under the mattress." The international …nancing package obtained by Argentina in the following months was largely used to establish a emergency deposit insurance scheme. The only purpose of this action was to restore domestic savers con…dence in the banking system. The whole long-term restructuring program of the Argentina economy was in danger following this banking crisis.

Although it is true that several FL processes came and went without large (or small) scale bank failures, the risk exists. Outright institutional debacles have occurred following FL. Examples of this are Argentina, Chile, Colombia, Indonesia, Mexico, Nigeria, Norway, Sweden, Venezuela among others. In e¤ect, many FL processes have ended, and were terminated, with a major crisis in the banking sector. These crisis sometimes represent huge losses to governments, like in Venezuela in 1994. There the government was forced to come up with a rescue package with a value equivalent to 13% of GDP of Venezuela [33]. In Argentina, in the period of six years following a FL initiated in 1977, almost 32% of the registered banking institutions disappeared. Often the actual absence of institutional failure results from the conjectural government guarantee (CGG) or forbearance extended by the state to ensure the solvency of the …nancial system throughout the FL process. This CGG may not have been removed as part of the FL process, or may have been reinstated when authorities perceived that the FL process puts the banking system in danger.

It is not our intention to question the legitimacy of FL. Rather, we seek to study the e¤ect of these reforms on the functioning of the banking system and to develop instruments that allow a better monitoring of banks under conditions of FL. The exhaustion of the controlled import-substitution model of economic growth left many countries with no option but to engage markets to resume growth or escape recession. Many are doing this in a radical way. It is by no means evident that, despite the wave of FL observable in almost every continent, many forms of controls on credit and interest rates may be very useful to promote economic growth and social justice. Recently Vittas and Cho [35] have reviewed the practices of directing credit allocation, a prominent form of …nancial repression, and found that some experiences (such as Korea and Japan) suggest that these credit programs can promote investment and growth.

To get a better grip of the issue we make, as Kryzanowski and Roberts [20], and King [19] a distinction between economic insolvency and institutional failure. More speci…cally we approach Demirgüc-Kunt's [5] de…nition of "market value insolvency" focusing on the probability that the market value of assets exceeds the market value of liabilities.[2] We view the methodology used more as part of an "early warning system" (EWS) to anticipate hazardous situations rather than to obtain point estimates of bankruptcy risk or deposit insurance premiums. The model we use draws from the options pricing theory. It exploits the information contained in both, the bank accounting data and the public information pool contained in the price index of banks, about the banking system's performance. In the option pricing context securities issued by the banking sector are claims whose value is contingent upon the value of assets and liabilities of the bank. Thus, changes in the prices of bank stocks (observable) provide the researcher a window into the market's assessment of both the expected performance of the bank and the value of the portfolio of loan assets (both not observable). We go further to investigate the even more pertinent

[2] In her classi…cation of failure de…nitions, Demirgüc-Kunt identi…es four di¤erent concepts of bank failure: book value insovency, market value insolvency, o¢cial (De Jure) insolvency, and De Facto failure. See [5], table 2, for details.

question of the change in risk of failure that these ‡uctuations suggest. Thus, we go on to compute probabilities of bank failure that results from comparing the value of bank's assets and liabilities. Insolvency risk is generally considered by bank supervisors and in Basle directives to be a key measure of bank performance (in contrast for example with the securities industry, where liquidation risk is considered of more importance). Bank insolvency risk is also the central point of concern in the 1993 bank capital adequacy directive (CAD) of the European Union that seeks to harmonize bank regulation across member states. We also compute an hypothetical insurer's contingent liability, valued as a put option bought by the bank from the insurer. This latter measure provides an excellent thermometer of the change in the bank's risk exposure with time, under any circumstance, including FL. [3] This approach has the advantage of assessing indirectly variable that, although critical to monitor bank solvency, cannot be inferred directly from accounting data generated by banks. For the purpose of this study, the emphasis is not on the point estimates of either bank insolvency probability or fair deposit insurance premium. Rather, being preoccupied by the e¤ect of institutional changes on bank performance, we focus on the changes in these values with time and events. Under these circumstances a bias in the estimates in one or the other direction is of little importance.

2 Financial liberalization and the banking sector

FL is complex processes and its e¤ect on the banking sector is only partially understood. In this section we will attempt to analyze the incentives a "typical" FL introduces in the bank management process and some of the foreseeable consequences. When applicable we will refer readers to the relevant literature.

2.1 FL: what does it do to commercial banks?

FL can change considerably the business environment of …nancial intermediaries. This is so because it changes radically the macroeconomic, legal and regulatory framework under which banks operate. Obviously, the sector that is most a¤ected by FL is the commercial banking sector. Commercial banks can be a¤ected directly or indirectly. Directly, because commercial banks are often the immediate targets of the liberalization process. Indirectly, because liberalization usually modi…es the decision parameters used by both banks and non-…nancial bank customers to make …nancing decisions.

The simplest possible de…nition of FL is removal of …nancial repression (FR). FR consists of a set of restrictions on market competition that yields a protected environment for …nancial intermediaries. The most common restrictions are: 1. Guaranteed intermediation margin through …xation of lending and deposit rates or direct subsidy programs (see for example Gibson and Tsakalotos [11]); 2. Controls on international capital ‡ows and foreign competition; 3. Barriers to exit for …nancial intermediaries

[3] We thank Prof. Van S. Lai for convincingly suggesting the use of this latter measure as an indicator of a bank's health.

often accompanied by unlimited (conjectural) deposit insurance; 4. Barriers to exit for major industrial clients of …nancial intermediaries, i.e. conjectural loan insurance for the largest loans in the portfolio; 5. Guaranteed business activity through government funded credit allocation programs to key economic sectors. A FL program consists of the simultaneous removal of all or part of these restrictions. Of all restriction, the one that is central to FR is …xation of interest rates. Therefore, as Galvis[9] [4] we take relaxation or lifting of controls on interest rates as the central event of FL.

Now, to see the impact of FL, consider the following list of measures and the consequences they may have on bank pro…tability and risk exposure. We summarize these e¤ects in Table 1

Table 1 goes here

2.1.1 Elimination of deposit and lending rates controls.

[2] Description: This regulatory change has four separate e¤ects on banks:

- Interest rate uncertainty: The immediate result of lifting controls is often an increase in the level and volatility of deposit and lending rates. Rate levels increase to bring them within a positive in‡ation-adjusted range. The increase in volatility may be caused by several factors of which we emphasize two: portfolio shifts and competition for funds. Portfolio shifts follow the elimination of rate controls, a form of market segmentation. These shifts occur when borrowers and lenders readjusts their positions to the new market conditions. Competition for funds is likely to be intense following a FL. Deregulation of rates can, and often do, lead to price wars as banks seek to capture market shares in a phenomenon similar to the one observed following the deregulation of the United States airline industry. These wars may be encouraged by the existence oligopolistic structure in the banking sector, a common phenomena among EM. The enhanced volatility can persist over a relatively long transition period until the market settles into an equilibrium point where speculation in, and arbitrage between di¤erent market segments, becomes less pro…table.
- Intermediation margin: Removal of controls (of borrowing and lending rates) eliminates the implicitly guaranteed intermediation margin (IM) and rent for the bank. Under the new environment banks may be forced to compete for deposits and loan costumers, squeezing their pro…t margins. The presence of oligopolistic power in the …nancial sector could imply that while some banks strive using their relative market power position, others may …nd the new competitive environment di¢cult to endure. Further, if banks accomplish any maturity transformation at all, an increase in

[4] This author goes as far as stating 'FL is the elimination of FR, that is, increase of interest rates to an e¢cient equilibrium level that promotes optimal saving rates and avoids misalocation of real and …nancial resources.'

deposit rates will not result in an automatic increase in rates of outstanding assets. The now almost-forgotten wave of American S&LA failures in the early eighties due to the rise (quite moderate by emerging-markets' standards) of deposit rates following President Carter's Depository Institutions Deregulation and Monetary Control Act (DIDMCA) of 1980, is a stark reminder of the e¤ect such an unilateral shift in rates may have on bank performance.

– Risk taking: Elimination of ceilings on deposit and lending rates changes the incentives for risk taking activities by banks facilitating moral-hazard problems in the industry. More concretely, it encourages risk taking and expands the opportunities for doing so.[5] Controlled lending rates encouraged banks to seek projects with low risk as lending rates cannot be adjusted to account for risk and moral hazard. With liberation of interest rates, increases in deposit rates practically forces banks to seek lending at higher rates in projects that are likely to be riskier. Lifting of lending-rate controls also reinforces the incentives for banks to seek to …nance borrowers willing to pay higher rates-higher risk projects. If deposit rates would be fairly priced according to the asset risk exposure of each bank, no bene…t would accrue to bank shareholders. However, in absence of such a fair pricing, given a cost of deposits (or unlimited CGG), agency theoretic arguments suggest that bank shareholders gain by seeking projects of higher risk. A fair pricing mechanism will surely not exist in the presence of a deposit insurance schemes (conjectural or explicit) at …xed rates. If the FL reduces the intermediation margin as a result of competition, this will also encourage banks to engage in lending to more risky customers to increase returns on funds placed. The phenomena of bank risk taking has also been analyzed in the context of DIDMCA of 1980 and the Garn-St. Germain Depository Institutions Act of 1982 (see e.g. Pantalone and Platt, [28] and Keeton,[18] and [?] on empirical evidences of the link between …nancial deregulation and risk-taking behavior in the United States) [6].

– Quality of asset portfolio: Volatility (usually with a marked increase) in interest rates will increase both …nancing costs and failure risk of bank non-…nancial costumers. The quality of bank assets will deteriorate accordingly.

[5] It is remarcable that, in one of the most thorough and candid analysis of the Mexican banking crisis made by a Mexican public …gure, Mr. Miguel Mancera Aguayo [22], the governor of the Bank of Mexico, fails to even mention as a problem the shift in risk taking activities of commercial banks following the FL in that country. It is worth noting that the hughe loan default rates was one important element in the crisis that lead to the establishment by the government of a resque package. This package consisted of over 11 billion dollars of taxpayer's money in direct …nancing to commercial banks. In addition a parallel Support to Non-performing Borrowers' Program (Acuerdo para el Apoyo de Deudores, ADE) with loan restructuring facilities of up to 30 years was also put in place. We do not have information about the cost to taxpayers of this program.

[6] See also Corbo, de Melo and Tybout [3] for some details of bank risk-taking practices during the FL experiences in Argentina, Chile and Uruguay.

- E¤ect: The overall result of the elimination of deposit and lending rates controls is that banks may face increased pro…t-making opportunities. However, they will also be exposed to a considerable increase in interest rate and asset portfolio risk. The e¤ect will generally not be uniform for banks of di¤erent size.

2.1.2 Deregulation and/or re-regulation of …nancial markets.

- Description: Again, there are several e¤ects that come into action. These measures consist mostly of elimination of regulated specialization of …nancial institutions and promotion of new …nancial instruments and markets (e.g. bonds and stock markets, …nancial derivatives, etc.).

  - Disintermediation. This process can generate strong incentives for market participants to engage in alternate forms of …nancial intermediation, in particular through securitized markets (disintermediation) [7]. Diversi-…cation of …nancial instruments in the economy is generally considered a desirable e¤ect in a global sense, since it has the e¤ect of "completing the markets". However, the consequences of disintermediation on individual banks may not be that bene…cial. On the liability side, availability of new …nancial instruments encourage the reallocation of funds to more competitive markets. Again, DIDMCA is a good example. Massive amounts of funds shifted out of the American banking sector into, mainly, a booming mutual fund sector. Under deregulation, mutual funds could provide bank-like services to depositors. Banks are thus forced to compete for deposits increasing the costs of funds. On the asset side, non-…nancial enterprises …nd it advantageous to raise funds through alternative mechanisms such as domestic stocks or bonds, or quite often, in the international bond and stock markets. Major borrowers, usually those with the highest credit rating, may thus reduce their demand for bank originated funds. Bank are forced to shift their loan portfolio to smaller customers, often more risky and with higher information asymmetry.
  - Risk taking Elimination of "…rewalls " and opening the opportunities to a wider range of banking activities also provides new opportunities for risk taking and moral-hazard. In some emerging markets banks are given the chance to operate as universal banks (e.g., Mexico, Thailand) thus enabling them to pro…t from these new opportunities. But, even if universal banking is allowed, this is often a new line of business in which bankers may possess little or no experience. Cole et all.[?] provide evidence of moral hazard problems associated with asset diversi…cation in S&LA in the United States after DIDMCA.

- E¤ect: The overall e¤ect may be a fall in the relative importance of the banking sector and increased asset risk. In a rapidly expanding economy, the growth

[7] See Merton [24] for an interesting discussion on the competitive interaction between …nancial intermediaries and …nancial markets in a secular as well as a deregulatory context.

in assets may compensate for this loss. However, if FL is not accompanied by adequate growth, the e¤ect would be a shrinking of the banks' balance sheet with reduction on both the assets and liabilities.

2.1.3 Economic reform.

- Description: Most FL programs are not undertaken in isolation. On the contrary, usually they are part of a larger package of economic reforms that include liberalization of the domestic good and international trade markets, cuts and shifts in government spending, changes in monetary and exchange rates policies, elimination of industrial subsidies, etc. Often, the package of FL is part of a "structural adjustment program" sponsored by the International Monetary Fund (IMF), that contains provisions for international trade, monetary and …scal policies. The consequences of these reforms on the performance of …rms can be quite varied. This in turn a¤ects the credit quality of the banks' portfolios. Some bank customers may indeed succeed and ‡ourish in this new competitive environment. Those …rms unable to adapt or those that exist for the sole purpose of exploiting the rents resulting from a particular form of market segmentation, may su¤er. While the success of the winners will not improve much portfolio performance (because of the non- residual nature of loan assets), the failure of the looser will re‡ect negatively on the performance of assets. In particular this will re‡ect on the non-performing portfolio of banks. Under these circumstances, banks often see the need to charge higher risk premiums on (now liberalized) loan rates charged to customers. While this may increase the pro…tability of banks in the short term, this higher premiums enhances the high credit-risk created by economic reforms [8]. Roe [30] is one author that has emphasized this relationship in what he calls "the macro-micro feedback process" although in the context of highly controlled markets rather than FL.

- E¤ect: The resulting e¤ect should be a short term increase in intermediation margins obtained from higher risk customers accompanied by a relative increase of non-performing loans in the long run.

2.1.4 Elimination of barriers to entry and exit.

- Description Under FR, the survival of banks and major non-…nancial enterprises is conjecturally but e¤ectively guaranteed by the state. [9] Elimination of barriers to exit (removal of CGG) –as occurred e.g. in the early 1980's in Argentina and Brazil– changes considerably both, the liquidity of the banks and the credit quality of the banks' loan portfolios. This e¤ect can be particularly severe in

[8] It is now a fairly established belief among Mexican economists that the current peak of non-performing bank portfolios is largely self-induced. Firms were facing two simultaneous shocks, the high risk associated with the sudden and almost total liberalization of international trade, and the high risk-adjusted loan rates charged by banks

[9] It is by no means unusual in repressed economies for the state to step in and rescue an enterprise whose insolvency would endanger the liquidity of a bank or an important number of jobs.

the absence of a deposit insurance scheme in place, a situation that is quite common in EM. Further, if FL also opens the market to domestic and foreign competition, elimination of barriers to entry increases competitive pressure on the banking system.

- E¤ect The e¤ect of this particular measure can be quite complex. On the liabilities side of the balance sheet, removal of CGG reduces savers con…dence in the solvability of the bank and discourages deposit–or shifts them from smaller or less solvable banks to larger or "to big to fail" banks. Thus, one e¤ect could be a relative shrinking of deposits with smaller bank. On the asset side, elimination of barriers to exit of industrial customers could a¤ect negatively the non-performing portfolio.

2.1.5 Adoption of international (BIS) capital standards

- Description: The adoption of the BIS or similar capital standards often accompanies FL. It has been argued (Breeden and Isaac, [2]; Wojnilower, [37]; Haubrich and Wachtel, [14]; Thakor, [34] and Berger and Udell, [1]) that risk-based capital standards (RBCS) can be viewed as a regulatory tax that is higher for asset items that are assigned a higher risk rating. Since equity capital is more expensive than any other source of fund, RBCS encourage substitution of risky assets for low risk assets, predominantly treasury securities. This leads to a credit crunch or reduction in the supply of credit to the business sector. This credit crunch, juxtaposed to the increase in interest rates, complicates the …nancing picture of business enterprises and, consequently, the value of the bank's loan portfolio.

- E¤ect: The e¤ects of this measures are hard to detect in the banks' balance sheet. However, one observable e¤ect should be a relative increase of holdings in government securities.

2.1.6 Bank supervision and enforcement powers.

Elimination of unlimited conjectural government guarantees on deposits and controls over the …nancial system price setting and allocation mechanisms is often accompanied by increased supervision of banks to guarantee the safety of the system. This is so because FL introduces many incentives and opportunities for pro…t and risk taking thus reducing the safety of the banking system. There exist a reciprocal relation between the value of the deposit insurance one side and covenant rights to surveillance and seize bank assets on the other, if one wishes to keep the safety of the system relatively constant (see e.g. Merton and Bodie, [25]). Now, the essentials components of a …nancially repressed system can often be eliminated quite easily given a reasonable political will. This, as we have seen, introduces considerable uncertainty into the banking system. For example, control on interest rates (deposit and lending), controls on international capital ‡ows, economic reforms, etc. can usually be

eliminated by a simple decree. However, the same cannot be said of bank supervision. Often, central banks or bank superintendents of developing countries must perform the supervision duty using company laws that apply to standard industrial enterprises. These company laws may not provide bank supervisory bodies with the power and ‡exibility in terms of disclosure requirements, ability of taking over the control of the bank, etc. available to bank regulators of most industrialized countries. The case of a single insolvent bank can languish over years in court putting into question the safety of the whole banking system. Thus, a FL processes that is undertaken without empowering the supervisory body to take rapid control of a critical situation through changes in company laws, adds considerably to the already inherently high uncertainty associated to the program

Although it is unlikely that all these developments will be felt simultaneously, it is very likely that several of these scenarios may present themselves concurrently in most FL processes. The overall e¤ect of the set of measures that accompany FL is to create incentives for banks to increase pro…t making while increasing interest rate and asset risk. Some aspects of the e¤ect produced by FL are similar to the ones outlined by Keeley [17], Furlong and Keeley [8], Furlong [7], Keeton [18] and others following deregulation in the United States. In the latter case the main argument is that deregulation may have decreased charter value, specially for institutions in protected local markets that had been relying on non-price competition to attract funds and borrowers. This, in turn may have reduced incentives for bankers to act prudently with regard to risk taking.

2.2 Financial liberalization in the countries under study

To help the presentation of this complex process, we provide a summary of the evolution of the regulatory and institutional framework associated to the banking system in the countries under study.

Malaysia

The FL process of Malaysia is probably one of the most gradual and also less radical. To a large extent the banking sector in this country is still one of the most protected not only of the sample used in this study but of all Asian countries that have initiated a FL process. A slow FL process started in the early 1970s, accelerated in 1978 with the freeing of several interest rates, but was halted in 1983. Interest rates on all priority sectors, that cover a very substantial portion of the bank^{0}s portfolios, came again under direct control by the central bank. This reversal accompanied a strong contraction in the …scal de…cit brought on by an attempt to soften the e¤ects of global recession and high oil prices. Between 1985 and 1987 the banking sector went through a period of turmoil that ended with the bail-out of four major banks including Bank Bumiputra, the largest bank in the country.

In 1987 deposit rates were liberated and banks were allowed to lend up to 4% above the base lending rate (BLR, the local equivalent of the prime rate) …xed by the central bank, Bank Negara Malaysia. In 1989 the Banking and Financial Institutions Act

was implemented providing an integrated bank supervision framework. Supervision of foreign banks was made possible by forcing foreign banks to incorporate locally. Simultaneously, new risk-weighted capital adequacy standards were put in place. Banks were given until the end of 1990 to comply with these standards. Finally in February 1991 banks were allowed the freedom to set their own BLR, however they remain restricted on the premium they can charge over this rate to 4%. Consumer and mortgage rates remain controlled.

The FL process of Malaysia, given its gradualism, appears to be progressing smoothly. None of the elements of banking crisis that have accompanied other FL of Asia and Latin America appear to trouble Malaysia.

Taiwan

The banking sector comprises 13 government-controlled full service banks and a number of medium sized private banks and credit cooperatives. Liberalization started quite slowly and, as of 1995, does not appear to have run into any serious di¢culties. It was argued that this restraint was due to the fact that repression suits many interest. Blue-chip borrowers enjoyed a cozy relationship with government banks, bureaucrats enjoyed power, perks and job security. A …rst e¤ort towards liberalization was done in 1980 with the promulgation of the Essentials of Interest Rate Adjustment, under which interest rates on CDs and other money market instruments were partially deregulated. Also a greater range of di¤erence between maximum and minimum loan rates was permitted.

Then, in March 1985 ten leading banks -including the Bank of Taiwan, Taipei City Bank, China International Commercial Bank- were allowed to announce their prime rate, and which were determined by banks individually according to their own position and market conditions. This is perhaps the point in the process that launches the FL os Taiwan. In 1986 the government liberalized deposit rates. Deposit categories on which the CB determined interest rate ceilings were reduced from thirteen to four, giving banks greater latitude in competing for deposits. Before, banks were locked into a …xed spread with ‡oors and ceilings set by the government according to the Regulation for the Control of Interest Rates of 1947. The same year, some foreign banks that had been in Taiwan for at least …ve years were allowed to open branches but with very limited functions.

In July 1989, coinciding with the arrival of Mr. Samuel Shieh, an assiduous promoter of internationalization and liberalization of the …nancial markets as governor of the Central Bank, a new banking law was passed. With the law started a slow privatization program that reduced the government holdings in the three leading commercial banks: First Commercial, Huan Nan and Chang Hwa. Also, under the law, domestic banks had to meet the 8% capital/asset ratio set by the BIS and the stage was set for further interest rates deregulation. Foreign banks were allowed to take long-term deposits and make long-term loans and eventually enter the consumer lending market. Lending and deposit rates were de…nitively liberalized, with the abolition of ceilings and ‡oor limits on both rates. In 1990 restrictions on US dollar holdings by Taiwanese banks were relaxed; a US dollar interbank market was created;

the amount of NT dollars that could be moved out of the country by resident was increased; and the holding of foreign currency deposits by residents in overseas banks was made easier.

In 1991, 16 new commercial banks were licensed. The new banks were permitted to open only …ve branches in addition to their headquarters and savings departments. Fifteen of these banks came into existence on January 1, 1992, in "one full swoop ", almost doubling the number of domestic banks in the country. The China Trust was transformed into a commercial bank. In that year, the Ministry Of Finance also liberalized the credit card business and the short-term money market. In 1994, the inward ‡ow of capital was liberalized with the permission for foreign parties to open Taiwan dollar accounts. The CB put no ceilings on inward remittances, although it retained the right to screen remittances exceeding 100,000 US dollars.

Finally, on January 5, 1995, the Cabinet approved a blueprint for a three-phase program to enhance Taiwan's capability to become a regional …nancial center intermediating funds for foreign and domestic …rms in the Asian Paci…c region. The measures include: further elimination of restrictions on operations by foreign banks, revisions to rules on international …nancial transactions, o¤ering incentives for an o¤shore …nancial center and allowing domestic individuals to open currency accounts in the o¤shore …nancial centers.

Thailand

Thailand can be viewed as a case of gradual but radical FL. Whether it will be possible to say in the future that it also was "safe, " is something that remains to be seen. A …rst gentle move of FL was undertaken in Thailand in 1980, when lending and depository rates raised by 3% from the statutory limit imposed since 1924. Ceilings have since been adjusted frequently. A stronger FL move came in 1989. In June of that year longer maturity time deposit rates were allowed to ‡oat. This was followed in March 1990 with the removal of interest rate ceilings on all time deposits and loans. Finally in January 1992, interest rates controls were eliminated on all savings deposits. This moves on interest rates were accompanied by a package of other measures including: liberalization of transactions in which banks are allowed to engage (including international, foreign exchange, debt underwriting, market making in government securities, fund management, etc.); liberalization of international capital ‡ows and liberalization and development of alternative …nancial markets. In 1992, the credit allocation quota system was relaxed and new legislation allowed the establishment of Bangkok International Banking Facilities (BIBF) with eurobanking powers. Foreign and domestic banks were eligible to open BIBF. In January 1993 BIS capital requirement guidelines were put into force with all banks given until December 1994 to comply. In February 1995, the government announces that the number of full branch banking licenses would be increased by nearly 50% by May 1996, with foreign banks (already with a presence through BIBF) allowed to compete with domestic banks for those licenses. Parallel to this regulatory changes, the government reduces its ownership stake in the banking system. In 1989, 10% of the government controlled shares of Kung Thai Bank (KTB) were sold to the public. In 1993 the

government sells further stakes of the KTB and the Bank of Asia (BoA).

Even with a massive increase in lending activity following the FL, there is no indication that the Thailand banking system faces serious solvency problems.[10] However, the Bank of Thailand appears to forecast some problems ahead. It has explicitly expressed a warning that smaller, weaker banks may …nd it di¢cult to survive in the increasingly competitive banking environment. Thus they may be forced into mergers with larger competitors.

3 The model and statistical methodology

3.1 The model

The model is based on the option's principle that a bank's equity can be viewed as a derived asset (a call option) whose value depends upon the value of the bank's asset, mostly the portfolio of loans. For the latter there is usually no observable market value. Book values are imperfect estimators of the true value of these assets. As is usually the case in adapting the options pricing model to corporate …nance, we assume that the bank's assets follow a Wiener process,

$$dA/A = \mu_A dt + \sigma_A d! \tag{1}$$

where $\mu_A dt$ represents the instantaneous expected change in asset value, σ_A is the instantaneous standard deviation of asset values changes and $d!$ is a white noise. Adding the standard "frictionless" market assumption two major results follow. First, if the bank's stock represents a call option on the bank's assets the following relation between the value of stock, V, and the value of assets, $A; \sigma_A$, and the value (exercise price) of liabilities, D including deposits and preferred stock can be established:

$$V = AN(d_1) - DN(d_1 - \sigma_A \sqrt{T}) \tag{2}$$

where $N(.)$ represents the standard normal cumulative distribution, T represents the expiration date of liabilities, and [11]

$$d_1 = \frac{\ln\left(\frac{A}{D}\right) + 0.5\sigma_A^2 T}{\sigma_A \sqrt{T}}$$

In contrast to Black and Scholes, in our context as in that of Ronn and Verma [1986] and Giammarino et.al.[1989], the nominal value of liabilities is the present

[10] This, in spite of the fact that in March, 1995, the Bank of Thailand saw it necessary to impose a limit on lending growth of 24% (in Baht and US$) per year on all domestic and foreign banks. Bank asset expansion had reached a peak of 30.3% per year in January of 1995

[11] The formulation given here di¤ers from the more recent applications of the model in that it does not incorporate a coe¢cient for bank supervisor's forbearance, ½. The reason is that in this paper we not interested in establishing whether banks pay a fair deposit insurance premium. Rather. we look at the change with time of the variables of interest. Traditionally ½ is introduced into equation (2) as a constant, $½ < 1:0$. It is likely that forbearance changes with FL, but this is another issue altogether. We also ignore dividend payments (see e.g. King [19]).

value of the exercise price of the option. Thus the risk-free interest rate does not appear in the equation. Second, Merton [1974] also shows that applying Ito's lemma, the standard deviation of the stochastic process dA=A can be represented as

$$\sigma_A = \frac{V\sigma_V}{A(\partial V/\partial A)} = \frac{V\sigma_V}{AN(d_1)} \tag{3}$$

where σ_V is the instantaneous standard deviation of the process dV=V. In this system of two equations (2) and (3), only the value of equity, V; and the current face value of liabilities, D, can be observed directly. The variable σ_V can be observed only indirectly. It represents the market's estimate, at time $t-1$ given the current information set, of the instantaneous standard deviation of the process dV=V over the period until expiration of the option. It is, thus, a conditional standard deviation, conditioned upon the information set Ω_{t-1}. We will have more to say about the estimation of σ_V later. This leaves a system of two equations with two unknown variables, A and σ_A, that can be solved simultaneously.

We now proceed to compute two measures of insolvency risk. One is the probability of insolvency, $P(X) = P(A \cdot D)$, and the other is the fair deposit insurance premium, O_d. The actual probability of institutional failure is function of many other factors besides the market's implicit assessment A and/or P(X). Similarly, deposit insurance premium does not exist in most emerging markets. In those few where this type of insurance exists, banks pay, as in the United States, a …xed premium. In this study we are less interested by the actual institutional liquidation probability or the premium a bank would have to pay if it decides to insure its deposits, than by the evolution of bank risk exposure that accompanies a FL process. Thus, we will focus on the relative change of P(X) and O_d with the passage of time and the application of FL.

3.1.1 Measuring insolvency risk

Insolvency occurs when the value of liabilities (excluding capital) exceeds the value of assets. We focus not on the ex-post bankruptcy states but rather on the ex-ante bankruptcy probability implied in the market's value assessment of bank stocks. Presumably, if the probability of insolvability is high enough, BA will intervene to take remedial action. More often than not, remedial action does not imply orderly liquidation of assets, but rather an exercise of CGG. The probability of bankruptcy can best be viewed in the context of options. Bankruptcy will occur if the stochastic value of assets is less than the exercise price of the option, the face value of debt. It is a well known fact of options theory, that $d_2 = d_1 - \sigma_A\sqrt{T}$ in equation (2) is standard normal variable and that the cumulative represents the probability that the price of the underlying asset exceeds the strike price. Thus the probability of bankruptcy is given by

$$
\begin{aligned}
P(X) &= P(A \cdot D) \\
&= 1 - P(A \geq D) \\
&= 1 - N(d_2) \\
&= 1 - N\left[\frac{\ln\left(\frac{A}{D}\right) + 0.5\sigma_A^2 T}{\sigma_A \sqrt{T}} - \sigma_A \sqrt{T}\right] \\
&= 1 - N\left[\frac{\ln\left(\frac{A}{D}\right) - 0.5\sigma_A^2 T}{\sigma_A \sqrt{T}}\right]
\end{aligned}
\tag{4}
$$

with every term as defined before.

3.1.2 The price of deposit insurance premium

Now, given estimated values of A and σ_A, the deposit insurer's contingent liability is valued as a put option:

$$
O_d = D_i N(y) + \sigma_A \sqrt{T} - \frac{A_t D_i}{D} N(y) \tag{5}
$$

where

$$
y \equiv \frac{\log\left(\frac{L}{A}\right) - 0.5\sigma_A^2 T}{\sigma_A \sqrt{T}}; \tag{6}
$$

and D_i is the face value of insured debt.[12]. O_d represents, as the insolvency risk, a measure of the bank's risk exposure. To get values that are independent of the size of deposits we set $o_d = O_d / D_i$. Thus o_d represents the insurance a bank would have to pay for each dollar or multiple of dollar of deposits. An increase (decrease) in the insurance premium per dollar of deposit indicates an increase (decrease) in the insolvency risk of the bank. As such it represents an excellent measure of the risk exposure of banks under any context.

3.2 Statistical methodology

The statistical procedure consist of three distinct steps: i) estimation of conditional variances of stock returns, V_t^2; ii) solution of the system of non-linear equations (2) and (3) for the value of the bank's assets,A, and conditional variances of asset returns, σ_{At}^2; iii) estimation of stock price implied probability of bank bankruptcy. Now the details.

3.2.1 Estimation of conditional expected returns, $E[r_{jt} \mid \Omega_{t-1}]$ and variances of stock returns, $\sigma_t^2 \mid \Omega_{t-1}$

The first step is to obtain an estimate of the conditional variance of returns of bank stocks. A procedure frequently used in the literature is to compute the variance over

[12] This methodology, and variations of it, have been used by several authors. Examples are Ronn and Verma [31], Giammarino, Schwartz and Zechner [10], and follows Merton [23]. We were not able to distinguish between deposits and borrowings. Thus we assumed that all liabilities are insured.

a moving window of past returns that varies from 12 months on a monthly basis [e.g. Noah and Roy, 1994; Furlong, 1988; Ronn and Verma, 1986] or on a daily basis [Giammarino et al., 1989]. We do not adopt this procedure because it supposes that, at each point in time, the historical standard error is equal to the conditional standard error. We employ an alternative methodology that makes use of recent theoretical and empirical developments in asset pricing technology. Consider a model that assumes the conditional …rst and second moments to be a linear function of the conditioning variables as follows:

$$\begin{aligned} E_t[r_{t;t+¿}] &= X_t{}^{-}; \\ \log(¾^2[r_{t;t+¿}]) &= \log(¾^2[r_{t;t+¿} \; ¡ \; X_t{}^{-}]) = X_t{}^{\circ} \end{aligned} \tag{7}$$

where X_t is the vector of conditioning variables, and $¾^2[:]$ is the variance, conditional on information available at time t. This speci…cation is very similar to that of Whitelaw [1994]. It has the advantage that it introduces very little structure into the pricing mechanism and the relation between moments. We di¤er in that, to guarantee a positive variance, we take the logarithm of the conditional variance, $¾^2[:]$, in an approach similar to the EGARCH of Nelson [26].[13]

We used the same conditioning set as Harvey's [12] set of 'domestic' information variables. It consisted of a constant, lagged returns on the market index, the real exchange rate, U.S. 1-mo TBills, the spread between U.S. 1-mo and 3-mo TBills, the U.S. 10-years Government Bond, domestic in‡ation, the world dividend yield and a dummy for liberalization (the latter not part of Harvey's set). A simultaneous generalized method of moments (GMM) estimation of the system provides asymptotically correct and heteroscedasticity-consistent standard errors. Thus, in addition of obtaining estimates of conditional moments, the procedure permits us to make inference about the set of coe¢cient estimates. The moment conditions are:

$$E\begin{bmatrix} (r_{t;t+¿} \; ¡ \; X_t{}^{-})X_t^{0} \\ (\log(¾^2_{t;t+¿}) \; ¡ \; X_t{}^{\circ})X_t^{0} \end{bmatrix} = 0 \tag{8}$$

Once the series of $¾_V$ was obtained we computed a forward-looking moving average of $¾_V$, $\tilde{¾}_V$. The purpose of this transformation is to eliminate some of the variability of the series of $¾_V$. Further, this procedure introduces some of the forward-looking information that is usually available in the market at any point in time and that cannot be captured by a purely technical forecast as the one obtained from estimating (7).

Now, estimating conditional moments by exploiting the heteroscedastic properties of the variance, is fundamentally inconsistent with the Black-Scholes options pricing model. This model assumes constant variance over the options holding period. One solution to this dilemma is to use a stochastic volatility options pricing model as

[13] We also tested a one-factor and a two-factor conditional CAPM model similar to the one applied successfully to United states data by Song [32], with up to three ARCH lags. As in Song the two factors were the market return and interest rates. We abandoned the Song model in favor of the one by Whitelaw [36] when Hansen's overidentifying restrictions tests consistently rejected the orthogonality conditions used in the estimation of both, the two-factor and the one-factor models. This latter model yields a just-identi…ed model.

proposed by Hull and White [15]. The down side of using this methodology is that the value of an options is much harder to compute. To our knowledge no author has evaluated bank asset values using this methodology. Further, there is very little to gain because, as Hull and White themselves put it: 'the bias caused by stochastic volatility is surprisingly small.' The only exception is for deep out-of-the-money options, our equivalent of banks whose asset value are far below the value of liabilities. Essentially, hopelessly bankrupt banks. Jorion [16] encounters a similar problem when analyzing the foreign exchange market. He also chooses to live with theoretical inconsistency. Another solution is to use, as other authors before, historical standard errors. In other words, use an established methodology. The problems with this solution is that even this established methodology is forced to assume, implicitly, that volatility is time-varying. This is so because volatility is computed over a moving window of …xed duration. Given these contradictions we decided to be pragmatic. We computed volatilities using both the conditional moments forecasting model (7) and historical volatilities using a moving window of 12 months. Then, we computed correlation coe¢cients between these estimates and realized volatilities. To compute realized volatilities we also used a moving window of 12 months. Forecasts using model (7) yielded correlation coe¢cients that where consistently higher than those using historical volatility.[14]

3.2.2 Solution of the system of contingent claims equations for the value of assets and variances of asset returns.

The system of equations (2) and (3) was solved for A and $¾_A$ once for each year and bank over the period for which data was available. The computer implementation of the procedure is based on a Mathematica routine that searches for the roots of a system using the secant method. The roots were robust for initial values within a very narrow interval around the solution values, but we never encountered the problem of …nding more than one real root. Outside of the interval, the procedure would simply not converge even after large numbers of iterations, or would jump to imaginary roots. Thus we were forced to approach the interval within which we could …nd the solution using the logic implicit in options model and by trial an error. Once in the useful interval, we observed a clear consistency between the sequence of numerical results obtained and the intuition suggested by the derivatives of the options pricing model.

3.2.3 Explanatory regressions of asset values and risk measures

The purpose of this portion of the study is to attempt to identify the environmental and management controlled factors that a¤ect asset values and risk exposure. The procedure is similar to the one used by Hassan, Karels and Peterson [13] but where the questions being asked are di¤erent. Hassan, et al. seek to explain the e¤ect of o¤-balance sheet activities on banking risk. We seek to explain the e¤ect of bank management (other than o¤-balance sheet) and macroeconomic policy on banking

[14] This conclusion should not be generalized. See Figlewski [6]

risk. We identify three groups of variables: i) market based control variables that includes proxies of domestic and United States risk free rate and returns on a market wide stock index ; ii) environmental factors that include predominantly macroeconomic variables more or less under control of the government and a dummy variable that accounts for the structural change that represents FL; iii) management factors that include variables that are generally under control of the bank's management such as most bank related …nancial ratios. The variables used in the …rst set are: the domestic T-Bill rate (when available) or interbank lending rate (k_{fd}), the 3-month United States T-Bill (k_{fUS}), the domestic stock index returns based on the EMDB (k_{md}) and the United States Morgan Stanley Capital International (MSCI) index return (k_{mUS}). The purpose of including the control variables is to …lter the data from the in‡uence of market wide ‡uctuations –i.e. independent of the speci…c evolution in the banking sector–, domestic or international. The candidate variables used in the second set are: a dummy for liberalization (LIB), and a measure of money (MON) [15], the change in consumer price index (INF), the exchange rate (CXR), the …scal de…cit (FDEF), the balance of trade (BOT) and a measure of the term structure of interest rates if available [16]. As starting point in the selection of …nancial ratios we used the set of ratios included in the United States Federal Reserve Board Early Warning System (EWS) and presented in Putnam [29][17] . The data available in the PACAP base allowed us to compute most –but not all– ratios in the EWS. The ratios used are those that were possible to compute. They are: return on equity at market value (ROEM), returns on assets (ROA), net operating income (NOI); loan ratio (LRIO); claims on government at individual bank level (COG); cash ratio (CR); Equity to asset ratio at market value (EARM) or equity to asset ratio at book value (EARB) when the former was not available; a gap management variable, dollar gap ratio (DGR) and the sensitive funds ratio (SFR); cash dividend ratio (CDR). The ratios are de…ned with more precision in the Annex1. In the …nal regressions we eliminated all variable that displayed cross correlations higher than 0.8.

We …rst perform a regressions of the dependent variables A, $¾_A$, o_d and $P(X)$ against the two sets of explanatory variables using an OLS procedure. The model can be represented as follows:

$$y_t^B = w_t \bar{} _0 + x_t \bar{} _1 + z_t \bar{} _2 + u_t \tag{9}$$

where y represents either A, $¾_A$, o_d or $P(X)$, w_t, x_t and z_t represent respectively: a matrix of market control variables including a vector of 1.0's, a matrix of variables

[15] We chose a monetary aggregate variable out of a set of four candidates: M1; quasi-money (time, savings and foreign currency deposits); reserve money (that consists of the domestic liabilities of monetary authorities, excluding government deposits) and net claims on central government. Note that the latter, but at the individual bank level, also appears under the management controlled variables. We picked the variables that displayed the lowest correlation with other environmental variables.

[16] We use the di¤erence between long-term government bond yields and the measure available of risk free (short-term) rate

[17] The choice of ratios is, of course, arguable. It is precisely for that reason that we chose a set that has been selected by the FRB based on its accumulated experience on bank insolvency prediction of Unites States.

under management control; and a matrix of environmental variables.

Another question of interest is the relative influence of management-controlled and environmental (state-controlled) variables on bank asset values and solvency risk. To determine this relative weight we use a Gauss-Newton regression (GNR). In essence, the problem of relative weight is similar to a non-nested model specification test. Suppose that the competing models are:

$$H_1 : y_t = x_t \beta_1 + u_t \text{ and } H_2 : y_t = z_t \beta_2 + v_t.$$

We can perform an artificial nesting, in which the two competing regressions are embedded into a more general model

$$H_C : y_t = (1 - \alpha) x_t \beta_1 + \alpha z_t \beta_2 + v_t. \tag{10}$$

In this equation α nests the two models. An α close to one means that environmental variables dominate management-controlled variables. The problem with this model is that it is not estimable because not all parameters are separately identifiable. In model (10) the intercept and the coefficients on the control variables r_{fd}, r_{fUS}, r_{md} and r_{mUS} should be present in either formulation. One solution to this problem was suggested by Davidson and MacKinnon [4]. It consists of replacing β_2 by $\hat{\beta}_2$, the OLS estimate of β_2. Thus , H_C becomes

$$H_C : y_t = (1 - \alpha) x_t \beta_1 + \alpha z_t \hat{\beta}_2 + v_t. \tag{11}$$

A test of the null hypothesis that $\alpha = 0$ is a standard t-test. We also use the linear version of this model focusing on the coefficient a from the GNR

$$y_t - \hat{x} = \hat{X} b + a(\hat{z} - \hat{x}) + v_t; \tag{12}$$

where $\hat{x} \equiv x(\hat{\beta})$ and $\hat{X} \equiv X(\hat{\beta})$, denoting the matrix of derivatives of $x(\beta)$ with respect to β. The test is also a standard t -test. We are interested less in the test on the coefficients α and a than in the numerical value of these coefficients.

Finally we performed (Wald) exclusion tests on the coefficients $\beta_1$and β_2 of regression (9) to test the hypothesis that one of the two set of variables is redundant.

4 Data

We use data from four different sources: i) The source of yearly bank income statement and balance sheet is the PACAP database (Pacific-Basin Capital Markets) produced by the PACAP Research Center, The University of Rhode Island for Malaysia, Taiwan and Thailand. ii) The source of monthly stock market returns and capitalization of domestic banks is also PACAP. iii) Macroeconomic data series including interest rates, measures of money, government finances, exchange rates and price indices. This data was obtained from the IMF's International Financial Statistics for all countries except Taiwan. The Taiwan macro data was obtained from PACAP.

All data were tested for stationarity using the Augmented Dickey-Fuller and Phillipe-Perron tests, and corrected accordingly. In the case of Malaysia, the banks' …scal year closed quite randomly. We used for each bank the value of the macroeconomic variable at the month of closure of the …scal year, except for variables that were available on a yearly basis only. In this case, we used the data of the closest end-of-calendar-year. iv) The dates and descriptions of FL events. This data was collected from a wide range of printed and electronic sources that include every possible scienti…c and journalistic publications to which we had access and time to research, including World Bank working papers, economic journals, the Financial Times, OECD Economic Studies, World Bank Country Studies, and all publications listed in the ABI Reference Index (that lists among others The Economist, Euromoney, Banker and several regional business reviews such as Asia Business, etc.).

In studying the institutional development accompanying FL we paid attention to every form of relaxation of restriction on the …nancial system. However, for statistical purposes, the event that was taken as key to the FL process is the lifting of controls on interest rates. For the period following this date the dummy variable LIB was given the value of 1.0 and 0.0 otherwise. The dates of relevance for the sample of countries in our study are the following:

Liberalization Dates and Sample Size		
Country	Date	No. of Banks
Malaysia	1991	10
Taiwan	1985	13
Thailand	1984	16

5 Results

Results will be presented in the following order: i) we present some graphs that illustrate the developments and the evolution of bank solvency variables surrounding FL; ii) more formally we present results for the estimation of conditional moments; iii) we present the results of the regression that seek to explain the variations in asset values and bank solvency measures.

In …gures 1-3 we present the price indices for the banking sector (broken lines) and the complete domestic market (full lines). The gray regions represent the post-FL periods. In the case of Malaysia and Thailand we note an overall upward trend of both price indices following the FL event. The Thai banking index follows quite closely the market index. This upward trend should not be interpreted as a result of FL only, but of the whole set of economic reforms that accompany. Below this graph we have plotted conditional variances estimated with equation (7) for the market-wide index and the banking index. In the case of Malaysia, volatility was high over the period of interest rates liberalization between 1978 and 1983, falling afterwards and raising again following the 1991 event. The 1985-1987 turmoil period appears to have had a small e¤ect on the volatility of the index. This could be explained by the fact that insolvency a¤ected a state-owned bank and some smaller private banks. In

Taiwan, we observe a jump in volatility in both the market and the banking indices. However the jump appears to be more accentuated for the banking index . A similar description could be made for Thailand. This is an e¤ect that we will see replicated at the individual bank level.

In …gures 4-12 we have plotted respectively standard deviation of bank assets, $¾_A$; bankruptcy probability, P(X) and the estimated deposit insurance premium per million of dollars, o_d. The plots include all banks over the periods for which data were available. The plots of the individual banks replicate quite closely what could be observed at the index level. In the case of Malaysia, all variables, $¾_A$, P(X) and o_d display peaks in the period 1978-1983, with increases again in the late 1980's but generally not after 1991. In the case of Thailand the implied variance of bank assets is relatively high following the 1980 "soft" FL. Then it dips through the early and middle 1980's. Toward the end of the decade volatilities of some banks increase dramatically. Then, starting in 1989 and through the end of the sample in 1993, volatility increases for all banks in the sample.

The use of a conditional moment forecasting model implies that we are assuming that returns of bank stocks are heteroscedastic. We test this assumption explicitly performing the GNR suggested by Engle [1982] for all series of bank returns. The statistic n times the centered R^2 is a test of heteroscedasticity distributed $Â^2(p)$. We used p = 6 and obtained evidence of heteroscedasticity for bank series of Malaysia, Taiwan and Thailand.

We do not report here the coe¢cients obtained from estimating system (7) for each bank using the GMM procedure. However in Table 2 we present the results of the GMM estimation of system (7) for the banking and market indices. Thailand is particularly di¢cult case to predict with almost no variable showing statistical signi…cance. The case of Malaysia and Taiwan is much easier, with several coe¢cients statistically di¤erent from zero, including the ARCH term. We also mention a few details about these estimations for individual banks. To test the overall model we included a surplus of instrumental variables. In the case of Malaysia and Taiwan in all estimations the overidenti…cation restrictions test did not reject the orthogonality conditions used to perform the estimation. In the case of Thailand, in 13 out 16 estimations the overidenti…cation restrictions test did not reject the orthogonality conditions. This suggests that the model is, overall, adequate. For Malaysia, the variable in the conditioning set that most often was signi…cant to predict conditional returns was the lagged US T-Bill (5 out of 8 estimations, with a negative sign) and the lagged US 10-year bond yield (5/8, negative). In the volatility prediction the coe¢cient that was most often signi…cant was the own lagged variance (the ARCH e¤ect, 2/8, positive). For Thailand, the variable in the conditioning set that most often was signi…cant to predict conditional returns was the lagged own stock return (8/16 estimations, negative). The second and third places went to the market index return (5/16, positive) and the US T-Bill (4/16, negative). In the volatility prediction the coe¢cient that was most often signi…cant was the one corresponding to the US T-Bill (4/16, negative), followed by exchange rate (3/16, inconsistent signs) and the domestic in‡ation (3/16, inconsistent sign but mostly positive). All variables were

lagged. The own lagged variance (the ARCH e¤ect) was signi…cant in only 2/16 estimations.

In Table 3-X we report the results of estimating model (9), (11) and (12). The last of this set of tables reports the results of a regression that includes the three countries with dummies for two of them. In this table we have used as dependent variables A, $¾_A$, P(X) and o_d, the latter three, of course, being measures of risk. In all three cases Thailand, by looking at general statistics it is evident that the variation in A and $¾_A$ can be relatively well explained, with adjusted R^2 ranging from 72% to 89%. Due to the presence of serial correlation in the regression, we used the procedure of Newey and West [27] with one lag whenever necessary. Thus all coe¢cients and test statistics have been computed using a consistent estimate (corrected for heteroscedasticity and autocorrelation) of the covariance matrix.[18]). The conclusion drawn from the graphs that FL tends to increase asset volatility is only partially supported by this regression. However there is a positive and signi…cant relation between FL and $¾_A$ in Malaysia and Taiwan, and positive but not signi…cant in the case of Thailand. The other two regressions yield somewhat contradictory results and a low adjusted R^2. The regression including the three countries yields the mos unambiguous results. When taken together, al test indicate a decrease in asset value and an increase in risk at statistically signi…cant levels.

In terms of the relative weight of management versus macro variables, in the individual country regressions the majority (7 out of 12) of the coe¢cients tend to be smaller than 0.5, and those that are larger than 0.5 (5 out of 12), are rarely statistically signi…cant. However, when taking the three countries together, the weights y suggest that macro variables play a bigger role in determining bank asset values and risk.

In Table 4, we report the results of the Wald test on the coe¢cients $¯_1$and $¯_2$ of regression (9). With few exceptions (namely Taiwan for P(X) and o_d; and Thailand for o_d) the test for management controlled variables are highly signi…cant and much larger than those for macro variables. Once again, when taking the three countries together, the results provide support to the hypothesis that macro variables are more relevant.

We do not focus on the sign and statistical signi…cance of explanatory variables other than the variable LIB. However, note the positive and signi…cant relation between the measures of risk and the DGR, as expected. More interesting is to see whether following FL management changed its practices and in which way this affected both bank value and risk. To se this we run the same regressions (9) but added interaction terms between LIB and two risk measures (LRIO, DGR). Details about the regression are not reported but the main results are the following:[19] First, Durbin Watson statistics tended to be more often within the normal range, suggesting a certain solution to the autocorrelation problem. Second, for both Malaysia and Taiwan, there is a positive relation between the value of assets and the DGR

[18] We also included a trend variable in the regression, however it was not signi…cant and was dropped from the de…nitive estimation reported in Table 3-X.

[19] Detailled results are available from the authors on request.

interaction term, and a negative relationship with the LRIO term. This suggests that the gap management tended to enhance value of the assets but the increase in credit risk had a negative e¤ect on assets. Third, several coe¢cients for risk interaction terms in risk-measure regressions for Taiwan and one for Thailand were positive and statistically signi…cant. This provides empirical support, for Taiwan and weakly for Thailand, that management practices as re‡ected by the LRIO and DGR were changed so as to increase the risk exposure of banks after FL. To some extent, these results could also be considered an empirical support for the proposition that moral hazard increases following FL.[20] The interaction coe¢cients where all non-signi…cant in the all-countries regression.

6 Conclusions and Policy Recommendations.

The evidence provided by the empirical analysis carried out in this paper suggests the following conclusions and policy recommendations:

1. The stock market in which bank shares are traded is an additional instrument to gage the evolution and health of the banking system in the context of …nancial liberalization. The market is sensitive to the impact of the FL process on the value of bank assets (in itself a thermometer of health in the economy) and its solvency situation. Thus, the market price can be used as an indicator of the impact of the whole liberalization process and economic cycles on commercial bank performance. It is of course an open question whether the "smart economists" of the ministry of economic a¤airs are ready to concede that prices and implicit valuations re‡ect the "aggregated wisdom" of market participants and not just volatile scare-rabbit response by uninformed investors.

2. Taken together, the results provide a reasonably strong evidence of increase in bank risk following FL, however measured. Conditional volatility of market-value of assets, implied probabilities of bankruptcy and deposit insurance premium per dollar of deposit appear to increase. This implies that the introduction of a FL increases the possibility of a banking crisis occurring some time after the intiation of the process. Further, it suggest that supervisory authorities need to scrutinize continuously all critical variables associated to bank performance following FL, more so than before.

3. The risk exposure of banks is a function of both, variable under control of management and macroeconomic variables. The e¤ect that management variables are important in determining risk provides supports to the proposition that moral hazard (and risk taking) by banks increases following a FL. Given that most of the banking crisis that followed FL in various countries have generally been blamed on macroeconomic policy, this research provides empirical support for an alternative explanation. In e¤ect, risk taking behavior by bank managers/owners may be more important in banking crisis than has been reported. This only emphasizes the importance of our previous recommendation that regulators an supervisory authorities need

[20] An alternative proposition would be that bank risk management simply becomes more di¢cult following FL and that this risk increase is beyond the control of management. However, the Wald test and the values of weighting coe¢cient, ®, lends this alternative explanation less plausible.

to keep a very close track of the management practices and risk exposure following FL.

4. There is little reason to believe that the e¤ects described above are speci…c to any country. Thus, these conclusions are most probably applicable to any banking system that goes through a FL process.

References

[1] Allen N. Berger and Gregory F. Udell. Did risk-based capital allocate bank credit and cause a "credit crunch" in the united states? Journal of Money Credit and Banking, 26:585–633, August 1994.

[2] Richard C. Breeden and William M. Isaac. Thanks basle for credit crunch. Wall Street Journal, page A4, November 1992.

[3] Vittorio Corbo, Jaime de Melo, and James Tybout. Por que fracasaron las recientes reformas en el cono sur. In Santiago Roca, editor, Estabilización y ajuste estructural en América Latina, pages 403–443. Escuela de Administración de Negocios (ESAN), Lima, Perú, 1985.

[4] Russell Davidson and James G. MacKinnon. Several tests for model speci…cations in the presence of alternative hypothesis. Econometrica, 49:781–793, 1981.

[5] Asli Demirgüc-Kunt. Deposit- institution failure: A review of empirical literature. Economic Review, FRB of Cleveland, 25:2–18, 4th Quarter 1989.

[6] Stephen Figlewski. Forecasting volatility using historical data. 1994. New York Univeresity, Salomon Center Working Paper Series S-94-13.

[7] Frederic T. Furlong. Changes in bank risk taking. Economic Review, pages 45–56, Spring 1988. FRB of San Francisco.

[8] Frederick T Furlong and Michael C. Keeley. Capital regulation and bank risk taking: A note. Journal of Banking and Finance, 13:883–891, 1989.

[9] Vicente Galbis. Liberalizacion del sector …nanciero bajo condiciones oligopolicas y la estructura de los holding bancarios. In Santiago Roca, editor, Estabilización y ajuste estructural en América Latina, pages 289–315. Escuela de Administración de Negocios (ESAN), Lima, Perú, 1985.

[10] Ronald Giammarino, Eduardo Schwart, and Josef Zechner. Market valuation of bank assets and deposit insurance in canada. Canadian Journal of Economics, 22:109–127, February 1989.

[11] Heather D. Gibson and Euclid Tsakalotos. The scope and limits of …nancial liberalization in developing countries: A critical survey. Journal of Development Studies, 30:78–628, April 1994.

[12] Campbell R. Harvey. Predictable risk and returns in emerging markets. The Review of Financial Studies, 8:773–816, 1995.

[13] Kabir M. Hassan, Gordon V. Karels, and Manfred O. Peterson. Deposit insurance, market discipline and o¤-balance sheet banking risk of large u.s. commercial banks. Journal of Banking and Finance, 18:575–593, 1994.

[14] Joseph G. Haubrich and Paul Wachtel. Capital requirements and shift in commercial bank portfolios. Economic Review, 29:2–15, 1993. FRB of Cleveland.

[15] John Hull and Alan White. The pricing of options on assets with stochastic volatilities. Journal of Finance, 42:281–300, June 1987.

[16] Philippe Jorion. Predicting volatility in the foreign exchange market. Journal of Finance, 50:507–528, 1995.

[17] Michael C. Keeley. Deposit insurance, risk and market power in banking. American Economic Review, 80:1183–1200, 1990.

[18] William R. Keeton. Deposit insurance and the deregulation of deposit rates. Economic Review, pages 28–47, April 1984. Federal Reserve Bank of Kansas City.

[19] Kathleen K. King. Deposit insurance as a put option: Alternative approaches to modeling regulatory forebearance. Board of Governors of the Federal System, September 1992.

[20] Lawrence Kryzanowski and Gordon S. Roberts. Canadian banking solvency,1922-1940. Journal of Money, Credit and Banking, 25:361–376, August 1993.

[21] Sergio Pereira Leite and V. Sundararajan. Issues in interest rate management and liberalization. IMF Sta¤ Papers, 37:735–752, December 1990.

[22] Miguel Mancera Aguayo. Ajuste de políticas frente a turbulencias …nancieras. El Mercado de Valores, 10:19–25, October 1995.

[23] Robert C. Merton. An analytic derivation of the cost of deposit insurance and loan guarantees: An application of modern option pricing theory. Journal of Banking and Finance, 1:3–11, June 1977.

[24] Robert C. Merton. A functional perspective of …nancial intermediation. Financial Management, 24:23–41, Summer 1995.

[25] Robert C. Merton and Zvi Bodie. On the management of …nancial guarantees. Financial Management, 21:87–109, Winter 1992.

[26] Daniel B. Nelson. Conditional heteroschedasticity in asset returns: A new approach. Econometrica, 59:347–370, March 1991.

[27] W. Newey and K. West. A simple positive-de…nite heteroscedasticity and autocorrelation consisten covariance matrix. Econometrica, 55:703–708, 1987.

[28] Coleen C. Pantalone and Marjorie B. Platt. Predicting commercial bank failure since deregulation. New England Economic Review, pages 37–47, July/August 1987.

[29] Barron H. Putnam. Early warning systems and …nancial analysis in bank monitoring. Economic Review, 68:6–13, November 1983. FRB of Atlanta.

[30] Alan Roe. Financial systems and development in africa. In P. Callier, editor, Financial Systems and Development in Africa, pages 5–28. The World Bank, Washington, D.C., 1991.

[31] Ehud I. Ronn and Avininash K. Verma. Pricing risk-adjusted deposit insurance: An option based model. Journal of Finance, 41:871–895, 1986.

[32] Frank M. Song. A two-factor arch model for deposit-institutions stock returns. Journal of Money, Credit and Banking, 26:323–340, 1994.

[33] V. Sundararajan. The role of prudential supervision and …nancial restructuring of banks during transitions to indirect instruments of monetary control. Journal of International Finance, 4, 1996. forthcomming.

[34] Anjan Thakor. Deposit insurance policy. Economic Review, pages 25–34, January/February 1993. FRB of St. Louis.

[35] Dimitri Vittas and Yoon Je Cho. The role of credit policies in japan and korea. Finance and Development, xx:10–12, March 1994.

[36] Robert F. Whitelaw. Time variation and covariations in the expectations and volatility of stock market returns. Journal of Finance, 49:515–554, 1994.

[37] Albert Wojnilower. Credit crunch. In M. Milgate P. Newman and J. Eatwell, editors, New Palgrave Dictionary of Money and Finance, pages 525–527. McMillan Press, London, 1992.

Table 1
Financial Liberalization: Measures and E¤ects
(Those that are of concern to regulators)

Measures			
Elimination of controls on deposit and lending rates	Deregulation/regulation of non-bank …nancial markets	Economic reforms (liberalization of real sector)	Elimination/lowering of barriers to entry /exit
E¤ect on banks			
*Reduction of charter value *Elimination of guaranteed intermediation margin *Increased interest rate volatility that a¤ect the banks' interesty rate risk and gap management risk *Opportunities for price wars to compete for market share *Increased clients' bankruptcy risk resulting from higher interest rates.	*Reduction of charter value *Disintermediation by borrowers and depositors *Volatility in international capital ‡ows (hot/cold money) a¤ecting share prices and money stock *Risk associated with new business lines (e.g. universal banking) *Inccreased competition from quasi-bank …nancial institutions (depository and non-depository)	*Increased loan portfolio risk	*Reduction of charter value *Elimination or reduction of "conjectural government guarantees" (CGG) *Increased competition by new entrants (domestic and foreign)
E¤ect on banks' clients			
*Increased cost of short and long term debt …nancing or re…nancing cost *Increased risk associated with …nancial leverage		*Increased business risk *Elimination or reduction of government induced rent opportunities	

Table 2
Estimation of Conditional Moments for the Market and Banking Indices Returns

This table reports the results of the GMM estimation of the system

$$E_t[r_{t;t+¿}] = X_t\bar{}; \qquad \log(¾^2[r_{t;t+¿}]) = \log(¾^2[r_{t;t+¿} ¡ X_t\bar{}]) = X_t°$$

where X_t is the vector of conditioning variables, and $¾^2[:]$ is the variance conditional on information at time t. The conditioning set consisted of a constant, own returns lagged (k_l), the real exchange rate (XR), U.S. 1-mo T-Bills yield (TB1M), the spread between U.S. 1-mo and 3-mo T-Bills yields (STB13), the U.S. 10-years Government Bond yield (TB10Y), domestic in‡ation (INF), the world dividend yield (DIV_w) and a dummy for liberalization (LIB). For the banking index we also included the returns on the market (k_md), and in the equation for conditional variance we included the error on previous periods' returns (the ARCH e¤ect, $²^2$). All variables except LIB were lagged.

	Malaysia				Taiwan			
	Market		Banking		Market		Banking	
Variable	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic
General Statistics								
DW eq. 1	1.99	-	1.94	-	1.84	-	1.89	-
DW eq. 2	1.94	-	1.67	-	1.81	-	1.87	-
$Â^2$	0.43	0.51	-	-	0.49	0.48		
Conditional Returns								
Constant	0.280	3.799	0.268	3.298	0.205	2.592	0.224	2.082
k_m	0.020	0.231	0.464	2.518	0.022	0.199	-0.327	-1.684
XR	0.114	0.552	0.185	0.925	-0.043	-1.636	-0.018	-0.584
TB1M	-0.015	-3.860	-0.011	-2.497	-0.001	-0.553	-0.001	-0.375
STB13	0.007	0.895	0.010	1.334	0.012	1.240	0.022	1.517
GB10Y	-0.023	-4.450	-0.018	-3.282	-0.000	-0.167	-0.001	-0.215
INF	-0.057	-0.051	-0.078	-0.069	-0.007	-0.009	0.128	0.138
DIV_w	-0.064	-2.205	-0.092	-2.823	-0.096	-2.413	-0.107	-1.996
LIB	0.024	2.043	0.056	3.740	-0.037	-1.446	-0.057	-2.074
k_md			0.055	2.376			0.347	2.263
Conditional Variances								
Constant	-7.164	-2.719	-5.713	-2.146	-5.459	2.056	-7.775	-3.302
k_l	-3.693	-0.158	-3.974	-0.399	1.602	-4.137	1.186	1.236
XR	-8.582	-0.796	-7.178	-1.654	0.223	1.887	0.161	0.553
TB1M	0.237	1.752	0.095	0.621	0.023	0.749	0.215	1.413
STB13	-0.593	-0.607	-0.487	-1.912	0.132	0.264	0.197	0.687
GB10Y	0.201	0.411	0.019	0.063	0.059	0.681	0.319	1.718
INF	8.414	0.178	19.181	0.749	19.368	0.435	8.355	0.620
DIV_w	-0.288	-0.518	-0.308	-0.434	-0.337	1.603	-0.152	-0.228
LIB	-0.021	-0.038	0.383	0.724	-0.303	-0.572	-1.049	-1.483
$²^2_{t¡1}$	-2.919	-0.015	-30.76	-0.143	7.573	2.395	2.782	0.648

Table 2 (Cont'd)
Estimation of Conditional Moments for the Market and Banking Indices Returns

	Thailand			
	Market		Banking	
Variable	Coe¤	t statistic	Coe¤	t statistic
General Statistics				
DW eq. 1	1.82	-	1.91	-
DW eq. 2	1.41	-	2.37	-
$\hat{A}^2$	0.43	0.51	-	-
Conditional Returns				
Constant	0.088	0.896	0.116	1.377
k_m	0.164	1.442	0.128	0.623
XR	-0.002	-0.285	-0.001	-0.194
TB1M	0.001	0.101	-0.004	-0.882
STB13	0.006	0.757	0.010	1.271
GB10Y	0.001	0.088	-0.004	-0.674
INF	-0.565	-0.631	-0.857	-1.199
DIV_w	-0.054	-2.145	-0.038	-1.485
LIB	-0.002	-0.078	0.036	1.769
k_{md}			0.012	0.588
Conditional Variances				
Constant	-1.274	-0.222	-5.033	-1.408
k_l	-0.649	-0.104	1.678	0.619
XR	-0.011	-0.019	0.099	0.300
TB1M	-0.451	-1.143	-0.134	-0.573
STB13	-0.272	-0.780	-0.240	-0.618
GB10Y	-0.643	-1.150	-0.137	-0.413
INF	-0.292	-0.006	20.720	0.948
DIV_w	-0.099	-0.109	-0.063	-0.065
LIB	1.063	1.289	0.938	1.669
$^{2}{}^{2}_{t\ i\ 1}$	-11.195	-0.543	28.167	1.224

Table 3- Malaysia
The Determinants of Bank Asset Values and Risk

This table reports the results of the regressions

$$y_t^B = w_t \bar{} _0 + x_t \bar{} _1 + z_t \bar{} _2 + u_t$$

where y represents either A, O_d or P(X), w_t, x_t and z_t represent respectively: a matrix of market control variables including a vector of 1.0's, the domestic and US risk free rates, r_{fd} and r_{fUS}, and the domestic and US market index returns, r_{md} and r_{mUS}; a set of variables under management control; and a set of environmental variables. We also run the models:

$$H_C : y_t = (1 - \alpha)x_t \bar{} _1 + \alpha z_t \bar{} _2 + v_t:$$

$$y_t - \hat{x} = \hat{X}b + a(\hat{z} - \hat{x}) + v_t;$$

and report the values of ® and a. See the text for an explanation about these regressions. The coe¢cients imply that the group of variables under control of management have a relative weight in determining the value of the dependent variable equal to 1 ¡ ® (1 ¡ a), while environmental variables have a relative weight of ® (a). All variables in real terms. Critical t-values of two-sided test for 5% and 10% signi…cance levels are respectively 1.96 and 1.645. ρ_1 represents the autocorrelation coe¢cient introduced to correct for serial correlation. .

	logA		¾A		P(X)		σd	
Variable	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic
General Statistics								
DW	1.25	-	1.25	-	1.70	-	1.97	-
adj. R^2	0.79	-	0.84	-	0.12	-	0.06	-
Control Variables								
Constant	1.401	1.22	0.189	0.94	-0.756	-0.20	-0.560	-0.14
k_{md}	-0.011	-1.94	0.001	2.11	0.042	1.52	0.041	1.31
k_{fd}	-0.007	-0.10	0.007	0.99	0.112	1.14	0.050	0.49
k_{mUS}	-0.014	-0.93	-0.001	-2.19	-0.044	-1.21	-0.038	-1.11
k_{fUS}	-0.058	-2.21	0.001	0.57	-0.030	-0.85	-0.019	-0.75
	Management Controlled Variables							
ROEB	-3.038	-1.73	0.259	2.85	2.539	0.77	2.759	0.83
ROA	17.376	3.07	-1.755	-7.79	-19.194	-1.64	-17.538	-1.54
LRIO	-1.540	-1.46	-0.379	-1.86	-0.815	-0.37	-0.980	-0.40
COG	-0.345	-0.21	-0.127	-0.68	-3.324	-1.39	-3.300	-1.39
CR	-1.760	-1.74	0.080	1.24	3.573	1.58	3.006	1.42
DGR	-1.132	-1.42	0.240	1.41	0.131	0.06	0.329	0.14
EARB	11.070	-6.92	0.776	3.72	6.260	1.30	5.152	1.11
BAR	20.112	2.94	-0.623	-3.15	-13.002	-2.54	-11.214	-2.61
CDR	-0.540	-3.58	0.009	0.99	0.059	0.42	0.059	0.45
Environmental Variables								
MON	-0.0001	-2.01	-0.000	-0.13	-0.000	-0.34	-0.000	-0.49
FDEF	-0.0001	-2.32	-0.000	-1.00	-0.000	-0.19	-0.000	-0.40
BOT	0.000	1.15	0.000	1.09	0.000	1.17	0.000	0.84
CXR	0.566	1.07	0.041	1.54	0.349	0.67	0.486	0.88
INF	0.590	0.06	-0.295	-0.49	-23.754	-1.29	-22.872	-1.13
LIB	-0.069	-0.57	0.023	3.53	0.444	1.36	0.373	1.30
Relative Weight of Environmental Variables								
®	0.41	3.52	0.46	1.61	0.91	1.35	0.92	1.04
a	0.41	3.78	0.46	1.74	0.91	1.46	0.92	1.11

Table 3- Taiwan (Cont'd)
The Determinants of Bank Asset Values and Risk

	logA		¾A		P(X)		σd	
Variable	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic
General Statistics								
DW	1.13	-	1.81	-	1.59	-	2.02	-
adj. R^2	0.89	-	0.72	-	0.51	-	0.24	-
Control Variables								
Constant	4.547	3.65	-0.112	-0.59	-0.040	-0.34	-44.079	-0.701
k_{md}	-0.020	-2.45	-0.000	-0.32	-0.000	-0.22	-0.033	-0.072
k_{fd}	0.103	1.98	-0.013	-1.55	-0.009	-1.82	-1.139	-0.486
k_{mUS}	-0.026	-2.14	0.006	1.78	0.001	1.02	1.300	1.066
k_{fUS}	-0.022	-0.87	-0.001	-0.35	-0.002	-1.02	-0.099	-0.122
	Management Controlled Variables							
ROEM	-3.760	-2.03	-0.363	-0.87	0.037	0.12	33.446	0.31
ROA	-32.894	-3.04	-4.397	-0.79	-3.318	-1.13	-2289.2	-1.34
LRIO	-3.859	-4.65	-0.267	-2.40	-0.161	-2.64	-76.879	-2.36
COG	-4.511	-3.71	0.094	0.64	-0.007	-0.05	35.748	0.60
CR	-2.263	-2.14	-0.023	-0.16	-0.111	-1.44	-7.352	-0.17
DGR	-1.656	-2.20	0.485	1.84	0.215	1.73	156.95	1.64
EARM	-0.128	-0.55	0.232	3.49	0.001	0.03	21.685	1.07
BAR	0.865	0.92	-0.532	-1.76	-0.243	-1.71	-180.38	-1.66
CDR	-0.693	-7.15	-0.041	-2.06	-0.025	-2.40	-11.818	-1.79
Environmental Variables								
MON	0.000	1.75	-0.000	-0.77	-0.000	-1.30	-0.000	-1.58
CXR	0.020	0.78	-0.011	-1.65	-0.010	-2.77	-4.739	-1.93
INF	-0.036	-1.28	0.016	2.57	0.008	2.26	3.042	1.82
LIB	-0.176	-1.14	0.036	1.09	0.047	2.20	-2.892	-0.29
Relative Weight of Environmental Variables								
®	0.06	0.29	0.11	1.00	0.74	1.53	1.00	13.8
a	0.06	0.21	0.11	1.00	0.74	4.60	1.18	2.36

Table 3- Thailand (Cont'd)
The Determinants of Bank Asset Values and Risk

	logA		¾A		P(X)		σd	
Variable	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic
General Statistics								
DW	0.98	-	1.79	-	2.12	-	2.27	-
adj. R^2	0.75	-	0.84	-	0.19	-	0.13	-
Control Variables								
Constant	-5.307	-2.17	0.099	2.78	1.359	1.54	0.103	0.60
k_{md}	0.009	2.07	-0.000	-1.98	-0.012	-1.86	-0.002	-1.33
k_{fd}	-0.055	-2.27	-0.000	-1.66	0.004	0.50	0.001	1.01
k_{mUS}	-0.008	-0.70	-0.000	-2.35	-0.005	-0.66	-0.001	-1.18
k_{fUS}	-0.028	-2.22	-0.000	-2.21	-0.027	-1.93	-0.003	-1.16
	Management Controlled Variables							
ROEM	7.893	4.10	-0.000	-0.05	-1.305	-1.31	-0.237	-1.18
ROA	-60.509	-2.15	-0.459	-0.71	-23.254	-2.07	-2.166	-1.60
NOI	14.833	1.38	-0.021	-0.12	5.383	1.30	0.587	1.01
LRIO	3.178	3.26	-0.022	-1.52	0.558	1.22	0.040	0.84
COG	-10.274	-2.47	0.048	0.91	0.132	0.06	0.426	1.22
CR	12.862	4.56	-0.026	-0.83	-1.184	-1.22	-0.239	-1.16
EARM	1.556	1.12	0.380	7.35	-0.162	-0.30	-0.013	-0.14
SFR	5.465	2.29	-0.077	-2.18	-1.421	-1.38	-0.310	-1.37
CDR	-0.285	-2.90	-0.000	-3.00	-0.107	-2.31	-0.016	-1.64
Environmental Variables								
MON	-0.006	-1.63	0.000	1.18	0.007	1.95	0.000	1.32
FDEF	-0.000	-1.45	0.000	0.40	0.000	1.63	0.000	1.15
CXR	0.203	4.37	-0.000	-2.38	-0.038	-1.95	-0.002	-1.39
INF	7.470	3.52	-0.026	-0.51	-0.501	-0.46	-0.216	-1.31
LIB	0.166	0.57	0.012	1.90	-0.167	-0.94	-0.021	-0.81
Relative Weight of Environmental Variables								
®	0.93	2.39	0.14	2.59	0.20	1.93	0.04	0.25
a	0.93	2.63	0.14	2.44	0.14	1.20	0.04	1.17

Table 3- All (Cont'd)
The Determinants of Bank Asset Values and Risk

	logA		¾A		P(X)		σd	
Variable	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic	Coe¤	t statistic
General Statistics								
DW	0.613	-	1.630	-	1.452	-	1.985	-
adj. R^2	0.63	-	0.74	-	0.27	-	0.06	-
Control Variables								
Constant	10.279	15.49	0.186	3.32	1.482	3.16	0.876	1.90
Taiwan	2.606	1.77	0.661	2.86	7.251	3.99	4.566	2.06
Thailand	4.063	5.19	0.414	3.66	4.110	4.32	2.613	2.36
k_{md}	-0.002	-0.59	-0.000	-1.34	-0.012	-1.74	-0.004	-0.79
k_{fd}	-0.001	-0.04	-0.000	-2.53	-0.022	-0.96	-0.020	-0.88
k_{mUS}	-0.027	-2.03	-0.000	-0.46	-0.016	-1.87	-0.008	-0.60
k_{fUS}	-0.094	-3.33	0.000	0.85	-0.051	-2.75	-0.026	-2.11
	Management Controlled Variables							
ROEM	0.051	0.02	-0.497	-3.23	-3.281	-1.24	-2.997	-1.21
ROA	-5.089	-1.13	0.425	1.80	1.763	0.78	1.178	0.70
NOI	-10.588	-1.30	0.718	1.15	-12.885	-3.74	-8.606	-2.28
LRIO	-4.569	-6.22	0.072	1.16	-0.202	-0.49	0.515	1.17
COG	-4.598	-3.35	0.297	1.76	1.980	2.49	2.075	1.71
CR	2.789	2.17	-0.020	-0.22	-0.617	-0.94	-0.154	-0.33
EARM	0.060	0.32	0.107	5.83	-0.182	-3.41	-0.066	-1.71
SFR	1.161	2.68	-0.141	-3.10	-0.417	-1.24	-0.510	-1.55
CDR	-47.014	-6.15	-0.362	-1.42	-6.604	-1.58	-3.038	-1.02
Environmental Variables								
MON	0.000	0.39	-0.000	-1.12	-0.000	-3.48	-0.000	-1.97
MXR	-0.005	-0.14	-0.017	-3.03	-0.170	-3.94	-0.112	-2.02
INF	0.130	2.93	-0.000	-1.47	-0.068	-1.77	-0.009	-0.28
LIB	0.204	1.32	0.043	3.87	0.581	5.16	0.269	2.57
Relative Weight of Environmental Variables								
®	0.998	1.61	0.96	7.39	0.99	2.54	0.99	1.11
a	1.16	2.04	0.96	6.72	1.15	3.01	1.16	2.06

Table 4
Wald Tests: all countries

This table reports the results of the Wald test performed on regression coe¢cients $\bar{}_1$ and $\bar{}_2$ of regression (9)

$$y_t^B = w_t \bar{}_0 + x_t \bar{}_1 + z_t \bar{}_2 + u_t$$

where y represents either A, O_d or P(X), w_t, x_t and z_t represent respectively: a matrix of market control variables including a vector of 1.0's, the domestic and US risk free rates, r_{fd} and r_{fUS}, and the domestic and US market index returns, r_{md} and r_{mUS}; a set of variables under management control; and a set of environmental variables. The Wald test is a test on the hypothesis that one of the two set of variables is redundant.

	log A		¾A		P(X)		o_d	
	test	signif.	test	signif.	test	signif.	test	signif.
Malaysia								
Management	81.69	0.000	137.69	0.000	064.91	0.000	4262.8	0.000
Macro	7.25	0.203	42.29	0.000	2.53	0.772	2.15	0.827
Taiwan								
Management	619.5	0.000	3204.9	0.000	14.87	0.037	8.11	0.230
Macro	7.386	0.117	24.26	0.000	44.08	0.000	30.31	0.000
Thailand								
Management	188.72	0.000	644.89	0.000	9.57	0.386	6.49	0.690
Macro	26.29	0.000	23.80	0.000	9.20	0.101	4.28	0.509
All								
Management	286.09	0.000	310.39	0.000	18.92	0.026	5.12	0.823
Macro	4.61	0.202	45.21	0.000	22.53	0.000	9.75	0.020

7 ANNEX

7.1 Data De…nition

In these tables we indicate the source of data used and the name of the series in the database. I, represents the IMF's International Financial Statistics; P the PACAP database; E, the International Finance Corporation's EMDB; O, "other," including the Morgan Stanley Capital International database and the Financial Time's Actuaries database. The country codes are as follows: "FM": Malaysia; "LM": Mexico; "FT": Taiwan, "FH": Thailand and "AET" when it applies to all countries except Taiwan, and "AIT " when it applies to all countries. [21]

MACROECONOMIC AND MARKET DATA		
SERIES	FREQ.	CTRY/SOURCE
Macro variables		
M1	Y	AET:I-34
Quasy Money	Y	AET:I-35
Reserve Money	Y	AET:I-14
Claims on Government	Y	AET:I-32an
Price Index	Y	AET:I-64
Exchange rate (local/$US)	M-Y	AET:I-ae
Balance of trade	Y	AET:I-70,71
Fiscal de…cit	Y	AET:I-80
Market variables		
Domestic bond yield	M-Y	AET:I-61
Domestic risk-free rate	M-Y	AET:I-60b
Domestic bank index	M	FM,FT,FH:P-0002; LM:EMDB
Domestic market-wide index	M-Y	FM,FT,FH:P-1000; LM:EMDB
U.S. bond yield	M-Y	AIT:O
U.S. risk-free rate (3MTB)	M-Y	AIT:O
U.S. 1-mo TBill	M-Y	AIT:O
U.S. market-wide index	M-Y	AIT:O
World dividend yield	M	AIT:O

[21] The reason for this distinction is that the International Financial Statistics does not report Taiwan data.

7.2 Financial Ratios

The following is the list of ratios that consititute the FRB early warning system (EWS), following Putnam (1993). Not all ratios were available. The ratios for which data was available di¤ered from country to country. The ratios actually used for each country are the ones listed in the corresponding country table.

1. Pro…t ratios

$$\text{ROE} = \frac{\text{Net income}}{\text{Total equity capital}}$$

$$\text{ROA} = \frac{\text{Net income}}{\text{Total assets}}$$

$$\text{Net operating income (NOI)} = \frac{\text{Total operating income-Total operating expenses}}{\text{Total assets}}$$

$$\text{Net¢interest margin (NIM)} = \frac{\text{Total interest income-Total interest expenses}}{\text{Total assets}}$$

$$\text{Yield spread (YLSP)} = \left(\frac{\text{Average rate}}{\text{earned on assets}}\right) - \left(\frac{\text{Average rate paid on}}{\text{interest bearing liaibilities}}\right)$$

2. Asset quality

$$\text{Loan rate (LRE)} = \frac{\left(\text{Gross loan losses charged to PLL}\right) - \left(\text{Gross recoveries on loans charged to PLL}\right)}{\text{Total loans}}$$

$$\text{Loan ratio (LRIO)} = \frac{\text{Total loans}}{\text{Total assets}}$$

$$\text{Claims on government (COG)} = \frac{\text{Claims on government}}{\text{Total assets}}$$

3. Liquidity

$$\text{Cash ratio (CR)} = \frac{\text{Cash and balances due from depository institutions}}{\text{Total assets}}$$

$$\text{Cash and securities ratio (CSR)} = \frac{\text{Cash plus securities held}}{\text{Total assets}}$$

4. Gap management

$$\text{Dollar gap ratio (DGR)} = \frac{\left(\text{Interest rate sensistive assets}\right) - \left(\text{Interest rate sensitive liabilities}\right)}{\text{Total assets}}$$

$$\text{Foreign debt (FD)} = \frac{\text{Foreign debt}}{\text{Total assets}}$$

$$\text{Sensitive Funds Ratio (SFR)} = \frac{\text{Interest rate sesistive funds}}{\text{Total sources of funds}}$$

Figure 1

MALAYSIA: Price indices and volatility

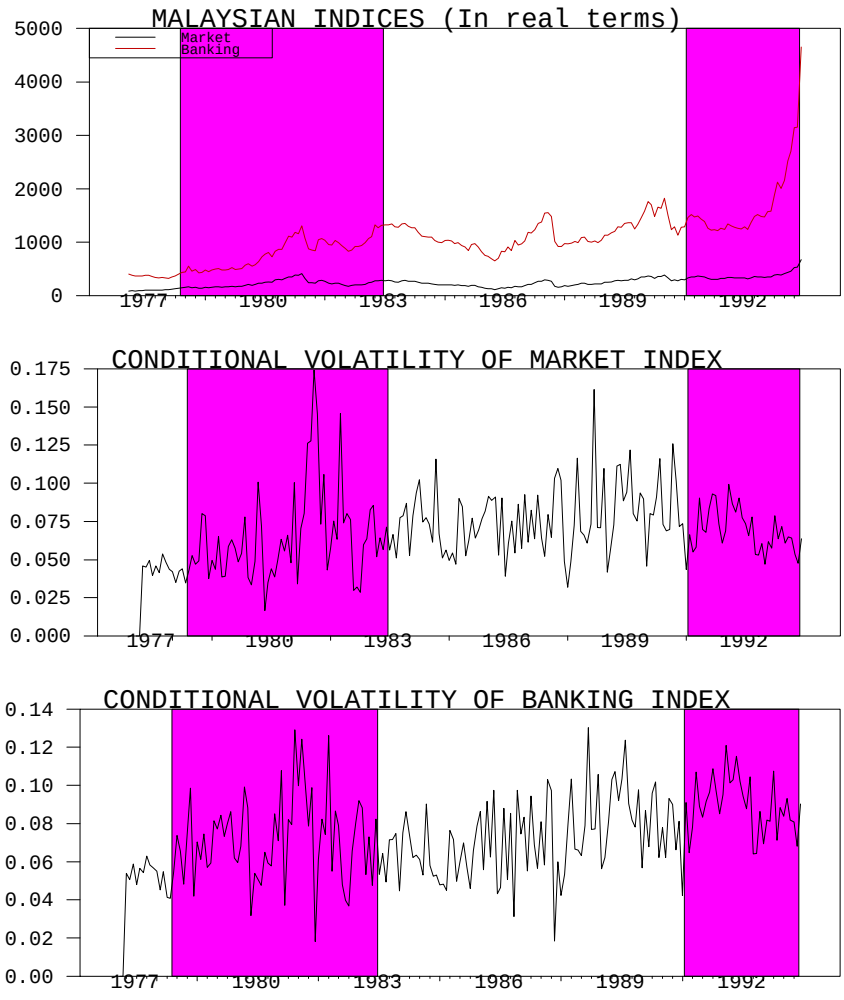


Figure 1 (Cont.)

TAIWAN: Price indices and volatility

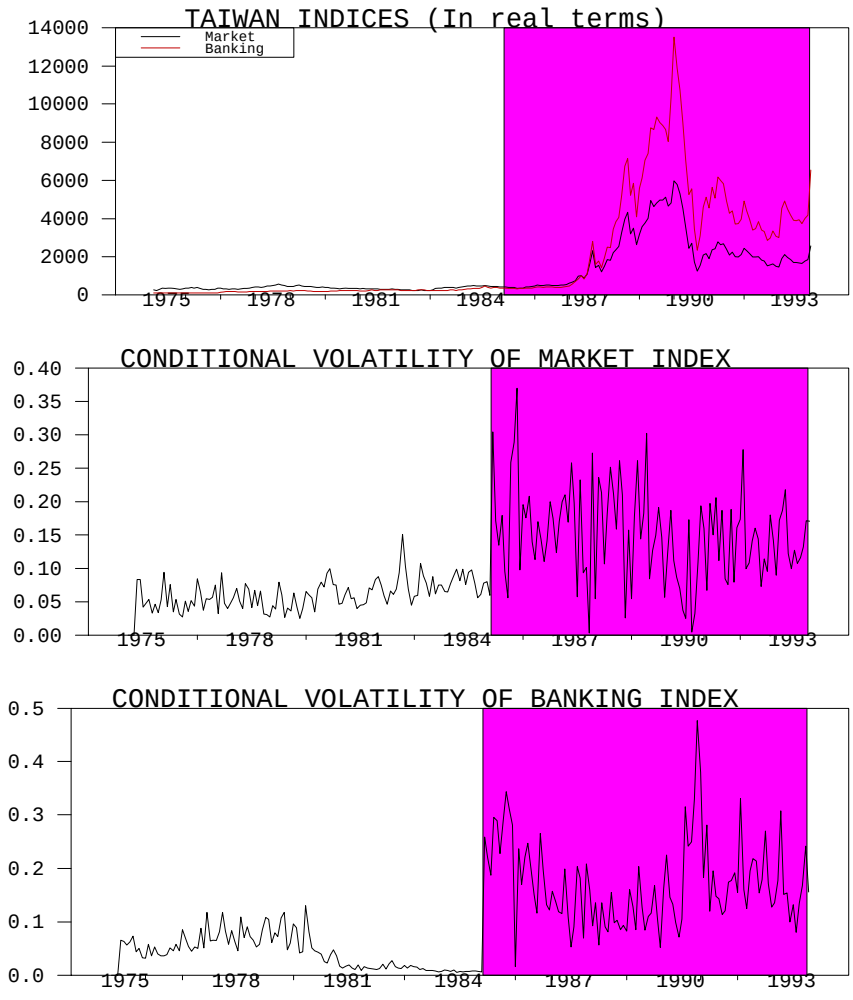


Figure 1 (Cont.)
THAILAND: Price indices and volatility

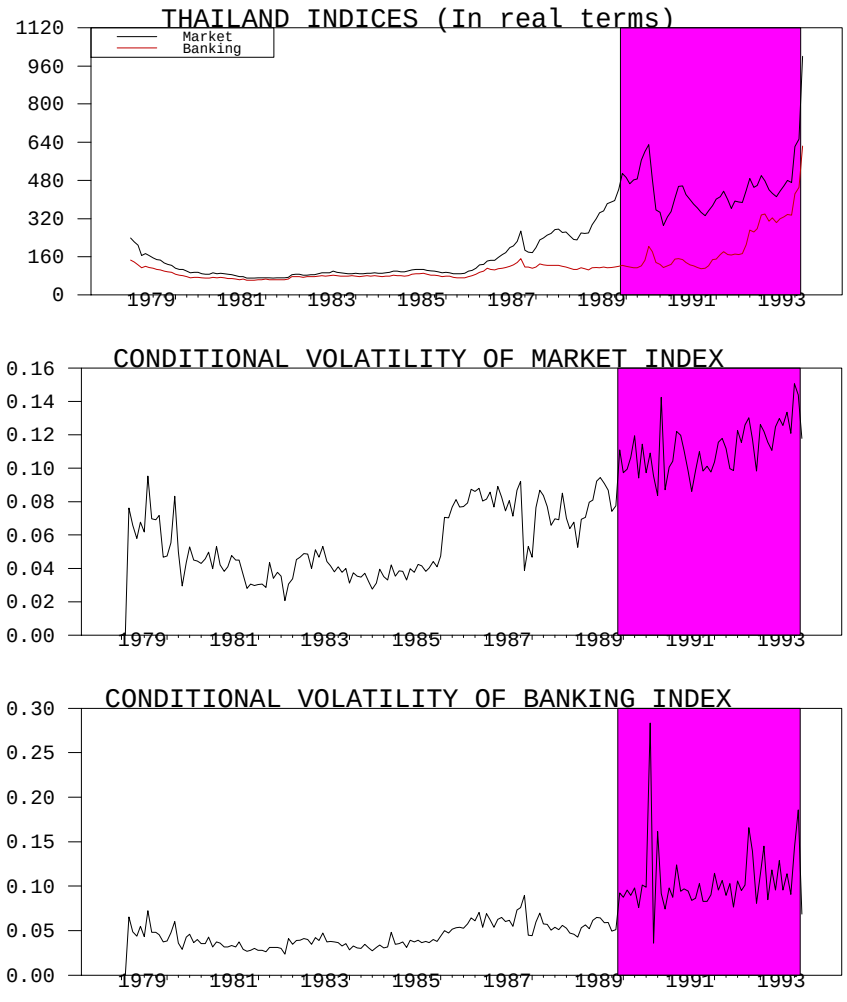
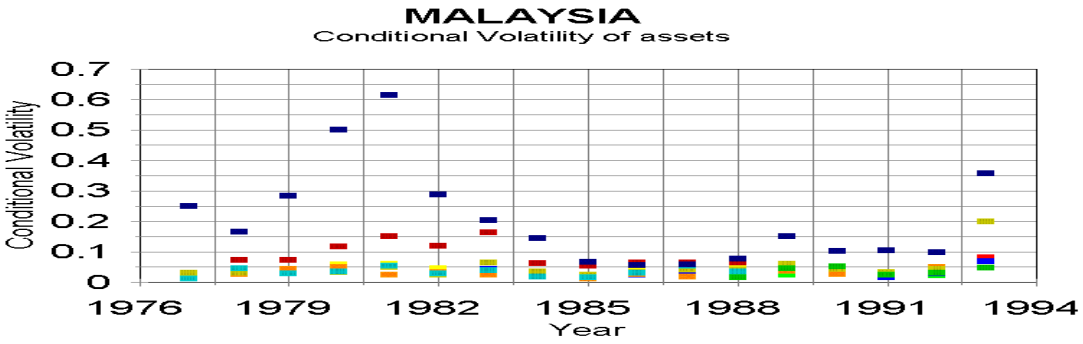
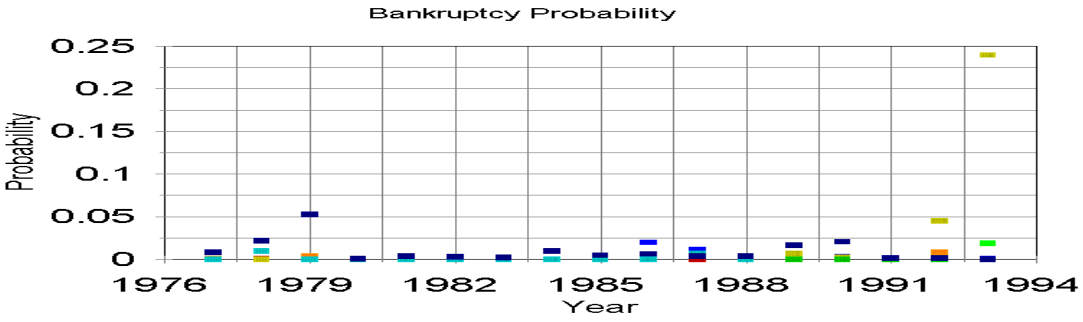


Figure 2


MALAYSIA
Conditional Volatility of assets
Conditional Volatility
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1976
1979
1982
1985
1988
1991
1994
Year


Bankruptcy Probability
Probability
0.25
0.2
0.15
0.1
0.05
0
1976
1979
1982
1985
1988
1991
1994
Year

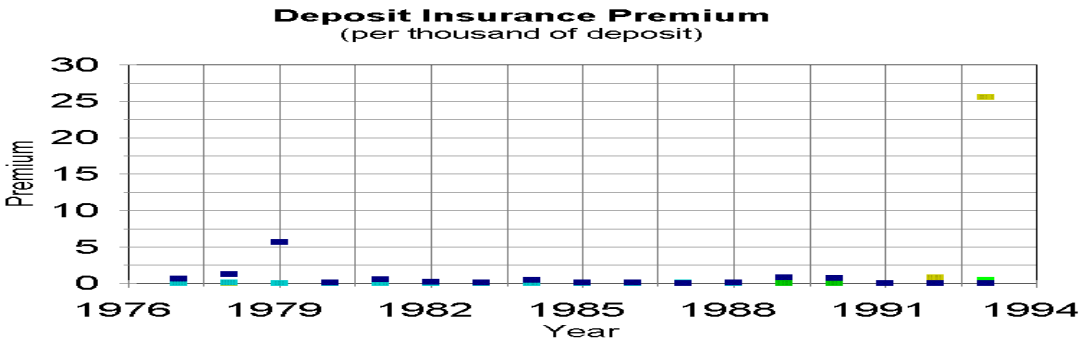
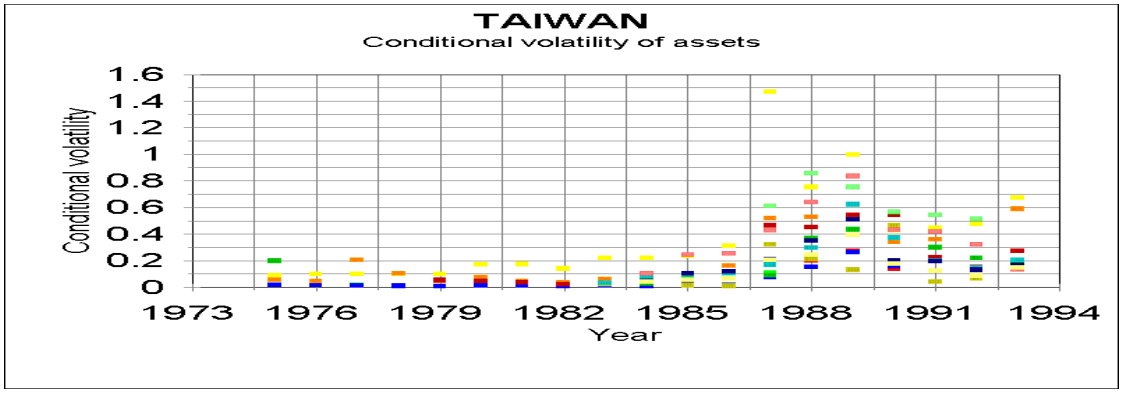
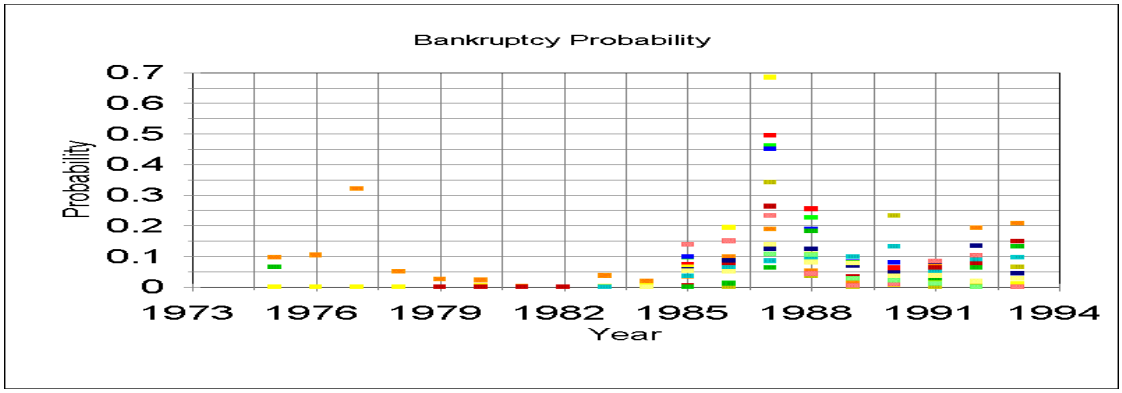

Deposit Insurance Premium
(per thousand of deposit)
Premium
30
25
20
15
10
5
0
1976
1979
1982
1985
1988
1991
1994
Year

Figure 2 (Cont.)





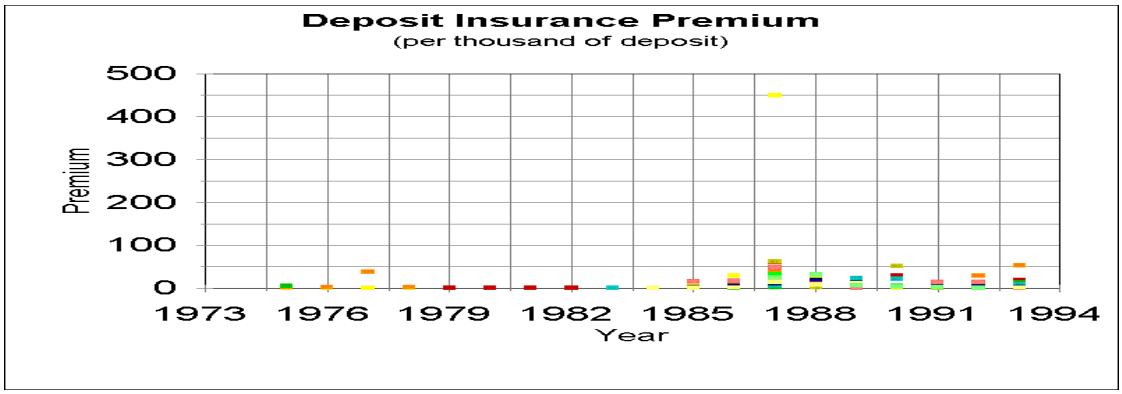


Figure 2 (Cont.)

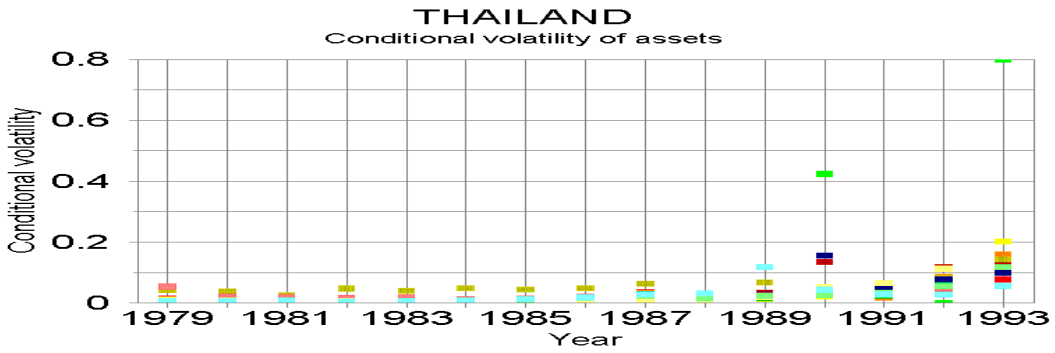


Figure 1:

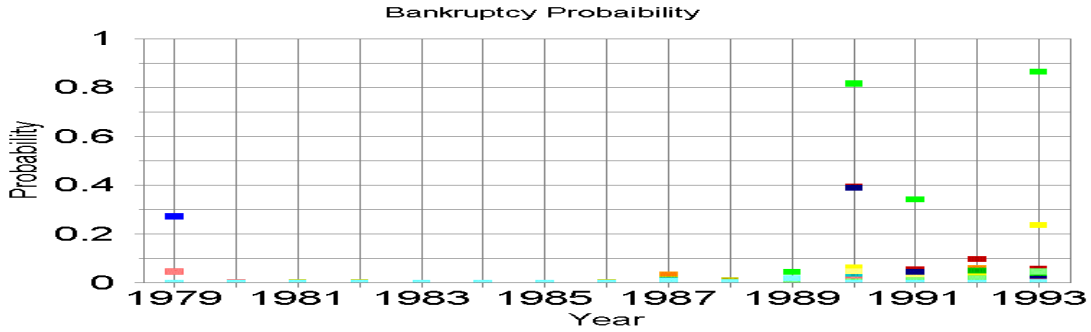


Figure 2: