BANKING FAILURE MODELS
&
THE CASE OF THE TRNC

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Abstract

The aim of this paper is to explain bank failure and its affects on the economy and the required models and regulations. We also focused on the banking sector in the Turkish Republic of Northern Cyprus (TRNC) and the failed banks through the years 1984 and 2005. We have also obtained information from the 22 banks in the TRNC to complete the research. The results show that deposit insurance & interest expense increased the bank failure in North Cyprus.

1.0 Introduction

1.1 Aim of this study

The aim of this study is to experience of the bank failure in TRNC and analyzing the performance of commercial banks in operation between 1984 and 2005.

1.2 Broad problem area

a) A recent review by the international monetary fund (IMF) revealed that many member countries had experienced significant banking sector problems during the years from 1980 to 2000. The most notable failures of the recent past being: Argentina, Chile, and Uruguay (1979-1983), the Nordic banking crisis (1987-1994), Japan (1992-), Mexico (1994) and more recently the Asian Financial Crisis (1997-).

b) Studying bank failures is important to be able to distinguish between good banks and troubles banks to avoid bank failure or at least minimize the loss on public.

1.3 Methodology

The methodology that is used in this study is Logit and CAMELS rating. The logistic regression (logit model) is used to investigate the probability of bank failure. CAMELS rating system is used is an acronym for five categories of condition and performance on which the institutions are graded: capital adequacy, asset quality, management, earnings and liquidity.

1.4 Structure of the study

The study is structure to consist of the following parts:

- Chapter 1 is devoted to introduction that explaining the topic.
- Chapter 2 reviews the North Cyprus Banking sector.
- Chapter 3 related to theoretical foundation of the study.
- Chapter 4 explains the methods used in study.
- Chapter 5 shows the analysis financing.
- Chapter 6 is the conclusive remarks are made.
- Chapter 7 and 8 represent the reference and appendix.

2.0 Banking Sector in the TRNC

2.1 Bank Failure in the TRNC

The banking crisis in TRNC started when the Yurt Bank was captured by the authorities and the clients ran to withdraw their deposits. The fear of further banking crisis expanded fast. Small and weak banks ran into troubles upon the immediate demand for withdrawals. The total loss was approximately $200,000,000.

Due to the weak financial positions, mergers, and bankruptcy, 12 banks failed to continue in the sector.

2.2 Failure reasons

Banking crisis in the TRNC was highly influenced by so many reasons and thus they were divided under two headings, internal and external influence.

i) Internal influences:

a) Legal regulations: So many countries when trying to liberalize the banking sector, they allow more competition in the market and this causes problems in the long run, if no appropriate regulations are adjusted accordingly. The situation in TRNC was that there was no capital adequacy control and no ratio requirements.

b) Auditing and inspection: These are the most important tool to be applied on banks to detect problems and find solutions before the crisis occur. There was no standard auditing mechanism. Internal auditors were not cooperating with the external auditors to provide proper financial reports that clearly explain the banks' condition. Lack of observation and inspection inevitably led to bank failure.

c) Holding bank: Low capital requirement was the main reason for many businessmen to start their own banks. Such banks engaged in many high risk investments. Due to these investments, these holding banks failed to keep enough liquid money. In the long run, however, mismanagement of the accumulated funds which had been invested in non-productive fields weakened the banks position. Once the rush had started, these banks failed to meet the demand of the clients.

d) The Central Bank: The Central Bank in the TRNC, and as any central bank, considered to be the last resort for bank failure, failed to make necessary interference to avoid the bank failures in that time. As the TRNC Central bank has no money printing authority, it also did not support the troubled banks with funds to avoid the crisis.

e) Credit risk and management: Ignoring the active/passive ratios, liquidity ratios, capacity, character and cash flows occurred to show that these failed banks were short of professionalism in assessing the credit applications. High risk credits were issued without any appropriate collateral been taken. So many issued credits were categorized as low-return investments. In the investigation it turned to show that the owners and managers of these banks were given credits above the limits allowed by the banking laws.

f) Capital Adequacy: Capital is the safety factor for the banks. Generally, 70% of the actives of the bank comprise the credits (Rose, 2002). Capital is the safety valve against the credit risk. Such ratios are important to determine the health of a bank. Low capital requirements led to inflation in the banks. After the bank crisis in year 2001, the minimum capital requirement for banks was increased to 2 million US Dollars.

ii) External influences

TRNC being directly related to Turkey and using the Turkish Lira as the official currency, any changes in the Turkish economy has a direct inspiration on the TRNC economy. When the Turkish country suffered from devaluation, high inflation rates, and high interest rates, the TRNC was highly affected and resulted in this crisis.

2.3 Results of the crisis in TRNC

The banks were then established under the law 39/2001 which was accepted on 23rd of November 2001. The minimum capital requirement for banks has changed to 2 million US Dollars. Currently, there is 1 public bank, 16 private banks, 6 foreign branch banks, and 1 development and investment bank.

After the crisis, also there were a lot of negative developments that affected the accounts in other banks in general. Total savings in January-May 2000 was 27.9%. For the same period in 2001, this dropped to 12.7%. The increase in the consumer prices in May 2000-May 2001 were 70.8% while the increase in the savings in the same period was only 49.6%.

Total current accounts also decreased by 15.1%. Interest currency accounts were reduced by 25.2%.

BANKS IN OPERATION

BANKS UNDER SAVINGS DEPOSIT INSURANCE FUND (S.D.I.F.)

1) Cyprus Commercial Bank Ltd.
2) Yasa Bank Ltd.
3) Tilmo Bank Ltd.
4) Asia Bank Ltd.
5) Industrial Bank of Kıbrıs Ltd.
6) Erbank Ltd.
7) Rumeli Bank Ltd.

BANKS UNDER LIQUIDATION

1) Cyprus Credit Bank Ltd.
2) Cyprus Liberal Bank Ltd.
3) Everest Bank Ltd.
4) Kıbrıs Yurt Bank Ltd.
5) Kıbrıs Finance Bank Ltd.
6) Cyprus Eurobank Ltd.
1) Cyprus Vakıflar Bank Ltd.
2) Cyprus Turkish Cooperative Central Bank Ltd.
3) Limassol Turkish Cooperative Bank Ltd.
4) Asbank Ltd.
5) Cyprus Economy Bank Ltd.
6) Artam Bank Ltd.
7) Creditwest Bank Ltd.
8) DenizBank Ltd.
9) Near East Bank Ltd.
10) Şekerbank (Kıbrıs) Ltd.
11) Akfinans Bank Ltd.
12) Yeşilada Bank Ltd.
13) Universal Bank Ltd.
14) Kıbrıs Continental Bank Ltd.
15) Viyabank Ltd.

3.0 Literature Review

This project was based on the studies and researches collected from different writers and different bank failure cases.

Aslı Demirguc-Kunt in 1989, researched about the deposit institution failures and the case in the Federal Reserve Bank of Cleveland. As a result of her study, she pointed to the results that regulator constraint and incentives play a significant role in failure determination.

Shelagh Heffernan in 1995, concentrated on the economic and financial modeling in bank failure. He concluded that it is important for practitioners and policy makers to understand the determinants of bank failure. The study had 2 objectives: to see whether it was possible to single out the factors which cause a bank to fail, and to discuss the value of trying to predict future bank failures.

The researcher Hülya Bayır analyzed the impact of full coverage deposit insurance policy as well as bank specific factors and Macro economic conditions on the bank failure over a sample of 35 privately owned commercial banks in Turkey for period 1991-1998. The model predicts a high probability of bank failure associated with full coverage deposit insurance policy.

In July 2000, Arturo Estrella, Sangkyun Park, and Stavros Peristiani wrote an article that compared the effectiveness of different types of capital ratios in predicting bank failure. The important result of the study is that simple ratio specifically the leverage ratio and the ratio of the capital to gross revenue- predict bank failure about as well as the more complex risk weighted ratio over one or two year time horizons. This finding suggested that bank regulators may find a useful role for the simple ratios in the design of regulatory capital frameworks, particularly as indicators of the need for prompt supervisory action. Risk weighted ratios; in contrast, tend to perform better over longer horizons.

Serpil Canbas, Altan Cabuk, and Suleyman Bilgin Kilic, focused on the prediction of commercial bank failure via multivariate statistical analysis of financial structures (IEWS) and the case in Turkey. They proposed a methodological framework for constructing the integrated early warning systems that can be used as a decision support tool in bank examination and supervision process for detection of banks, which are experiencing

serious problems. They studied 40 privately owned Turkish commercial banks. The result of the study indicated that if IEWS was effectively employed in bank supervision, it can be possible to avoid from the bank restructuring costs at a significant amount of rate in the long run.

In the Asian Economic Journal 2004, an article written by Shahidur Rahman, Lian Hwa Tan, Ooi Lyn Hew, and Yih San Tan, wrote about identifying financial distress indicators of selected banks in Asia. They investigated empirically financial ratios that could better identify problem banks in Asia and attempt to develop accurate problem bank identification models for each country.

Pouran Espahbodi, in 1990 wrote a paper about identification of problem banks and binary choice models. The study developed and tested logit and discriminant models that could aid regulatory agencies as well as bank examiners investors analysts and others in identifying the potential failures in the banking industry.

In the year 2000, a critical review in the leading indicator models of banking crises was written by James Bell. The search for leading indicators of banking crises has generated considerable interest in recent years. The article reviewed the results of a selection of recent empirical studies and assesses the practical usefulness of these leading indicator models. It concluded that, the models are subject to some significant weaknesses and limitations, especially as potential tools for policymakers.

James B Thomson focused on predicting bank failures in the 1980s. His study showed that the probability that a bank will fail is a function of variables related to its solvency, including capital adequacy, asset quality, management quality, earnings performance, and the relative liquidity of the portfolio.

In June 2000 Andrew Benito and Gertjan Vlieghe stylized facts on UK corporate financial health: evidence from micro data.

The micro-data on large numbers of individual companies can help to describe the evolving financial health of UK companies. Examination of data covering the past 25 years suggested some potential risk to financial robustness in the corporate sector.

3.1 The CAMEL-S Model

The CAMEL Rating system was adopted by NCUA (National Credit Union Administration) in October 1987. Its purpose is to provide an accurate and consistent assessment of a credit union's financial condition and operations in the areas of the five critical elements.
CAMEL is an acronym for five categories of condition and performance on which the institutions are graded: capital adequacy, asset quality, management, earnings and liquidity.

Capital adequacy is a measure of an institution's buffer against future unanticipated losses. In evaluating an institutions asset portfolio, examiners focused on loan quality. Examiners go through loan documentations and check the quality of collateral, if any, backing each loan.
The determination of an institution's management quality is very subjective. Typically, examiners decide on the competence on management based on the institution performance in the other four categories.
Examiners rate the earnings of an institution on both recent performance and on the historical stability of its earnings stream. Performance and stability are determined by looking at the institution's profit composition.

Asset quality is rated in relation to the quality of loan underwriting, policies, procedures and practices, the internal controls and due diligence procedures in place to review new loan programs, high concentrations and change in underwriting procedures and practices of existing programs, the level, distribution and severity of classified assets, the existence of high loan concentrations that present undue risk to the credit union, the investment risk factors when compared to capital and earnings structure, and, the appropriateness of investment policies and practices.
The asset quality rating is a function of present conditions and the likelihood of future deterioration or improvement based on economic conditions, current practices and trends.
Interrelated to the assessment of credit risk, the examiner evaluates the impact of other risks such as interest rate, liquidity, strategic, and compliance.
The quality and trends of all major assets must be considered in the rating. This includes loans, investments, other real estate owned, and any other assets that could adversely impact a credit union's financial condition.

Management is the most forward looking indicator of condition and a key determinant of whether a credit union possesses the ability to correctly diagnose and respond to financial stress. The management component provides examiners with objective, and not purely subjective, indicators. An assessment of management is not solely dependent on the current financial condition of the credit union and will not be an average of the other component rating. The management rating is based on the following areas:

- Business strategy/Financial performance
- Information system and technology
- Internal controls

Earnings are the appropriate return on a bank's assets which enables it to fund expansion, remain competitive and replenish and/or increase capital.

Liquidity of the institution is analyzed to determine its exposure to liquidity risk. To determine the institution's ability to meet unanticipated deposit outflows, examiners look at the bank's funding sources as well as the liquidity of its assets.

Both the existing CAMEL model and PEWS offer a systematic framework for analyzing bank performance and distinguishing between failing and non-failing banks, albeit with different levels of predictive ability. However, each suffers from two weaknesses related to their sole focus on ratios and the setting of performance benchmarks. Firstly, both the methods are solely ratio based analytical techniques that largely ignore non-financial indicators of failure, which may appear a lot sooner than a deterioration of ratios.

Secondly, the total absence of benchmark in ratios in the CAMEL model leaves the assessment of performance at the discretion of individual bank inspectors. Although the PEWS have benchmarks set to classify different levels of performance, it does not provide for a systematic review of those benchmarks.

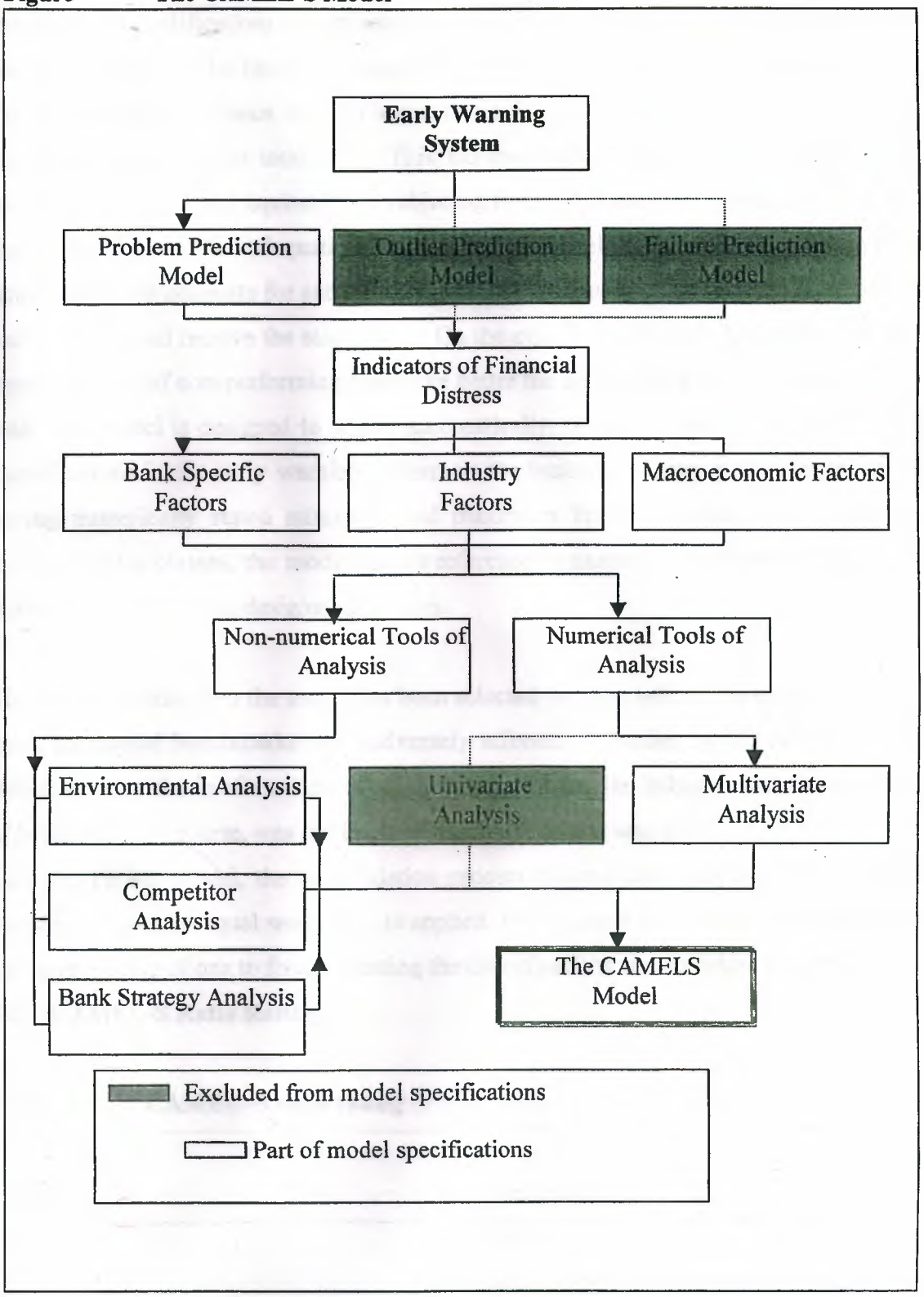
The CAMEL-S Model proposed in this paper builds on the strengths of the two models while at the same time dealing with these two key weaknesses. The CAMEL-S Model is designed to operate as a problem prediction model and adopt the similar bank rating classifications as the PEWS Model. Bank performance is classified as either 'strong', 'satisfactory', 'possible emerging problems', or 'problem'. The ratings have been extended on the upper scale in comparison to those of the PEWS, in order to distinguish between banks requiring little or no

allocation of supervisory resources, and banks with deteriorating financial situations for which, progressively, more supervisory resources ad actions may be required.

Figure1 The CAMEL-S Model

In order to incorporate this new dimension of non financial indicators, tools of analysis from the strategic management literature have been incorporated into the model. Porter's five forces, the generic strategies model, the BCG matrix, and the product-market matrix are used to discuss critical bank and industry specific non-financial issues affecting bank performance.

Figure The CAMEL-S Model



With respect to the financial analysis, the CAMEL-S model builds directly on the PEWS model, with modifications being made to the choice of ratio, and the computation of benchmarks ratios. The choice of ratios in the PEWS has been retained with one exception. The ratio for the allowance for loan losses to total loans has been replaced with the ratio for non performing loans to total loans. This has been done because it was observed that the former ration could not equitably be subjected to rating scale. An allowance of 2% to total loans may be more than adequate for a bank with an excellent loan portfolio, while the same ratio may not be adequate for another bank with a poor quality loan portfolio. Yet, on a rating scale, both would receive the same grade. On the other hand, it is generally accepted that the lower the ratio of non-performing loans, the better the condition of the bank, regardless of its loan. The model is designed to revise, automatically, the benchmark ratios for the different classifications in the early warning system on the basis of industry performance. Instead of having numerically stated minimum and maximum limits for each ratio, indicating the different status classes, the model makes reference to numerical units above and below the industry median ratio in designating classes.

The median, rather than the mean, has been selected because when tests using the mean were used, the model benchmarks were adversely affected by outlier ratios, ratios that were so different from the performance of the other banks in the industry that the average was affected. This, of course, was not the case when the median was used.

Like the PEWS Model, the consolidation process follows three steps in which the rule of simple averages, or equal weighting, is applied. Firstly, each of the fourteen ratios is given a rating on a scale of one to five, indicating the classifications shown below in Table 1.

3.2 CAMEL-S Ratio Rating

Table 2 CAMEL–S ratio rating

Rating	Designation
1	Strong
2	Satisfactory
3	Fair
4	Marginal
5	Unsatisfactory

Secondly, all the ratio rating within each performance category are aggregated to arrive at a single rating. Finally, all the performance category ratings are aggregated to arrive at banks' composite rating and its classification defined in accordance with that rating as indicated in Table 2. Except for the breakdown of the PEWS 'satisfactory' category into two – 'satisfactory' and 'strong'- the rating scale is the same as that used by the PEWS model.

Table 3 CAMEL-S composite ratings

Composite rating	Designation
1.0-1.4	Strong
1.5-2.4	Satisfactory
2.5-3.5	Possible emerging problem
3.5 +	problem

3.3 Financial Analysis

Tests using moving benchmarks centered on the median reveal that comparable results to those obtained using the PEWS model can be obtained, as indicated in the attached appendix. Overall, the CAMEL-S model is more flexible approach to the effective diagnosis and prediction of bank failures. Firstly, the model is able to monitor macroeconomic factors, industry specific factors and bank specific conditions. The identification of bank problems and the degree of potential failure is effected at three levels, allowing for the identification not only of the financial symptoms of failure, but also the underlying strategic causes of that failure. Secondly, the use of other sources of information, such as the banks' strategic plans, and reliable press articles, is formally acknowledged and integrated in the design and implementation of the CAMEL-S early warning system. Finally, and perhaps most importantly for the financial analysis, the early warning system provides for an automatic means of revising the benchmarks for performance.

Research into failure prediction models has been complicated by the absence of a conceptual theory upon which to build such models. Attempts, how ever, continue to be made at identifying financial ratios that best differentiate general patterns of behavior prior to failure. In banking, ratios related to capital, asset quality, earnings and liquidity have been used in

varying forms, either individually or by mathematically amalgamating them into a composite score.

In designing an early warning system and, more specifically, selecting the variables to include the model, it has to be acknowledged that the process is not an exact science.
Thus, it is not and should not be assumed to be a one off event, but rather an evolving process whereby bank specific, industrial wide, and environmental indicators of failure are constantly reviewed. Banks cannot be subjected to any form of static regimented early warning system.

Table 4 PEWS & CAMEL-S benchmark

PEWS Ratios	CAMEL-S Approach	Rating	Classification
10% and above	Plus 4% above IM	1	Strong
8%-9.9%	Plus 2% above IM	2	Satisfactory
6.0%-7.9%	Industry median (IM)	3	Fair
4.0%-5.9%	Minus 2% below IM	4	Marginal
3.9% and below	Below 4%	5	Unsatisfactory

4.0 Methodology

4.1 Leading Indicator Models

Most define failure as occurring when a firm's liabilities exceed its assets. This definition is not immediately transferrable to the banking industry because bank regulators have the power to close a bank if the interests of depositors or potential depositors are threatened even if it still has positive net worth. A definition of bank failure is required therefore, that incorporates regulatory action. Regulators' powers are usually governed by legislation, the terms of which vary from country to country. Different national authorities also use slightly different crisis resolution technique. Studies of bank failure therefore tend to use country specific definitions of what constitutes a bank failure.

The main approach that has been adopted in the literature – the qualitative response model:

Qualitative response model: this approach employs regression techniques to estimate the relation ship between the various potential indicators and identified discrete outcomes such as a bank failure or a banking crisis. Specifically, qualitative information on the occurrence of such events is used to construct a dependent variable which can take on a limited number of discrete values. This dependent variable is assumed to be drawn from some continuous probability distribution. Regression analysis is then used to capture the effect of movements in the indicator variables on the probability of the event occurring (James Bell, 2000).

4.2 Micro economic Models

Micro economic studies focus on individual ban statistics of performance. They aim to discern commonly predictable patterns and trends in these statistics for use in predicting future bank failures. The ratios used reflect the position of bank relative to its capital, asset quality, management earnings and liquidity. The micro economic models for the prediction of distress are classified as either problem prediction models, outlier/peer group models or failure prediction models (Sinkey, 1979).

Problem prediction models replicate and predict bank examiners "problems banks" classifications. The classifications are generally based on the quality of a banks loan portfolio. High volumes of substandard loans relative to capital and reserves have an adverse impact on bank performance and raise the attention and concern of the regulatory authorities.

The classification of a bank as a "problem bank" does not mean in itself that a bank is going to fail, rather than it problems may lead to failure if not attended to. Outlier prediction models, sometimes referred to as Peer Group Models, focus on statistical differences between banks. Once regulatory authorities establish bench mark measures of bank vulnerability, based on the industry average performance, such models identify banks with outlier characteristics as being in need of supervisory actions.

Failure prediction models focus on identifying factors that lead to the seizure or complete failure of institutions operations. The absence of conceptual theory about corporate failure has led to diverse definitions and interpretations of what constitutes failure. Difference in definition naturally leads to different designs of the "optimal" failure prediction model. Beaver (1968) for example, operationalised failure as having taken place when one of the following occurred; bankruptcy, preferred stock dividend arrears, bond default, and having an over drawn account. Other researchers have restricted their definitions of failure to include only those firms that have experienced insolvency or liquidation proceedings. Despite the different definitions of failure, the failure process is characterized by a systematic deterioration of the values of the ratios. The research into the use of ratio has, therefore, centered on identifying the ratios with the most markedly different behavior pattern prior to failure, and deciding how best to incorporate the selected ratios into a formal failure prediction model.

A fundamental assumption with univariate models is that the distribution of the selected ratios differs significantly between those firms heading for failure and those that are not – a difference that can be exploited for predictive purposes. Univariate models have the potential to give conflicting predictions or indications about an institution's future because individual ration trends may be heading in different directions. Multivariate analysis is a direct attempt at dealing with this problem. Multivariate financial analysis combines different ratios, usually by some form of weighting, to produce a single index. Altman (1968) pioneered the work into the use of multivariate statistical analysis. A number of researches studies in the 1970's concentrated on developing his initial accounting models. Foster (1978) identified the important issues of investigation at the time as being either deciding what form the model should take, deciding what variable should be included or deciding what weights to apply.

The research by Rojas-Sarez (1998) is a recent study, which adopts a typical microeconomic approach. She used bank level indicators based on the CAMEL model to evaluate bank failures in developing countries. She concluded that the CAMEL indicators were not good measures of bank strength in emerging countries. What were required for them were simpler alternative measures that were more appropriate to the unsophisticated nature of developing countries. She recommended the use of four basic indicators, namely, deposit interest rates, the spread between lending and deposit rates, the rate of credit growth and the growth of the inter bank debt. While these measures may be considered inadequate for identifying systematic weaknesses of the banking sector, they are adequate for identifying individual bank weaknesses. This criticism is in light of the use of banking system averages as warning thresholds for individual indicators of bank risk (Demirguc-Kunt & Detragiache; 1999). The difficulty for academics in utilizing these models for research is that of obtaining data on individual banks, especially in developing countries. The required data on individual banks is often confidential, outdated or simply not of a comparable nature with other commercial banks. Where a study intends to examine a number of countries, differences in accounting principles, standards and definition of ratios, means that comparative studies may be misleading (Gonzalez-Hermosillo, 1999).

4.3 Logit Model and Estimation

To investigate the banks' financial distress indicators, the logistic regression (logit) model is used. Logit is appropriate when the dependent variable can be grouped into discrete states. Consider the set of explanatory variables be denoted by x and the explained variable is described by the binary variable y which takes a value of 1 if the bank is in distress and 0 otherwise. The explanatory variables are capital adequacy, interest income/interest expense, liquidity, loan quality, loan volume, management efficiency, profit margin, ROA, ROE, and source of revenue. These are significant indicators of problem banks in the past studies.

The logit model is based on cumulative logistic probability specified as

$$Pi=prob(yi=1)= 1/1+e^{-xi'\beta} =F(xi'\beta)$$

Where β is the set of parameters to be estimated. In a linear regression model (logit), the coefficient β measures the effect on the average value of the regressand for a unit change in the value of the regressor. But the logit model deals with the probability of the event occurring. The parameters of the model are estimated using the maximum likelihood method where the coefficient that makes the observed results most 'likely' are selected.

The model for each case study consist of independent variables deemed to be having the best fit for the one, two and three years prior to distress data samples. To sequentially add the best variable to the model, forward step wise selection procedure in logistic regression was employed. The relative contribution of each of the variables and the inter-correlation between variables were also considered during the selection process.

4.4 Estimating bank crisis probabilities in a multivariate logit framework:

In bank failure forecasting, early attempts to use ratio analysis to predict corporate failure are associated with Beaver who proposed the frameworks for univariate analysis. The popular functional form used by bank failure researchers is the logit model. Linear discriminant analysis assumes full linear compensation between the independent variables which seldom holds. Quadratic discriminant analysis proposes a more general relationship, which is quadratic function. However, both linear and quadratic discriminant analyses are sensitive to deviation from multivariate normality. The logit model does not assume multivariate normality, but the logit approach does give a crisp relationship between explanatory and response variables based on the given data from a statistical view point.

The starting point of this analysis is an econometric model of the probability of a systematic banking crisis. Demirguc-kunt and Detragiache in 1998 estimated that various alternative specifications of a logit regression for a large sample of developing and developed countries, including both countries that experienced banking crisis and countries that did not.

To form the basis of an easy-to-use monitoring system, the econometric model should rely on data that is readily available, and if it utilizes contemporaneous values of the explanatory variables, it should use variables for which forecasts are routinely produced.

Accordingly, in this selection we will present estimation results for a specification of our empirical model that includes only variables available from the International Financial Statistics or other publicly available data bases, and that are routinely forecasted by the Fund in its bi-annual World Economic Outlook (WEO) or by professional forecasters as reported by consensus forecasts. As it turns out, this is not the specification that fits the data the best. There is one important exception to this criterion, however: professional forecasts for the nominal interest rate are not available for most countries in the sample, but excluding the real interest rate from the regression would have meant losing a lot of explanatory power.

4.5 Deposit Insurance

An instrument called deposit insurance has been developed as a precautionary measure to protect depositors against bank runs. This instrument has one explicit and implicit target. The explicit target is to protect depositors. The implicit targets are to reduce the unpleasant macroeconomic consequences of bank failure and to prevent contagious effects of panics during crises in the financial sector.

Deposit insurance has different regulations across countries, ranging from full to partial coverage, from explicit to implicit appliance, from being compulsory to non compulsory. Deposit insurance may also differ in terms of premium implementation.

Some economists such as Gonzalez-Hermosillo (1996) argued that the most evident danger of full coverage application is the moral hazard problem that makes depositors less careful initially in the selection of their bank and later discourages them from moving their funds to safer banks.

The first deposit insurance scheme was set up in the United States of America in 1934, with the setting up of the federal deposit insurance corporation (FDIC). The FDIC is an official organization set up by the US federal government and was created in response to the failure of many banks during the great depression in the early 1930's.

Deposit insurance was first set up in the TRNC by a law passed on in 1991; the savings deposit insurance fund set up under this law was to be administered by the TRNC central bank. Subsequently, the savings deposit insurance fund law passed in the year 2000 and 2001 kept a major role for TRNC central bank in the funds administration with a minor role being accorded to the private sector, through the appointment to the fund's board of directors a representative of the North Cyprus Banks Association.

The aim of the TRNC savings deposit insurance fund as stated in its law is 'to insure savings deposits in banks and to protect all the rights of depositors'.

5.0 Data Analysis

5.1 Definitions and Expected Signs of the Micro(Bank-Specific) Variables

Table 5

Variables	Definition	Expected Sign Failure
Capital Adequacy		
Capital / Asset	Total capital as a percentage of total assets	-
Loan / Capital	Total capital as a percentage of total capital	+
Asset Quality		
Loan / Asset	Toatal loan as apercentage of total assets	+
Management Quality		
Interest Expense / Deposit	Deposit interest expense asa percentage total deposit	+
Earning		
Net Income / Asset	Net income as a percentage of total assets	-
Interest Income / Asset	Net-interest income as a percentage of total assets	-
Liquidity		
Liquid / Asset	Liquid assets as a percentage of total assets	- / +
Liquid / Deposit	Liquid assets as a percentage of total deposits	- / +
Deposit / Loan	Total deposits as a percentage of total loans	- / +
Asset Size		
Asset Size	Logarithm of total assets	-
Deposit Insurance		- / +

Based on previous analysis, a number of financial ratios appeared to provide a suitable basis for bank failure prediction.

The **capital adequacy** indicator is the ratio of total capital equity to total assets and the ratio of total loans to total equity. The ratio capital/asset shows probability of bank failure if it is negative. Higher ratio indicates sufficient capital to absorb unexpected losses. The second ration loan/capital, will lead to a failure when the loan losses increase and cause to a decline in bank's capital.

Asset quality is the measuring total loans to total assets. The increase in this ratio may increase the probability of bank failure as this means that the bank has poor asset quality and non-performing loans.

The **management quality** of a bank can be measured by operating efficiency. Always high costs and expenses lead to a probability in bank failure.

As **earning** is the most important measurement for a bank, the ratio of net income to total assets measures the profitability of the bank. The higher this ratio is, less the probability for bank failure will be.

Liquidity has both positive and negative effect on bank failure. Higher ratios lead to lower the probability of failure as the depositors will feel confident towards the bank. On the other hand, this may also convince the bank to imply weak financial investment activities.

The **asset size** variable has a negative influence on the probability of failure. As the size of a bank increases it is less possible for a bank to fail.

5.2 Correlation Analysis

Correlation is a bivariate measure of association (strength) of the relationship between two variables. It varies from 0 (random relationship) to 1 (perfect linear relationship) or -1 (perfect negative linear relationship). In SPSS, select Analyze, Correlate, Bivariate; check Pearson.

Correlation table

	lta	loandep	liqdep	deptl	intexpta	liqta	nintta	patta	loanta	tltc	loantc	tcta
lta	1											
loandep	-0.0964	1										
liqdep	-0.1586	0.0988	1									
deptl	0.0633	-0.1646	-0.0717	1								
inexpta	0.0593	-0.0586	-0.2324	-0.0202	1							
liqta	-0.3322	-0.3865	0.3617	-0.0304	-0.2252	1						
nintta	-0.1043	0.1519	0.2661	-0.0227	-0.3251	0.0592	1					
patta	-0.0923	0.0947	0.3471	0.0236	-0.4408	0.1661	0.5315	1				
loanta	-0.0796	0.4455	-0.3678	-0.0918	0.3875	-0.6014	-0.0055	-0.1679	1			
tltc	0.2458	-0.0636	-0.1735	-0.0366	0.4572	-0.1399	-0.2557	-0.334	0.1842	1		
loantc	0.1704	0.0377	-0.1997	-0.0287	0.5657	-2540	-0.2276	-0.3329	0.4355	0.9079	1	
tcta	-0.077	0.1182	0.4644	0.1317	-0.5296	0.1093	0.1592	0.293	-0.4668	-0.4689	-0.4701	1

5.3 Logit Analsis and Determinants of Bank Failure

Variables	1	2	3	4	5
Capital Adequacy					
Capital / Asset	-0,07 (0,030)			0,0009 (0,027)	
Loan / Capital		-0,0006 (0,0006)	-0,0007 (0,0006)		
Asset Quality					
Loan / Asset	0,0008 (0,024)	0,053 (0,057)	0,07 (0,062)	0,074 (0,043)	0,04 (0,04)
Management Quality					
Interest Expense / Asset	0,09 (0,03)	0,1 (0,03)	0,13 (0,04)	0,12 (0,0418)	0,11 (0,041)
Earning					
Net Income / Asset					-0,0004** (0,122)
Interest Income / Asset					
Liquidity					
Liquid / Asset	-0,01 (0,02)	0,38 (0,47)			
Liquid / Deposit					
Deposit / Loan		-0,02 (0,04)	-0,04 (0,04)	-0,031 (0,033)	-0,027 (0,032)
Size					
Asset Size	0,174 (0,504)	0,383 (0,472)	-0,155 (0,564)	-0,34 (0,55)	
Deposit Insurance			2,11** (0,078)	2,17** (1,24)	1,686** (1,01)
Constant	-5,38 (4,6)	-7,53 (3,59)	-3,81 (3,77)	-2,46 (3,51)	-4,20 (1,66)
Model Statistics					
Pseudo R2	0,2	0,23	0,27	0,25	0,24

As it can be seen in table 5.3, only ratio of interest expenses to asset and deposit insurance is significant at %95 confident level. Our highest R2 values is 0, 25. This is very low value. This may suggest that other macroeconomic factors, such as interest rate, inflation, exchange rate may also affect the bank failure in North Cyprus.

5.4 Analysis Conclusion

As a conclusion it could be stated that the deposit insurance, interest rates, low capital adequacy, and inflation played an important role in bank failures in the TRNC. As a consequence of the low level of minimum capital requirement of the government, the banks in TRNC were seriously undercapitalized.

As the deposit insurance was not very important for the banking sector in the TRNC before the crisis, this ended up to increase the panic that resulted in the crisis.

Liquidity ratio indicates that the banks faced unexpected deposit run, which increases the probability of banks' failure.

Furthermore, the banks being offering high interest rates on deposits are always a significant sign for a risky banking sector being engaged in risky activities.
Due to the missing or the poor inspection system in the TRNC such features were not discovered or noticed.

6.0 Conclusion and Recommendation

Our result shows that Deposit Insurance & Interest Expense significant factor that increased bank failure in North Cyprus. That is high interest expense increases and the presence of deposit insurance after year 2000 worsened the financial position of banks in North Cyprus through moral hazard & adverse selection

Our result shows that R2 values are low. This may suggest that other macroeconomic factors, such as interest rates, inflation, foreign exchange reserves and capital flow may affect failure in North Cyprus. For other studies I suggest researcher to combine both microeconomic & macroeconomic factors into the process of analysis. These results may suggest that it would be preferable to remove the deposit insurance in order to minimize bank failure in North Cyprus

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Appendix 1

List of Financial ratios used in the selection of the model:

Capital Adequacy= Net Worth/Total Assets

Interest Income/Interest Expense

Liquidity 1= Liquid Assets/(Deposits + Money Market Funds)

Liquidity 2= Liquid Assets/Total Assets

Load Quality= Loan Loss Reserves + Problem Loans/Total Gross Loans

Loan Volume= Total Gross Loans/Total Assets

Operating efficiency= Total operating Expense/Net Income before Tax

Management Efficiency= Interest Expense/Total Loans

Profit Margin= Net Income before Tax/Total Gross Income

Return on Assets= Net Income before Tax/Total Assets

Return on Equity= Net Income before Tax/Net Worth

Source of Revenue= Interest Income/Total Gross Income

Appendix 2

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