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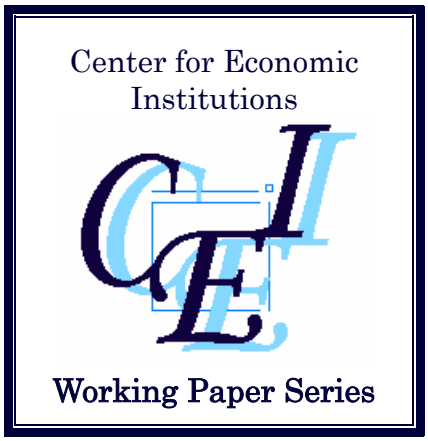


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# Financial fragility under implicit insurance scheme: Evidence from the collapse of Thai financial institutions

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Abstract

Using the Thai experience as a clinical study of a financial crisis, we investigate financial failures of Thai financial institutions. This study augments the CAMEL perspective by considering corporate governance and the moral hazard problems under the state of implicit government guarantee. The overall results suggest that high-replicated CAMEL ratings and downgrades of the ratings based on accounting-based information are likely to be important indicators of bank fragility. The ownership-based incentives of the largest shareholders and the level of risk associated with moral hazard problems are also factors that help discriminate sound and unsound financial institutions.

*Keywords:* CAMEL rating, incentives, deposit insurance, financial failure, Thai financial institutions
*JEL classification:* G13; G21; G34

## 1. Introduction

After the onset of the 1997 financial crisis in the East Asian countries, many attempts by scholars and policymakers have been taken to identify key macro-economic indicators such as real interest rates, economic growth, inflation, capital and current accounts, international reserves, M2, debt profiles and the like that may be used to predict possible crisis has been revived.[1] Looking from micro perspectives, many studies in this area have been done to predict bank failure using accounting-based CAMEL components. This study focuses on micro-based factors by augmenting CAMEL perspective to account for corporate governance mechanisms and market-based risk.

Taking Thailand as a laboratory experiment of a financial crisis, we investigate factors that may help to explain the failures of financial institutions. With its unique characteristics of having highly ownership concentration by the largest shareholders and implicit government subsidy, this research attempts to analyze the importance of four major factors, which include accounting-based CAMEL ratings, the downgrading of CAMEL ratings, incentives, and the risk associated with implicit guarantee.

The paper close to our study is Bongini et al. (2001, 2002). However, their studies are based on the international cross-section data. Although they control for country effect on the distress and closure of financial institutions, the analysis is not sufficient to draw conclusion about the effects of governance mechanisms since countries differ in terms of legal, regulatory and institutional frameworks, taxation

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[1] For more details, see Demirguc-Kunt and Detragiache (1997) and Kaminsky et al. (1998).

schemes, and accounting practices. Moreover, we employ alternate ways of replicating CAMEL scores and emphasize more on the downgrade of CAMEL ratings.

The overall results show that CAMEL ratings constructed based on the financial information of financial institutions have a significant influence on the likelihood of financial failures. The paper provides additional evidence to the literature by presenting that financial institutions in which the CAMEL rated scores are downgraded into the critical score zone of 3-5 are more likely to experience financial failures. Using market-based measure of contingent liability to be borne by the government, we find that the larger the cost associated with implicit government guarantee, the higher the institutions are likely to suffer from financial failures.

After controlling for institutional size, our findings further show that the institutions where the incentives of the largest shareholders are aligned with those of other shareholders are more likely to survive the crisis. However, when the shareholders from family business group are involved in the board of directors' decision, this increases the likelihood of the problem.

The rest of the paper is organized as follows. In the next section, we provide an overview of Thai financial market. Section 3 discusses theoretical issues and hypotheses regarding the information content of accounting-based information, the risk associated with implicit government guarantee, and incentives. We describe data sources, methodologies and measurements in Section 4. Section 5 provides descriptive statistics and regression results. Lastly, Section 6 concludes the paper.

## 2. Overview of Thai financial market and challenges to its sustainability

To study determinants that explain the causes of Thai banking crises, we first investigate the background of its financial system. The history of Thai financial market

development went back to 1888 when the British-owned *Hong Kong and Shanghai Bank* set up its first branch to facilitate foreign trade financing. Foreign banks had enormous influence on banking business in Thai financial market during its early stage of development. Realizing the economic importance of having independent financial system, the first domestic commercial bank was established in 1904 under the name of *Book Club*, presently known as the *Siam Commercial Bank (SCB)*.

Thai commercial banking business has expanded over time with the establishment of 14 more domestic banks during 1930s and 1960s, of which 12 banks were founded by family groups, many of which had remained control over the banks' daily operations until before the crisis. Ownership had been highly concentrated in the hands of the largest individual shareholders even though the laws put the upper limits of shareholdings to be at 5 percent and 10 percent for banks and finance companies respectively (Anuchitworawong et al., 2003).

Thai banks have long enjoyed a high degree of protection against foreign bank competition. Until 1996, there were 25% foreign shareholding limit and a moratorium on the granting of new banking licenses by the central Bank of Thailand (BOT).[2] These protections may lead to lack in skills and progress of institutional development, which later drive crisis. Furthermore, such market access limitation gives rise to the increasing

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[2] After the crisis in 1997, the BOT allowed more participation from foreign banks by allowing foreign investors to hold more than 49% of the shares in financial institutions for up to 10 years, after which they will be grandfathered with respect to their existing ownership. Recently, a draft *Financial Master Plan* plans to allow foreign banks already in the country to apply for more full-branch licenses (The Nation: December 27, 2003).

roles of finance companies that are subject to less stringent prudential requirements than banks.[3] However, finance companies that are young relative to banks have been left to engage in more risky behaviors. Some finance companies were independent while many institutions were subsidiaries or affiliates of family-controlled banks.

Thailand's banking industry has been concentrated and characterized by an oligopolistic market structure. Bangkok Bank, the largest bank in the market, had a market share of 28 and 21 percent at the end of 1988 and 2001 respectively. The bulk of the commercial banking system assets was accounted for by five banks – privately owned Bangkok Bank, Thai Farmers Bank, Bank of Ayudhya, Siam Commercial Bank and government-owned Krung Thai Bank. Their combined market share amounted to more than 60 and 59 percent in 1988 and 2001 respectively.

Financial institutions – commercial banks in particular – are the central players in Thai financial system. The ratio of total bank assets to GDP has been more than 100 percent throughout the period of 1993-2001, while that of other financial institutions has never been higher than 40 percent. Banks also play important role in absorbing more than 75 percent of total deposits during 1993-2001 while finance companies absorb less than 32 percent before the crisis, and less than 10 percent after the 1997 financial crisis.

In retrospect, Thai financial system had ever experienced three important crises from the collapses of: 1) large finance firm called *Raja* Finance in 1979 due to the use of substantial amount of money in manipulating its share price, 2) a number of finance

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[3] Unlike banks, finance companies are not allowed to take direct deposits from the public, but can fund operations primarily through the issuance of large-denomination promissory notes, or through credits from banks and other financial institutions

companies in 1983 due to fraud and mismanagement, and 3) 56 troubled finance companies and the bath devaluation in 1997. One of the reasons that could help explain such phenomena is the lack of sufficient supervisory structure on financial institutions, especially for the 1997 financial crisis in which the effect of weak corporate governance in both financial and corporate sectors has often been debated.

To rehabilitate troubled institutions and restore solvency and financial stability, the Bank of Thailand set up the Financial Institutions Development Fund (FIDF) in 1985. In fact, Thailand has no formal explicit deposit insurance scheme, but the FIDF may be considered as providing implicit guarantee and financial assistance to depositors and creditors of financial institutions. During the financial crisis in 1997, the FIDF had to resort to a blanket guarantee to restore public confidence and played an important role in reimbursing the depositors of 56 closed finance companies by exchanging promissory notes of these institutions with three- to five-year notes of government owned financial institutions. Note that the depositors of failed institutions were reimbursed a portion of their deposits long before the establishment of the FIDF.

In the early 1990s, the Thai authorities liberalized financial system in various dimensions including mainly: 1) liberal foreign exchange controls, 2) the development of offshore banking facilities, and 3) the removal of interest rate ceilings on deposits and loans. However, the authorities stopped short of liberalizing exchange rate scheme that should correspond to the changing nature of capital inflows and outflows. Even worse, there was a failure to prudently supervise financial institutions by the authorities and to ensure prudent lending and borrowing policies of the institutions. These factors can largely be attributed to the causes of financial collapse in mid-1997. Attempting to resolve the causes of the problems, the Thai authorities have adopted financial reform

measures relating to structural, legal, regulatory, and supervisory framework to strength financial and economic structures.

## 3. Theoretical background

### *3.1 Information content of financial data*

There is by now a vast literature attempting to address the causes of the financial crises from a macro perspective. Researchers argue that many crises are macro-induced or externally driven (Demirguc-Kunt and Detragiache, 1997; Hardy and Pazarbasioglu, 1998; Eichengreen and Rose, 1998; Kaminsky and Reinhart, 1999; to name a few). Macroeconomic variables that help explain the phenomena are, for example, slow GDP growth, high domestic credit growth, high inflation, and high world and domestic interest rates. However, these macro-related causes fail to pinpoint causes of problems at the micro-related level.

To account for micro-related causes, many studies have focused on internal factors especially relating with financial conditions of financial institutions in understanding the soundness of the institutions. Most studies find that CAMEL (an acronym for *Capital adequacy, Asset quality, Management, Earnings and Liquidity*) ratings are generally reflecting the soundness of financial institutions. For instance, based on event study methodology, Berger and Davies (1998) find that the downgrading of CAMEL ratings reveals unfavorable information about the financial health of banks to the stock market. Similarly, DeYoung et al. (2001) show that supervisory ratings contain information that market participants do not have.

Bongini et al. (2001) investigate the determinants of financial distress during the East Asian crisis by employing the sample of 283 financial institutions from the East Asian countries – Indonesia, Korea, Malaysia, the Phillipines, and Thailand. Similarly,

Persons (1999) focuses on the financial fragility of Thai finance companies. Both studies present that CAMEL-type financial data helps predict the failure of financial institutions. However, their study may be prone to high correlation among financial data. Later, Bongini et al. (2002) improves the method by using composite indicator in the analysis of their international cross-section data. They provide support to the power of ex-post CAMEL rating indicator in discriminating strong and weak banks. Thus we expect:

*H1: Financial institutions with poor CAMEL composite rating are more likely to fail.*

Recent research suggests the use of information about the condition of financial institutions derived from financial statements in predicting which institutions would have their supervisory ratings downgraded to unfavorable status (Gilbert et al., 2000). Since the literature suggests that CAMEL ratings do contain information of financial soundness of financial institutions useful to both the supervisory and public monitoring, the downgrade or upgrade of the ratings may also provide information to differentiate sound financial institutions from problem institutions.

*H2: Financial institutions that have worse CAMEL composite ratings compared to those in the recent years are more likely to fail.*

*3.2 Insurer's contingent liability*

Deposit insurance has different regulations across countries, ranging from full to partial coverage and from explicit to implicit scheme. All have costs and benefits. Full coverage scheme helps eliminate bank run to preserve the stability of all financial institutions. However, such a scheme can create moral hazard problem that tempts these institutions to make unreasonable commitments, and at the same time makes depositors

less careful, and discourage them from moving their funds to safer institutions. As a result, a poorly designed scheme may encourage risky behavior by both depositors and institutions, and this will not improve the stability of financial system.

The literature concerning the bank fundamentals suggests that lack of monitoring and discipline resulting from full implicit deposit insurance guarantees is at the center of banking crises that culminate in currency crises. Eichengreen and Portes (1997), Dooley (1997), Krugman (1998), Corsetti, et al. (1998), Glick (1998), Mishkin (1999), and Chinn and Kletzer (2000) to name a few, assume that the Thai government (and other East Asian governments) provided full implicit deposit guarantees to the depositors of private financial institutions, which along with weak supervision and regulation led to lack of discipline, resulting in moral hazard behavior at these institutions. This behavior led to over-investment (especially in real estate), producing a boom/bust asset price cycle that brought down these Asian economies.

Demirgüç-Kunt and Huizinga (1999) find that explicit deposit insurance system weakens market discipline on banks by their creditors. Garcia (1999) further argue that poorly designed deposit insurance scheme will cause agency problem in which bank managers or employees acting as an agent of shareholders pursue their own interests rather than those of the shareholders. In addition, the bank owners and managers of the insured institutions, realizing that runs are unlikely, may take on additional risk in their asset portfolios

Subsequent to the development of option-pricing framework of Black and Scholes (1973), Merton (1977) was the first to model deposit insurance as a put option on bank assets. Marcus and Shaked (1984) examine the overpricing of deposit insurance by looking at the pre-insurance value of bank assets and find evidence of substantial

overpricing of insurance premiums. Ronn and Verma (1986) account for regulatory capital forbearance in their pricing model, and the post-insurance value of assets, allowing for the dependence of the value of guarantee on the future value of assets.

Later, Duan (1994) develops a maximum likelihood framework to estimate the value of deposit insurance. However, implementing the Duan method requires accurate and high frequency data on deposits. Duan and Yu (1994) apply the method of Duan (1994) to calculate insurance premiums for Taiwanese depository institutions. They find that these institutions were heavily subsidized by the deposit-insuring agency.

Using the sample of 15 Thai banks, Kaplan (2002) uses the method of Duan (1994) to estimate government subsidies. The author argues that the estimated value of government subsidy can serve as an early warning indicator of banking crisis in Thai financial system. Applying the barrier model of Boyle and Lee (1994) to measure deposit insurance premiums of Thai banks and finance firms during 1992-1996, Tirapat (2002) finds similar evidence that higher risk institutions have higher insurance premiums. Based on these arguments, we expect that:

*H3: Financial institutions that have substantial costs of implicit government guarantee are more likely to fail.*

*3.3 Incentives and internal corporate control*

Much of the focus in the governance literature is how managerial discretion can be brought under effective control through ownership and internal control (Berle and Means, 1932; Jensen and Meckling, 1976; Grossman and Hart, 1988). The costs and benefits of having large shareholders are at least theoretically clear. Demsetz and Lehn (1985) argue that large shareholders are not well diversified and have to bear excess

risks due to wealth vested in firms.

Recent studies provide convincing evidence that, especially in the countries with weak minority protection, when there is a high degree of deviation of cash flow rights from control rights of large or controlling shareholders, this will have significant negative effect on firm performance (Claessens et al., 2002; La Porta et al., 2002). To the extent that control mechanisms lead to deviations from one-share-one-vote rule, the controlling shareholders will have control and opportunity to pursue for private interests incompatible with other shareholders' interests. From these arguments, higher cash flow rights may benefit atomistic shareholders, by increasing monitoring of management and by raising the cost of the largest shareholder of diverting profits from a firm

Furthermore, a number of studies examine the relationship between bank risk and ownership. Their findings have varied considerably. Some argue that the relationship between insider ownership and the risk of banks is sometimes positive, some times negative, sometimes U-shaped, and some times inverted U-shaped (Demsetz et al., 1997; Brewer and Saidenberg, 1996)

As banking crises have shown not only that banks often take excessive risks but also that risk taking differs across banks. Some banks engage in more risks while others institutions are more prudent and would be able to alleviate tremendous effects of a crisis. By incorporating the view that ownership is an incentive-inducing mechanism, we expect that, in general

*H4: Financial institutions where the largest shareholders have more incentives corresponding to their large ownership in financial institutions are less likely to fail.*

## 4. Data and measurements

### *4.1 Sample and data sources*

The sample includes 52 Thai financial institutions – institutions quoted in 1996 in the banking section and in the finance and securities section of the Stock Exchange of Thailand (SET) with complete available information, except securities and leasing firms – used in investigating determinants that explain subsequent closure or intervention by the government after the 1997 financial crisis. Information about the closure is collected from news, articles, magazines, and announcements from state authorities.

We primarily use annual reports of financial institutions and I-SIMS database developed by the SET to collect bank specific information, daily market capitalization, relevant accounting items from financial statements, and equity ownership of shareholders who hold more than 0.5 percent of total outstanding shares.

Further, this study is based on a unique ownership database and different sources of information about family relationship. The sources include Phipatseritham (1981), Phipatseritham and Yoshihara (1983), Suehiro (1989), Chulpongsatorn (2000), and Sapphaibun (2001a and 2001b). Importantly, the information on all registered firms used in tracing ownership of private firms at the layers of control chains is obtained from the on-line database service of Business Online (BOL) that has been granted the right by the Ministry of Commerce. Using this information allows us to trace for ultimate ownership and control of each financial institution.

### *4.2 Failure of financial institutions*

To investigate the relationship between governance quality, informativeness of accounting information and contingent liabilities and the likelihood of bank failure using logit regression analysis, we account for three definitions of bank failure –

mandatory closure, suspension, and distress. Following Bongini et al. (2001), this study treats the distress of financial institutions and closure separately. Additionally, we separately analyze the case of suspension. Mandatory closure refers to the case when a financial institution was ordered to close by the authority during 1997-1999. Suspension is assigned to a financial institution whose operations were suspended by the order of the Ministry of Finance in the crisis year of 1997. Distress includes all institutions that were recapitalized with capital support from the government authority, compulsorily closed by the laws, or suspended during 1997-1999. In logit regression models, the dependent variable is a binary variable, coded separately according to the definitions of bank failures. For example, under the definition of suspension, the dependent variable takes a value one if a financial institution was suspended from operations in 1997 by the order of the authority.

Table 1 summarizes the distribution of the sample banks and finance companies based on the definitions given above. The sample consists of 16 banks which include one government-owned specialized institution and 36 finance companies. Panels A and C show that nearly 53.85 percent and 59.62 percent of all sample institutions were compulsorily closed by the government authority and were in distress conditions respectively. Panel B for the case of suspension reveals that about 38.46 percent of all firms were suspended from operations. Overall, finance companies were the largest group of firms that experienced failures during 1997-1999.

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Insert Table 1 about here

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*4.3 Contingent liability*

This section describes the method for estimating the magnitude of contingent liability or deposit insurance premiums for financial institutions. This paper follows Ronn and Verma (1986) in calculating deposit insurance premiums that was modeled by Merton (1977), based on the Black and Scholes (1973) option-pricing framework. The concept is to interpret deposit insurance as a put option on the value of bank assets.

To apply option-pricing model to a financial institution, several assumptions are made. First, it is assumed that the bank's debts are equal to its deposits, *D*, and that all deposits including their interest are insured. Next, it is assumed that the time, *T*, until the maturity of the deposits is equal to the time until the next annual audit of the bank. In our context, we assume *T* to be one year. This is reasonable since the Bank of Thailand makes an on-site inspection annually. Lastly, it is assumed that the bank's asset values follow geometric Brownian motion with drift $\mu$ and volatility $\sigma$:

$$d \ln V_t = \mu dt + \sigma dW_t \tag{1}$$

where V is the value of assets, W indicates a standard Wiener process.

Given the above assumptions, the Black and Scholes (1973) option pricing model is used to value the price of deposit insurance per unit of deposits, *p*, which can be written as follows:

$$p = \Phi(\sigma\sqrt{T} - y_t) - ((1-\delta)V_t / D)\Phi(-y_t) \tag{2}$$

where $y_t = (\ln[(1-\delta)V_t / D] + (\sigma^2 / 2)(T)) / (\sigma\sqrt{T})$, $\Phi$ is the cumulative standard normal distribution function, and $\delta$ is the dividend per dollar of the value of assets.

To implement the model, we follow Ronn and Verma (1986) in estimating two unobservable variables in equation (2), i.e. the bank's asset value, *V*, and its volatility,

$\sigma$. We view the equity value of bank, *E*, which is directly observable, as a fully dividend-protected call option on the bank's assets with a strike price equal to the value of its debt as follows.

$$E_t = V_t \Phi(h_t) - D\Phi(h_t - \sigma\sqrt{T}) \tag{3}$$

where $h_t = (\ln[V_t / D] + (\sigma^2 / 2)(T)) / (\sigma\sqrt{T})$. $\sigma$ can be solved by applying Ito's Lemma to equation (3).

$$\sigma = \frac{\sigma_E E_t}{V_t \Phi(h_t)} \tag{4}$$

where $\sigma_E$ is the annualized standard deviation of equity returns.

With observable market capitalization and equity volatility, we simultaneously estimate these two non-linear equations to obtain V and $\sigma$, which will be used in deriving deposit insurance premiums in equation (2). Note that we acknowledge the deficiency of imposing constant equity volatility. Nevertheless, to implicit the Duan's method where estimates are consistent, we need audited high-frequency data on deposits that is not generally available.

*4.4 CAMEL components*

Accounting information has long been used to detect financial and managerial risk of firms. Many scholars have focused on such information as an early warning system that helps discriminate between financially troubled firms and viable firms. The majority of prior research that attempts to predict bank failure focuses on capturing informativeness of CAMEL components. However, there is no a precise choice of financial variable that corresponds to each CAMEL component.

Bongini et al. (2001) employ a set of traditional, CAMEL-type variables which

are equity to gross loans, loans to borrowings, operational expenses to revenues, loan loss reserves to capital, loan growth, net interest income to total income, and return on assets. Only the last four variables were found to predict subsequent distress and closure relatively well. However, for our sample, we find that this set of variables tends to be highly correlated and would cause multicollinearity in regressions, which will makes results hard to interpret. Thus, we decide to use alternate proxies instead as follows:

*a) Capital adequacy*

This study utilizes the equity ratio, defined as the ratio of total shareholders' equity to total assets, to serve as a proxy for capital adequacy. Generally, we expect the ratio to be negatively associated with the probability of failure because a higher portion of equity represents a cushion to absorb future losses.

*b) Asset quality*

Previous research often uses non-performing loans (NPLs) ratio that is associated with credit risk. However, information about NPLs of each institution in 1996 is not publicly available. Therefore, we use the ratio of loan loss provisions to total assets as an indicator of asset quality. Because a higher level of this ratio reflects deterioration in asset quality, we expect that it will result in higher probability of failure.

*c) Management*

The variable used to proxy for management quality is the ratio of non-interest expenses to non-interest income, which may reflect the competence of the management in controlling costs. We are concerned for operating efficiency of an institution. Better ability to control operating costs is indicated by a smaller value of this ratio. It is expected that higher operating efficiency should reduce the likelihood of failure.

*d) Earnings*

Earnings are measured with the ratio of earnings before tax to total shareholders' equity. This profitability ratio indicates how well an institution is managed to earn a high return for shareholders. Therefore, we expect that higher profitability ratio will reduce the likelihood of institutional failure.

*e) Liquidity*

A ratio of cash to total assets is included into the model as a representative of liquidity in the assessment of failure. An adequate level of liquidity will help an institution to meet financial commitments and unexpected withdrawals. In this sense, we expect that financial institutions with more liquidity are likely to encounter lower probability of distress or failure.

*4.5 CAMEL composite indicator*

We further attempt to construct a single composite indicator that would help reduce the number of explanatory variables and the problem associated with highly correlated variables in regression models. In this study, we apply two methods in constructing a CAMEL composite indicator.

*4.5.1 Weighted average*

Using this method, we first compute a percentile ranking for each of CAMEL components – equity ratio, loan loss provision ratio, cash ratio, the ratio of non-interest expenses to non-interest income, and return on equity. Next, the percentile rankings for all components are then equally weighted. Hence we assume that all CAMEL components are equally important. Note that we need to transform loan loss provision ratio and the ratio of non-interest expenses to non-interest income by using their reciprocals before ranking. We then add the weighted percentile scores together to obtain total weighted percentiles for an institution, which are used in assigning a score.

This study uses 5-score scale in replicating the bank regulator's CAMEL rating scheme. Specifically, the composite CAMEL indicators (CAMELEQWEIGHTED) are assigned on a scale of 1 to 5, with a score of 1 for 90-100 percentile range, 2 for 70-90 percentile range, 3 for 50-70 percentile range, 4 for 30-50 percentile range, and 5 for 0-30 percentile range. Financial institutions with score 5 represent the set of institutions with the most severe problems that need immediate supervisory concern.

*4.5.2 Dichotomizing*

The second method follows a similar approach by Bongini et al. (2002). The composite indicator is constructed by dichotomizing each of CAMEL components by assigning the value one to the component that has a percentile ranking below a threshold. This paper uses a stricter threshold of 50% level rather than 25% as in Bongini et al. (2002). Then we sum the assigned values across all components to derive composite indicator *CAMELDICHOTOMIZED*. Hence, an indicator for an institution can take any of the values 0, 1, 2, 3, 4 or 5. An institution with higher value of this indicator is expected to bear higher risk.

*4.6 Governance variables*

We employ three measures to capture their effects on the viability of financial institutions from corporate governance perspective. They include ownership concentration, board linkage between family business groups and financial institutions, and board independence.

For ownership concentration, we use cash flow rights held by the largest shareholders that represent their incentives in monitoring and controlling financial institutions. Cash flow rights (CFRIGHT) are the percentage of ownership rights held by a controlling shareholder, collected as of December or the closest date and computed

based on Claessens et al (2000), and Anuchitworawong et al. (2003) for Thai financial institutions in particular. In addition, the shareholdings of individuals related through blood or marriage are aggregated and reported as a single unit.

Connection used to capture the potential for moral hazard is represented by board linkage between family business group and financial institution (FAMINBD). The *FAMINBD* dummy variable takes the value one if the largest shareholder from family group is on the board of directors and zero otherwise.

To capture the effectiveness of the board of directors, we construct a DUALITY variable to take the value one if a chief executive officer (CEO) chairs the board of directors. A person who holds both positions tends to have a significant power to control a firm and makes it difficult for the board to effectively monitor the firm, thus this is considered an agency problem.

In addition, we control for the size of financial institution (FIRM SIZE), which is defined as the natural logarithm of the book value of total assets. Firm size is used to examine if the implicit "too big to fail" protection induces lower probability of failure, as suggested in the literature. Table 2 gives summary definitions of all variables used in this study.

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Insert Table 2 about here

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## 5. Results

### 5.1 Descriptive statistics

The following sub-sections provide descriptive analysis on accounting information that is used to proxy for CAMEL components, CAMEL ratings, contingent

liabilities due to implicit guarantee scheme, and ownership-based incentives. The analysis is presented by categorizing firms based on the definitions of bank failures.

### 5.1.1 CAMEL components and ratings

Accounting information used as a proxy for Camel components in this study includes equity ratio, loan loss provision ratio, cash ratio, the ratio of non-interest expenses to non-interest income, and return on equity. In Table 3, Panel A shows that, irrespective of the definitions of bank failure, problem firms that include closed, suspended and distressed financial institutions experienced unsatisfactory financial performance, when compared with non-problem firms. For example, distressed financial institutions had lower level of capital adequacy measured by equity ratio and lower asset quality shown by higher loan loss provision ratio. However, their mean and median differences are not statistically significant.

Interestingly, problem institutions tend to have liquidity problems and inefficient management quality. For instance, among three types of bank failures, the institutions that were suspended and not reopened are the group of firms that had the lowest average cash ratio, especially in 1996 only at 1.25%. In addition, problem institutions tend to experience a high ratio of non-interest expenses to interest income in 1996, the year prior to the crisis. In addition, non-problems institutions generated higher return on equity. Using Wilcoxon rank-sum test of differences between relevant partitioned groups, we find that median differences on cash ratio, the ratio of non-interest expenses to interest income and return on equity for each type of bank failures are statistically significant at conventional level.

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Insert Table 3 about here

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In Table 4, we transform the CAMEL components in Table 3 into a composite indicator. Low CAMEL rating indicates the soundness of an institution. From the results over the periods 1994-1996, we find stronger support to previous paragraph that problem firms were riskier and needed closer supervision from the central bank supervisor. The differences in mean and median between related partitioned groups under each type of failures are significant at the 5 percent level or better almost in every category.

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Insert Table 4 about here

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5.1.2 Contingent liability

Table 5 presents that, irrespective of whether problem financial institutions are defined under mandatory closure, suspension or distress, the costs of implicit government guarantee in problem institutions on average are relatively much higher than those in non-problem institutions. For instance, the mean (median) value of the government's contingent liability is approximately 5.01 (3.48) basis points in suspended institutions, compared with only 2.21 (1.09) basis points in non-suspended institutions. Their differences are also highly significant. Our results provide support to Tirapat (2002), Kaplan (2002) and Anuchitworawong (2003) who use the sample of Thai financial institutions to investigate deposit insurance premiums and find similar conclusion that weak institutions tend to generate high cost of deposit insurance.

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Insert Table 5 about here

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5.1.3 Ownership and internal corporate control

Table 6 first investigates the incentives of the largest shareholders in monitoring the firms' operations by looking into their cash flow rights. We find that the largest shareholders in non-problem institutions held larger cash flow rights relative to those of problem firms. Similarly, their voting rights on average are relatively high in excess of the maximum level of 5 percent for banks and 10 percent for finance companies designated by laws.

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Insert Table 6 about here

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Table 7 reveals that not less than 80 (60) percent of all firms have the largest shareholders hold control rights (cash flow rights) in the range between 10-50%. Furthermore, voting rights are highly concentrated in the hands of a family or a group of related families, seconded by the government authority. Having members from a family or a group of related families as the largest shareholders, they would assign any of their family members to serve on the board of directors. Table 6 suggests that problem institutions often have the largest shareholders from a family hold board positions.

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Insert Table 7 about here

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## 5.2 Empirical results

Logit regression models are employed to identify whether the determinants like governance variables, contingent liabilities and CAMEL-based measures have power in predicting the failures of Thai financial institutions. Table 8 groups regression results based on the definitions of failures – mandatory closure, suspension, and distress. The overall results tend to provide similar conclusions by suggesting the informativeness of CAMEL ratings, governance variables, and stock market based information in explaining financial institutional failures

Irrespective of the types of failures, the results show that there is an increased likelihood of becoming problem financial institutions in which they experience high CAMEL ratings, meaning that the institutions are poorly rated. The result provides support to Hypothesis 1. The specifications with CAMELEQWEIGHTED and CAMELDICHOTOMIZED have fairly high predictive power over other model specifications, as indicated by their concordant ratios in excess of 78 percent together with relatively high pseudo R-squared ranging in between 37.36 percent and 52.39 percent. Apparently, the specification (7) shows better predictive power with the highest pseudo R-squared at 52.39 percent and the highest concordant ratio of 84.62 percent while it shares quite low Type I error at only 15 percent.[4]

In addition, the positive coefficients of CAMEL ratings downgraded into the score zone of 3-5 points (DGRADECAMELEQ and DGRADECAMELDICHO) support Hypothesis 2, which indicates that financial institutions with poor CAMEL

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[4] For robustness check, we use CAMEL ratings averaged over the periods 1994-1996. However, the results are not changed qualitatively.

ratings compared with those in the recent years are more likely to fail. The models' overall predictive power is relatively high for the set of mandatory closure. Their concordant ratio is about 80-82.69 percent while there is quite small percentage of Type I error.

Regarding the risks based on estimated contingent liability, the results show that financial institutions with higher costs of implicit deposit insurance tend to experience financial problems. The contingent liability variable, however, does not enter the regression significantly in every specification. Therefore, the results are unable to strongly support Hypothesis 3.

Based on the results in all regressions, we find strong evidence that financial institutions in which the largest shareholders from family business groups are present on the board of directors are more likely to be fragile. The coefficient of *FAMINBD* is highly significant at the 5 percent level or better in all regression specifications. This may suggest that when a family business group has an influence over the board of directors' decision in a financial institution, it is more likely that the institution will experience financial problems.

However, it is found that when the largest controlling shareholders hold substantial cash flow rights in an institution, there is an increased likelihood that this financial institution will survive, weakly consistent with Hypothesis 4. The results suggest that the controlling shareholders may be reluctant to pursue their own private benefits when they have large stakes in the institutions.

## 6. Conclusion

This study provides a strong support to the importance of accounting-based information and to a certain extent the use of market-based deposit insurance premium

and ownership-based incentives in explaining the financial fragility of Thai financial institutions. Although we cannot draw the generalization of the research results because of the small sample size, the study raises an important issue of whether the CAMEL ratings measured based on the on-site/off-site examinations by the central bank supervisor should be disclosed in order to induce better public monitoring on the financial soundness of financial institutions. The study further introduces how much the incentives and the risk associated with the moral hazard problems under implicit insurance are important to the viability of financial institutions.

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Table 1
Sample distribution
This table summarizes the distribution of sample banks and finance companies listed on the Stock Exchange of Thailand (SET) during 1996 according to the definitions of failures which are mandatory closure, suspension, and distress. The % columns present the counts as a percentage of total number of banks and finance companies in the sample.

| | Banks | (%) | Finance Companies | (%) | All | (%) |
|---|---|---|---|---|---|---|
| Panel A: Mandatory closure | | | | | | |
| Mandatorily closed (1997-1999) | 4 | 7.69 | 24 | 46.15 | 28 | 53.85 |
| Non-closed (1997-1999) | 12 | 23.08 | 12 | 23.08 | 24 | 46.15 |
| Panel B: Suspension | | | | | | |
| Suspended (1997) | 0 | 0.00 | 20 | 38.46 | 20 | 38.46 |
| Non-suspended (1997) | 16 | 30.77 | 16 | 30.77 | 32 | 61.54 |
| Panel C: Distress | | | | | | |
| Distressed (1997-1999) | 7 | 13.46 | 24 | 46.15 | 31 | 59.62 |
| Non-distressed (1997-1999) | 9 | 17.31 | 12 | 23.08 | 21 | 40.38 |
| No. of institutions in the sample | 16 | 30.77 | 36 | 69.23 | 52 | 100.00 |

Table 2
Summary of variable definitions
All variables except ownership variables are measured as of December 31, 1996. Cash flow rights of the largest shareholders are measured as of the last book closing date in a sample year which varies among the firms and is not exactly at December 31.

| | |
|---|---|
| *Risk:* | |
| Contingent liability | Cost of deposit insurance per unit of all bank debts using the method of Ronn and Verma (1986) |
| *CAMEL Components:* | |
| Equity ratio | The ratio of total shareholders' equity to total assets as a proxy for *capital adequacy* |
| Loan loss provision ratio | The ratio of loan loss provisions to total assets as a proxy for *asset quality* |
| NONINTEXP/NONINTINC | The ratio of non-interest expenses to non-interest income as a proxy for *management quality* |
| Cash ratio | The ratio of cash to total assets as a proxy for *liquidity risk* |
| Return on equity | The ratio of earnings before tax and extra-ordinary items to total shareholders' equity as a proxy for *earning* |
| *CAMEL Rating:* | |
| CAMELEQWEIGHTED | Score that is assigned to any of 5 ranges based on an equally weighted average of percentile scores of all CAMEL components (5 ranges: 0-30 with score 5, 30-50 with score 4, 50-70 with score 3, 70-90 with score 2, 90-100 with score 1) |
| CAMELDICHOTOMIZED | Sum of the values assigned to five dummy variables that are transformed based on the percentile scores of corresponding CAMEL components. Dummy variable takes value one if the percentile score of a CAMEL component is below 50% |
| DGRADECAMELEQ | Dummy variable which takes the value one if CAMELEQWEIGHTED in 1996 has the score higher than 2, compared with average CAMELEQWEIGHTED for the period 1994-1995 |
| DGRADECAMELDICHO | Dummy variable which takes the value one if CAMELDICHOTOMIZED in 1996 has the score higher than 2, compared with average CAMELEQWEIGHTED for the period 1994-1995 |
| *Governance variables:* | |
| CFRIGHT | The percentage of cash flow rights held by the largest shareholder in 1996 (Cash flow rights are measured as of the last book closing date in 1996, which varies among financial institutions and is not exactly at December 31) |
| FAMINBD | Dummy variable which takes the value one if the largest shareholder from family group is on the board of directors and zero otherwise |
| DUALITY | Dummy variable which takes the value one if the chairman of the board also serves the chief executive officer or the chairman of the executive board and zero otherwise |
| *Other variable:* | |
| FIRM SIZE | Natural logarithm of the book value of total assets |

Table 3
Descriptive statistics for CAMEL
This table summarizes descriptive statistics for accounting information used to proxy for CAMEL components according to the definitions of failures which include mandatory closure, suspension, and distress in Panels A, B and C respectively. Figures in parentheses below each mean value are median values. Mean and median differences for relevant partitioned groups are tested using *t* -test and Wilcoxon rank-sum test respectively.

| Panel A: Mandatory closure | | 1994 | | 1995 | | 1996 | |
|---|---|---|---|---|---|---|---|
| | All | Non-closed [N=24] | Closed [N=27] | Non-closed [N=24] | Closed [N=28] | Non-closed [N=24] | Closed [N=28] |
| Equity ratio (%) | 10.61 | 10.46 | 11.44 | 10.47 | 11.10 | 10.41 | 9.74 |
| | (9.90) | (8.97) | (10.68) | (9.85) | (11.48) | (9.68) | (9.86) |
| Loan loss provision ratio (%) | 0.37 | 0.30 | 0.32 | 0.21 | 0.21 | 0.31 | 0.86 |
| | (0.24) | (0.26) | (0.28) | (0.22) | (0.17) | (0.31) | (0.30) |
| Cash ratio (%) | 2.37 | 4.00 | 1.66* | 2.95 | 2.11** | 2.44 | 1.46*** |
| | (1.67) | (2.97) | (1.34)*** | (2.79) | (1.62)* | (2.20) | (1.35)*** |
| NONINTEXP/NONINTINC | 1.92 | 1.35 | 1.25 | 1.71 | 1.25 | 1.98 | 4.87 |
| | (1.49) | (1.27) | (1.00) | (1.59) | (1.36) | (1.86) | (2.50)** |
| Return on equity (%) | 17.43 | 29.02 | 24.09** | 21.06 | 11.72*** | 18.77 | 2.54** |
| | (17.02) | (28.49) | (23.54)** | (22.03) | (12.57)*** | (17.49) | (9.12)*** |
| Panel B: Suspension | | 1994 | | 1995 | | 1996 | |
| | All | Non-suspended [N=32] | Suspended [N=19] | Non-suspended [N=32] | Suspended [N=20] | Non-suspended [N=32] | Suspended [N=20] |
| Equity ratio (%) | 10.61 | 10.77 | 11.33 | 10.62 | 11.11 | 10.31 | 9.63 |
| | (9.90) | (9.40) | (10.20) | (10.41) | (11.41) | (9.82) | (9.80) |
| Loan loss provision ratio (%) | 0.37 | 0.32 | 0.29 | 0.22 | 0.18 | 0.71 | 0.43 |
| | (0.24) | (0.31) | (0.28) | (0.22) | (0.12) | (0.32) | (0.28) |
| Cash ratio (%) | 2.37 | 3.56 | 1.38** | 2.93 | 1.80*** | 2.32 | 1.25*** |
| | (1.67) | (2.89) | (1.19)*** | (2.79) | (1.38)*** | (2.03) | (1.34)*** |
| NONINTEXP/NONINTINC | 1.92 | 1.44 | 1.05 | 1.77 | 1.43 | 2.26 | 5.58 |
| | (1.49) | (1.27) | (0.94) | (1.55) | (1.36) | (1.92) | (2.45)* |
| Return on equity (%) | 17.43 | 27.27 | 24.96 | 18.95 | 11.36*** | 11.03 | 8.44 |
| | (17.02) | (26.28) | (23.54) | (19.09) | (12.32)*** | (16.07) | (9.12)*** |
| Panel C: Distress | | 1994 | | 1995 | | 1996 | |
| | All | Non-distressed [N=21] | Distressed [N=30] | Non-distressed [N=21] | Distressed [N=31] | Non-distressed [N=21] | Distressed [N=31] |
| Equity ratio (%) | 10.61 | 10.91 | 11.03 | 10.95 | 10.71 | 10.86 | 9.50 |
| | (9.90) | (9.63) | (9.63) | (10.96) | (11.39) | (9.90) | (9.80) |
| Loan loss provision ratio (%) | 0.37 | 0.29 | 0.32 | 0.19 | 0.22 | 0.30 | 0.81 |
| | (0.24) | (0.25) | (0.28) | (0.21) | (0.18) | (0.30) | (0.31) |
| Cash ratio (%) | 2.37 | 4.13 | 1.80* | 2.82 | 2.29 | 2.35 | 1.61** |
| | (1.67) | (2.52) | (1.52)** | (2.51) | (1.67) | (1.87) | (1.37)** |
| NONINTEXP/NONINTINC | 1.92 | 1.32 | 1.28 | 1.73 | 1.38 | 2.00 | 4.58 |
| | (1.49) | (1.01) | (1.00) | (1.57) | (1.39) | (1.88) | (2.38)* |
| Return on equity (%) | 17.43 | 29.51 | 24.24** | 20.75 | 12.83*** | 18.60 | 4.23** |
| | (17.02) | (29.36) | (23.23)** | (21.90) | (13.00)*** | (16.96) | (9.40)*** |

Table 4
CAMEL Rating
This table summarizes descriptive statistics for constructed CAMEL ratings according to the definitions of failures which include mandatory closure, suspension, and distress in Panels A, B and C respectively. *CAMELEQWEIGHTED* is the score that is assigned to any of 5 ranges - 0-30 with score 5, 30-50 with score 4, 50-70 with score 3, 70-90 with score 2, and 90-100 with score 1 - based on an equally weighted average of percentile scores of all CAMEL components. *CAMELDICHOTOMIZING* is the sum of the values assigned to five dummy variables that are transformed based on the percentile scores of corresponding CAMEL components. The dummy variable takes value one if the percentile score of a CAMEL component is below 50 percent. The variable has value ranging from 0 to 5. Figures in parentheses below each mean value are median values. Mean and median differences for relevant partitioned groups are tested using *t* -test and Wilcoxon rank-sum test respectively.

| Panel A: Mandatory closure | | 1994 | | 1995 | | 1996 | |
|---|---|---|---|---|---|---|---|
| | All | Non-closed [N=24] | Closed [N=27] | Non-closed [N=24] | Closed [N=28] | Non-closed [N=24] | Closed [N=28] |
| CAMELEQWEIGHTED | 3.41 | 3.08 | 3.82*** | 3.25 | 3.68** | 2.83 | 3.64*** |
| | (3.00) | (3.00) | (4.00)*** | (3.00) | (4.00)** | (3.00) | (4.00)*** |
| CAMELDICHOTOMIZED | 2.48 | 2.00 | 2.93*** | 2.22 | 2.74* | 1.78 | 3.00*** |
| | (2.50) | (2.00) | (3.00)*** | (2.00) | (3.00)* | (2.00) | (3.00)*** |
| Panel B: Suspension | | 1994 | | 1995 | | 1996 | |
| | All | Non-suspended [N=32] | Suspended [N=19] | Non-suspended [N=32] | Suspended [N=20] | Non-suspended [N=32] | Suspended [N=20] |
| CAMELEQWEIGHTED | 3.41 | 3.31 | 3.75** | 3.34 | 3.70* | 3.03 | 3.65** |
| | (3.00) | (3.00) | (4.00)** | (3.00) | (4.00) | (3.00) | (4.00)** |
| CAMELDICHOTOMIZED | 2.48 | 2.26 | 2.89** | 2.29 | 2.84* | 2.06 | 3.05** |
| | (2.50) | (2.00) | (3.00)* | (2.00) | (3.00) | (2.00) | (3.00)** |
| Panel C: Distress | | 1994 | | 1995 | | 1996 | |
| | All | Non-distressed [N=21] | Distressed [N=30] | Non-distressed [N=21] | Distressed [N=31] | Non-distressed [N=21] | Distressed [N=31] |
| CAMELEQWEIGHTED | 3.41 | 3.00 | 3.81*** | 3.19 | 3.68** | 2.76 | 3.61*** |
| | (3.00) | (3.00) | (4.00)*** | (3.00) | (4.00)** | (3.00) | (4.00)*** |
| CAMELDICHOTOMIZED | 2.48 | 1.80 | 2.97*** | 2.15 | 2.73* | 1.55 | 3.03*** |
| | (2.50) | (2.00) | (3.00)*** | (2.00) | (3.00)* | (2.00) | (3.00)*** |

Table 5
Cost of deposit insurance
This table reports the estimated costs of deposit insurance (contingent liablity) estimated using the method of Ronn and Verma (1986) and related components. Each variable is presented according to the definitions of failures which include mandatory closure, suspension, and distress. Figures in parentheses below each mean value are median values. Mean and median differences for relevant partitioned groups are tested using *t* -test and Wilcoxon rank-sum test respectively.

| | | Mandatory closure | | Suspension | | Distress | |
|---|---|---|---|---|---|---|---|
| | ALL [N=52] | Non-closed [N=24] | Closed [N=28] | Non-suspended [N=32] | Suspended [N=20] | Non-distressed [N=21] | Distressed [N=31] |
| Contingent liability (basis points) | 3.29 | 1.77 | 4.59*** | 2.21 | 5.01** | 1.95 | 4.20** |
| | (2.06) | (0.97) | (3.45)*** | (1.09) | (3.48)** | (1.03) | (3.28)** |
| Book value of total assets | 123,446 | 89,248 | 32,666*** | 78,394 | 26,890*** | 83,479 | 37,670** |
| (Millions of Baht) | (42,996) | (74,186) | (31,083)*** | (65,635) | (25,458)*** | (65,635) | (33,226)* |
| Estimated market value of | 128,043 | 224,294 | 45,543*** | 186,988 | 33,731** | 233,085 | 56,886*** |
| total assets (Millions of Baht) | (42,719) | (79,237) | (30,534)*** | (70,850) | (24,679)*** | (73,002) | (33,092)* |
| Estimated asset return | 4.89 | 5.16 | 4.66 | 5.38 | 4.11* | 5.47 | 4.50 |
| volatility (%) | (4.21) | (4.26) | (4.20) | (4.61) | (3.65)** | (4.34) | (4.16) |
| Estimated equity return | 44.20 | 39.98 | 47.82*** | 41.36 | 48.75*** | 40.29 | 46.85*** |
| volatility (%) | (45.50) | (40.71) | (47.00)*** | (41.35) | (48.00)*** | (41.00) | (46.00)*** |
| Bank debts/Market value | 88.69 | 86.73 | 90.36*** | 86.81 | 91.69*** | 86.01 | 90.50*** |
| of total assets (%) | (89.11) | (87.30) | (90.69)** | (87.30) | (92.87)*** | (87.29) | (90.94)*** |

***, **, and * denote significance at the 1, 5, and 10 percent levels respectively.

Table 6

Ownership and internal corporate control

This table reports the summary of ownership concentration of the largest shareholder, the presence of the largest individual shareholder on the board, and the presence of Chairman-CEO duality for the year ending 1996. Control right is the aggregation of direct ownership and indirect ownership which is the sum of the weakest links in the chain of voting rights. Cash flow right is the aggregation of direct ownership and the sum of the products of all ownership stakes along the chain of control. *FAMINBD* is a dummy variable which takes the value one if the largest shareholder from family group is on the board of directors and zero otherwise. *DUALITY* is a dummy variable which takes the value one if the chairman of the board also serves the chief executive officer and zero otherwise. Figures in parentheses below each mean value are median values. Mean and median differences for relevant partitioned groups are tested using t-test and Wilcoxon rank-sum test respectively.

| | | Mandatory closure | | Suspension | | Distress | |
|---|---|---|---|---|---|---|---|
| | ALL [N=52] | Non-closed [N=24] | Closed [N=28] | Non-suspended [N=32] | Suspended [N=20] | Non-distressed [N=21] | Distressed [N=31] |
| Cash flow rights | 21.68 | 25.73 | 18.20* | 24.46 | 17.21* | 26.55 | 18.37** |
| | (19.64) | (23.70) | (16.78)* | (21.97) | (11.22)* | (24.72) | (17.93)* |
| Control rights | 28.74 | 32.38 | 25.63* | 31.62 | 24.14* | 33.64 | 25.43** |
| | (29.51) | (31.56) | (24.44) | (31.56) | (23.22)* | (32.61) | (24.75)* |
| FAMINBD | 0.63 | 0.58 | 0.68 | 0.56 | 0.75 | 0.52 | 0.71 |
| | (1.00) | (1.00) | (1.00) | (1.00) | (1.00) | (1.00) | (1.00) |
| DUALITY | 0.29 | 0.33 | 0.25 | 0.31 | 0.25 | 0.33 | 0.26 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |

***, **, and * denote significance at the 1, 5, and 10 percent levels respectively.

Table 7
Distribution of control
This table presents the frequency of control by the types of the largest shareholders and by the levels of concentration for all sample banks and finance companies in 1996.

| Panel A: By owner identity | No. | % |
|---|---|---|
| Family/A group of related faimilies | 35 | 67.31 |
| Crown property bureau | 5 | 9.62 |
| Government agency | 9 | 17.31 |
| Foreign investors | 3 | 5.77 |
| Total | 52 | 100.00 |

| Panel B: By concentration level | Control rights | | Cash flow rights | |
|---|---|---|---|---|
| | No. | % | No. | % |
| 0 - 5% | 0 | 0.00 | 5 | 9.62 |
| 5 - 10% | 3 | 5.77 | 10 | 19.23 |
| 10 - 25% | 19 | 36.54 | 19 | 36.54 |
| 25 - 50% | 25 | 48.08 | 15 | 28.85 |
| 50 - 75% | 5 | 9.62 | 3 | 5.77 |
| 75 - 100% | 0 | 0.00 | 0 | 0.00 |
| Total | 52 | 100.00 | 52 | 100.00 |

Table 8
Bank failure, CAMEL ratings and corporate governance

This table reports logit regressions relating bank specific characteristics (CAMEL components, contingent liability, corporate governance variables) to bank failure. Bank failure takes the value 1 if a financial institution experienced failure and o otherwise. Bank failure is defined to have three different definitions which are mandatory closure, suspension, and distress. Contingent liability is the cost of deposit insurance in basis points estimated following Ronn and Verma (1986). CFRIGHT is the percentage of cash flow rights of the largest shareholder. FAMINBD is a dummy variable equal to 1 if the largest individual shareholder sits on the board of directors and 0 otherwise. DUALITY is a dummy variable equal to 1 if a person serves as both a board chairman and CEO. Firm Size is natural logarithm of total assets. *CAMELEQWEIGHTED* is the score that is assigned to any of 5 ranges based on an equally weighted average of percentile scores of all CAMEL components. CAMELDICHOTOMIZING is the sum of the values assigned to five dummy variables that are transformed based on the percentile scores of corresponding CAMEL components, where a dummy takes the value 1 if the percentile score is below 50%. *DGRADECAMELEQ* (*DGRADECAMELDICHO)* is a dummy variable equal to one if *CAMELEQWEIGHTED (CAMELDICHOTOMIZING)* in 1996 has the score higher than 2, compared with average *CAMELEQWEIGHTED (CAMELDICHOTOMIZING)* for the period 1994-1995. P-values are shown in parentheses.

| | Mandatory closure | | | | | Suspension | | | | | Distress | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
| Intercept | 7.039 | -0.377 | 4.038 | 8.300 | 7.501 | 16.145 | 16.704 | 17.618 | 18.250 | 18.856 | 5.206 | -3.570 | 0.704 | 6.803 | 4.416 |
| | (0.084) | (0.949) | (0.412) | (0.071) | (0.141) | (0.014) | (0.043) | (0.024) | (0.012) | (0.016) | (0.166) | (0.532) | (0.884) | (0.108) | (0.307) |
| Contingent liability | 0.310 | 0.431 | 0.414 | 0.311 | 0.309 | 0.349 | 0.407 | 0.403 | 0.327 | 0.310 | 0.249 | 0.369 | 0.388 | 0.241 | 0.238 |
| | (0.070) | (0.066) | (0.056) | (0.101) | (0.105) | (0.072) | (0.112) | (0.076) | (0.138) | (0.135) | (0.124) | (0.109) | (0.085) | (0.201) | (0.169) |
| FAMINBD | 2.000 | 2.614 | 2.229 | 2.357 | 2.225 | 2.848 | 4.196 | 3.497 | 3.085 | 3.134 | 2.346 | 3.223 | 2.797 | 3.009 | 2.595 |
| | (0.030) | (0.022) | (0.033) | (0.020) | (0.040) | (0.020) | (0.013) | (0.018) | (0.018) | (0.021) | (0.012) | (0.008) | (0.013) | (0.007) | (0.016) |
| DUALITY | -1.661 | -1.926 | -1.799 | -1.937 | -1.879 | -1.128 | -0.921 | -0.988 | -1.099 | -1.158 | -1.684 | -2.120 | -1.944 | -2.240 | -1.868 |
| | (0.085) | (0.086) | (0.089) | (0.063) | (0.083) | (0.321) | (0.428) | (0.379) | (0.336) | (0.312) | (0.066) | (0.054) | (0.072) | (0.037) | (0.070) |
| CFRIGHT | -0.045 | -0.062 | -0.051 | -0.048 | -0.048 | -0.088 | -0.147 | -0.116 | -0.103 | -0.095 | -0.045 | -0.064 | -0.054 | -0.047 | -0.046 |
| | (0.100) | (0.072) | (0.111) | (0.106) | (0.135) | (0.038) | (0.021) | (0.027) | (0.032) | (0.039) | (0.089) | (0.058) | (0.097) | (0.101) | (0.134) |
| Firm size | -0.699 | -0.505 | -0.586 | -0.889 | -0.821 | -1.652 | -2.194 | -1.967 | -1.889 | -1.982 | -0.504 | -0.259 | -0.307 | -0.745 | -0.506 |
| | (0.052) | (0.276) | (0.166) | (0.035) | (0.074) | (0.008) | (0.012) | (0.012) | (0.006) | (0.009) | (0.123) | (0.537) | (0.442) | (0.053) | (0.178) |
| CAMELEQWEIGHTED | | 1.507 | | | | | 1.459 | | | | | 1.758 | | | |
| | | (0.012) | | | | | (0.021) | | | | | (0.008) | | | |
| CAMELDICHOTOMIZED | | | 0.610 | | | | | 0.645 | | | | | 0.830 | | |
| | | | (0.027) | | | | | (0.062) | | | | | (0.007) | | |
| DGRADECAMELEQ | | | | 1.547 | | | | | 1.248 | | | | | 1.975 | |
| | | | | (0.054) | | | | | (0.155) | | | | | (0.023) | |
| DGRADECAMELDICHO | | | | | 2.128 | | | | | 1.731 | | | | | 2.104 |
| | | | | | (0.014) | | | | | (0.071) | | | | | (0.016) |
| N | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| Pseudo R-squared | 29.30 | 42.49 | 37.36 | 35.22 | 40.20 | 41.94 | 52.39 | 48.24 | 45.14 | 47.75 | 26.40 | 42.31 | 40.28 | 35.46 | 37.00 |
| % concordant | 73.08 | 78.85 | 80.77 | 82.69 | 80.00 | 80.77 | 84.62 | 80.77 | 80.77 | 84.00 | 75.00 | 80.77 | 80.77 | 78.85 | 78.00 |
| Type I error | 21.43 | 17.86 | 17.86 | 14.29 | 14.81 | 25.00 | 15.00 | 20.00 | 30.00 | 21.05 | 16.13 | 16.13 | 12.90 | 19.35 | 13.33 |
| Type II error | 33.33 | 25.00 | 20.83 | 20.83 | 26.09 | 15.62 | 15.62 | 18.75 | 12.50 | 12.90 | 38.10 | 23.81 | 28.57 | 23.81 | 35.00 |