WHICH FACTORS CAUSE FAILURE OF UKRAINIAN BANKS?

by

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Abstract

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Over the 10 years of transition, Ukraine's financial system did not establish itself as a growing and advanced sector of the economy. Rather, it remained weak, narrow, and inefficient, with almost a quarter of banks undergoing the liquidation procedure and a handful of problematic banks. In this paper we discuss reasons for the banking sector fragility and identify factors that reduce or raise the probability of becoming bankrupt for a given bank. Based on financial ratios of 91 sound bank and 20 bankrupt banks calculated for the years 1995–1996, we utilize the probit cross-section model and identify that traditional indicators such as size, capital adequacy, and return on assets are not the principal determinants of the soundness of Ukrainian medium-sized bank. Rather, bank's stability depends on the location and the number of years in business. Further, based on the analyzed policies of the National Bank of Ukraine, we conclude that, aside from macroeconomic conditions, raising the transparency of banks' reporting procedures would enhance competition among banks, help attract resources into the banking system, and feed into the soundness of each particular bank.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

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GLOSSARY

The National Bank of Ukraine (NBU). The central bank of Ukraine, an independent monetary authority of the Ukrainian government.

OVDP. Government short-term securities introduced in 1995 as the first money market instrument in Ukraine.

Bankrupt bank. Bank either closed by NBU or monitored by a liquidation commission appointed by the court. Terms “bankrupt bank”, “discontinued bank”, “failed bank”, “poorly-performing bank” are used interchangeably.

INTRODUCTION

Why are courses on the banking system and finance underrepresented in economics programs? The reason is the difference in how financiers and economists view the financial system. The former consider it primarily as a source of profits. The latter view it as a channel of funds "from people who save to people who have productive investment opportunities" (Mishkin 2000, 7) and thus as an institution important for economic development. Despite both professions end up with examining performance indicators as efficiency measures, economists allow thinking of the banking system in a wider context, which is not captured by the traditional accounting courses.

We consider soundness of the banking sector as a determinant of the sector's performance and thus its ability to boost economic growth. There are at least two important motives why it might be expedient to raise the quality of banking services. Firstly, banks transform savings into investments, which determine country's future wealth. Secondly, efficiently operating banking system allows better monitoring of the monetary indicators dynamic, as well as foreseeing and preventing the effects of external shocks. This is because more people choose to keep their savings in banks as the riskiness of the banking services proves to be reasonably low. Conversely, bank failures convey negative information to economic agents: they signal that banks generate too low revenues to meet their liabilities. This scares away depositors and reduces the government's influence on the money turnover, thus undermining current economic stability and future growth prospects.

What is the role of the banking sector in Ukraine's economic development and how well does it fulfill its core function? Unfortunately, its role as a financial intermediary is extremely limited. By the results of 2000, the share

of problematic banks constituted 32.3% of those operating in Ukraine. Their number grew significantly after the 1998 crisis, from 10 in 1997 to 52 in 1999, and to 72 in 2000 (Herald of the National Bank of Ukraine 3/2001, 2). Banks extended only UAH 9.5bn of new loans to businesses in 2000, which is 5.4% of GDP (ibid., 5). Over the same period, gross investments amounted to UAH 33.1bn, or 18.8% of GDP (Quarterly Predictions 14/2001, 89). On the other hand, the sector mobilises a tiny part of savings in the economy: only 5.384mn Ukrainians (or one of nine people) keep their deposits in banks. The amount of new deposits reached 1.9bn UAH last year, which is 1.1% of GDP (Herald of the National Bank of Ukraine 3/2001, 3). Compared to other transition economies of the Central Europe, these are hardly sufficient amounts for boosting the business sector development, strengthening the social welfare system, and, in the end, promoting fast economic growth. For example, new deposits in Estonia and Hungary last year constituted 10% and 7% of their GDPs, respectively (Roe, 2000). To conclude, Ukraine's central bank (NBU) has every incentive to improve the performance of the banking sector and raise its role in economic development.

Before curing a disease, its causes must be identified. These may be found in general economic conditions, the structure of the banking sector, regulatory practices of the central bank, and bank management. After nine years of transition, Ukraine's economy started to grow only in 2000, posting 6% increase in GDP. The size of nominal average wages, however, has been at low USD 30 since the early 90s, which clearly could not result in any significant savings in the household sector (Bulletin of the State Statistics Committee on Social and Economic Development 2/2001, 5). Ukrainian enterprises, which were used to work under soft budget constraints, could easily default on their debt. This is reflected by the amount of overdue accounts payable accumulated by Ukrainian enterprises: as of February 1, 2001, it reached UAH 185bn (ibid., 62). In addition, banks do not operate in a competitive environment, since the government stands

ready to bail out many of them, especially systemic banks. Moreover, comprehensive laws on the central bank and banks/banking activities became effective only in May 1999 and December 2000, respectively. Previously, NBU regulated the commercial banks' activities by means of multiple and persistently amended sub-normative acts. Finally, management practices did not change significantly since the Soviet times: in the absence of structural changes, there was no need to adjust the patterns of behaviour to the needs of the market economy. Besides, the presence of foreign banks in the Ukrainian market is rather limited: as of January 2001, only 7 100%-owned foreign banks operate in the local market (Herald of the National Bank of Ukraine 3/2001, 2). Under these conditions, banks can hardly generate stable and sizeable revenues.

Another important determinant of banks' successful operation is the access to information about their performance. Being aware of a certain bank's performance and its ability to meet requirements of the regulatory authority, depositors can easily identify problematic banks and avoid them. Then, competition among banks would arise, forcing "lemons" to exit the market. This was and still is not the case in Ukraine, where little information is available about banks' actual performance. Gross numbers are usually reported, while detailed statements are not available. Banks tend to disappear from NBU's reporting sheets as their performance starts worsening, as well as names of banks which undergo reorganisation procedures are kept in strict secrecy. Finally, NBU never reported on the enforcement of its austere regulations. In this way, the banking sector remains a "black box" for the overwhelming majority of economic agents.

However, mere conveyance of information to the public cannot and does not ensure by itself that banks operate in the most efficient way. The regulatory body must be able to use this information so as to identify factors which have the strongest effect on banks' stability and work hard to prevent the realisation of the dangerous potential on time. In developed economies, a set of indicators is used for this purpose. It includes financial ratios calculated at the end of the reporting

period such as profitability, solvency, liquidity, capitalisation, and the quality of management. This approach, however, has several weak points, which are mainly due to the static nature of this kind of analysis. Quite often, this technique will merely result in the statement of an outcome which has already been observed. In case of the negative result (that is, illiquidity or insolvency) the back-casting can hardly provide a policy maker with the best and quickest response. An alternative way is to make predictions on the basis of a dynamic pooled model containing factors which best indicate the probability of a certain bank to become bankrupt.

Based on the above, we formulated two main questions to be answered in this work. The first is to identify a set of indicators that best explain the probability of an individual Ukrainian bank to become bankrupt or remain sound across time, as well as to assess the scale of their impact. The second is to see how important the availability of information on banks' activities might be for their soundness. For these purposes, we analyse banks' financial statements over the period 1995–1996. Our sample consists of medium sized banks, 91 of which are sound and 20 would go bankrupt at a later point in time, which is known from official publications of the National Banks of Ukraine. The source of our data is the database of Kalyna Information Agency, published in Finansovye Riski (Financial Risks) analytical review. We use this data to calculate financial ratios, which are both appropriate for the Ukrainian context and tested in the previous studies. Further, we run cross-section probit models for each period to see how the effect of our control variables on the probability of bankruptcy changes over time. Unfortunately, data limitations did not allow us to develop a pooled time-series predicting model, restricting us to the analysis of cross sections. As a result, we were not able to include variables that would control for changes in macroeconomic environment.

The results of our examination show that, unlike in developed Western economies, failures of Ukrainian banks are weakly dependent on the performance indicators, including size, capital adequacy, and return on assets. Instead, banks'

innate characteristics such as location, the number of years in business, and the network of regional branches have a comparable or stronger effect than that of traditional indicators on the stability of Ukrainian medium sized bank. Further, based on the analysed policies of NBU, we conclude that, aside from macroeconomic conditions, raising the transparency of banks' reporting procedures would enhance competition among banks and improve their performance.

We organise this paper as follows. The previous research is discussed in Chapter 1. Theoretical model and the Ukrainian context, including legislation regarding the failing banks in Ukraine are outlined in Chapter 2. In this chapter, we also consider the chosen econometric technique, as well as justify the specification of the model. Estimation results and their discussion are presented in Chapter 3. Conclusions and policy implications follow.

Chapter 1

PREVIOUS RESEARCH

Economic research analysing the soundness of the banking sector dates back to the 1920–30s, when bank runs and mass business failures had been observed in the US. It was noticed that financial statements of poorly performing firms were significantly different from those of sound ones: the size of failed banks was usually smaller, liquidity ratios lower, and capital reserves was not as large as in sound banks. The fundamental research based on the financial ratio analysis was performed by Hardy and Meech (1925), as well as Merwin (1942). However, the flaw of this method was that "common a priori standards [such as capital requirement] could not segment closed banks from viable institutions" (Meyer and Pifer 1970, 854).

Studies of the 60s primarily focused on exploring the potential of the financial ratio analysis and indicated the possibility for predicting firm's pending problems. Rather than assessing and cross-comparing financial ratios of individual entities, authors of these works aimed to single out trends in the behavior of the most important factors, as well as to determine the weights of their impact on the bankruptcy potential. One of the pioneering works in this field was by Altman (1968), who gave a quantitative answer to the question "which factors are most important in detecting bankruptcy potential, what weights should be attached to those selected ratios, and how should the weights be objectively established" (Altman 1968, 589). Most appropriate statistical techniques, which received sophisticated development in the future studies, were multiple discriminant analysis (MDA) and probabilistic analysis.

The method of MDA had been extensively used in biological and behavioural studies before first applied to solving financial problems such as consumer credit evaluation and investment classification (Myers and Forgy, 1963). In brief, an observation is classified "into one of several a priori groupings dependent upon the observation's individual characteristics" (Altman 1968, 591). These groups are qualitative in nature (e.g., solvent/bankrupt, male/female), and MDA determines a linear combination of these characteristics "which best discriminates between companies in two mutually exclusive groups" (ibid., 589). Unlike the traditional financial ratio analysis, MDA allows identifying the probability of an observation which is not in the sample to enter one of the groups. Altman's followers, Meyer and Pifer (1970) and Sinkey (1975), to mention a few, extended his basic ideas to predicting fragility of the banking sector.

Still, the multiple discriminant analysis is rather limiting in its applications. Ohlson (1980, 112) noted that "there exists an excessive number of strict assumptions that limit the scope of investigation if a researcher wants to go beyond simply developing a discriminating device". Among these limitations is the need to draw a matched sample: the number of bankrupt and sound firms should be equal and have comparable characteristics. This task, however, is very difficult to accomplish, especially in case of research on emerging markets, where sources of data are limited. Besides, the output of the method is a score, used to rank banks according to their performance, which complicates its interpretation in front of decision makers. In addition, "it would seem to be more fruitful actually to include variables as predictors rather than to use them for matching purposes" (ibid.). Another drawback of the MDA, as noticed by Santomero and Vinso (1977, 187), is that "the essentially static nature of such devices remains their fundamental flaw. Rather than obtaining evidence concerning the bank's likely exposure to failure in its operations, these ratios question the ability of the bank to avoid *present* failure with its *present* asset characteristics".

More suitable (that is, less restrictive) models that can serve the same purpose (and be used as forecasting tools) would be probabilistic cross-section or pooled time-series models. Santomero and Vinso (1977) first introduced these stochastic models with respect to the bank failure. In particular, they examined the cross-section riskiness of the US banking structure, and its sensitivity to variations in the size of bank capital over 15-year time period (Santomero and Vinso, 1977). They also used their model to show the impact of different regulatory changes on banks' performance and constructed projections regarding the banks' response. This approach received further development in works by Moyer (1977) and Ohlson (1980) (among the many others), who employed the technique of conditional logit analysis to both cross-section and pooled time series data. Using common financial ratios as predictors of bankruptcy, they showed model's advantages as a policy instrument. Besides, they pointed at the caveats of the multiple discriminant approach, emphasising the need to test the predictive power of the model and tune up the sample selection procedure.

Pooled time-series limited dependent variable models of banks' failure received further development in the mid80s and late 90s, when financial crisis in Latin America and East Asia burst out. At the cross-country level, they served extremely well for identifying a significant dependence of the financial system collapse on macroeconomic variables, characteristics of the banking sector, and country-specific indicators (Demirgüç-Kunt and Detragiache, 1998a). Other studies support the hypothesis that early financial liberalization (proxied by the deregulation of bank interest rates) can worsen performance of the banking sector (Caprio and Kliengebiel, 1999) and catalyse financial crises (Demirgüç-Kunt and Detragiache, 1998b).

To sum up, the probabilistic model became a widespread technique in identifying the banking sector fragility. At the same time, although all these studies aim to predict the extent of bank/banking system fragility and use the technique to develop an early-warning tool, they all rest on different factors to

explain this probability. As noted by Talmor (1980, 785), "[early warning models that are based on financial ratios] all share a lack of theoretical justification". As a result, "researchers adopt a trial-and-error process of experimenting with a large number of measures, various kinds of models, and various statistical techniques" (Lev 1974, 149). Depending on the scale of the research, some of them concentrate on the effects of financial measures (such as liquidity, profitability, and solvency (Altman, 1968, and Ohlson, 1980)), while the others attempt to identify the influence of local and general economic conditions, integrity of employees (Meyer and Pifer, 1970) etc. Recent cross-country studies of the World Bank experts questioned the ability of traditional financial indicators to predict the reasons of bank failures in the emerging markets correctly and emphasised the need to control for the asset diversification, financial market development, presence of foreign banks, contract and regulation enforcement (Caprio and Honohan, 1999). We will turn to discussing factors which influence banks' performance in Ukraine in Chapter 2 of this research.

On the one hand, this flexibility of the model is a definite advantage, because a researcher can reasonably adjust the specification to individual features of a given country. On the other hand, this complicates (if not eliminates) the possibility to compare the effects of similar factors, as well as their values, across countries.

Taking into account all its advantages mentioned above, we chose to use the limited dependent variable model (namely, the probit model), as it suits the goal of this research the best. Thus far, there have been only one statistical study for the former Soviet Union countries in this area by Borovikova (2000), who examined the probability and timing of bank failure in Belarus, and we continue to contribute to this field of research. Unlike in the case of Belarus, where data on failing banks was available for 1992-1998, we are restricted to analysing financial statements over 1995-1996. Still, we discuss possibilities of testing the influence of macroeconomic and country-specific factors as a matter of further research.

Chapter 2

THEORETICAL MODEL AND THE UKRAINIAN CONTEXT

The economic question we attempt to answer in this paper is as follows: had financial indicators of discontinued banks that went bankrupt been really worsening with time? If so, which indicators have the heaviest effect on the probability of becoming bankrupt for a certain bank? As we have already mentioned, no conventional, one-and-for-all formal model has been developed in this field. Rather, authors adjusted and modified the underlying idea of forecasting bankruptcy on the basis of financial ratios, relying on their intuition and knowledge of the examined banking system and environment in which it had been operating. The meaning of underlying assumptions is best understood in the context of the system that they explore. That is, this kind of modelling, recognised as informal, is "…intended to give a more or less complete explanation of empirical phenomena [which] can therefore be meaningfully tested against the data" (Mayer 1998, 198).

In our paper, we will also rely on informal modelling and introduce assumptions only as they are needed. In this way, we will try to avoid errors related to "the omission of anything that cannot be modelled or measured even as a latent variable" (ibid, 197). We begin with exploring the data and, based on the results of our examination, develop alternative hypotheses and construct relevant representations. Thus, we do not test our model against a single null hypothesis and provide only *an* explanation (among the many that exist) to the banks' bankruptcy in Ukraine, based on convincing evidence. Accordingly, we believe that our model captures major characteristics of the Ukrainian banking system, and reflects its specific features quite adequately.

In line with this reasoning, we organise the rest of this chapter as follows. Firstly, we discuss the environment in which Ukrainian commercial banks operated over 1995–1998, including NBU's performance and liquidation policies with respect to commercial banks. Secondly, we present and justify the econometric technique used to determine the influence of financial factors on the probability of bankruptcy. Finally, we examine the data used in this research and give a discussion of the model specification.

Banking Sector and Banking Sector Policies in Ukraine in 1995–1998

The Ukrainian banking sector entered the transition period in 1991 along with the whole economy. Then, NBU was established and the major branches of the former State Bank were reorganised into five specialised banks: Prominvestbank (servicing the industrial sector), Ukraina bank (agriculture), Ukrsotsbank (social services), Oschadbank (savings bank), and UkrEksImbank (foreign trade) (Gros and Steinherr 1998, 219). In 1991, the Law "On banks and banking activities" was adopted[1]. The law established the key rules for operations of commercial banks, including registration procedures, formation of bank capital and reserve funds, and bank liquidation. However, the law did not contain any specific norms and requirements: a majority of them were determined later in persistently changing and amended subnormative acts of the NBU. Banks did not need to obtain specific permits to carry out usual banking operations besides obtaining the general license for banking operations and license for foreign currencies transactions. As a result, a multiple number of newly-created banks entered the financial services market, some 238 as of January 1995 (Drobiazko, Kudelia, and Matveichuk 1996, 43).

[1] The Law was suspended last year, after the new Law #2121-III "On banks and banking activities" came into force on December 7, 2000.

The reason that economic agents rushed into the financial sector was the opportunity to earn above-normal profits. By 1996, almost all financial markets[2], where banks usually operate, had been present in Ukraine, including the foreign exchange (FX) market, securities market, money market, and long-term borrowing market. Over 1992–1994, banks could make some 40% return by lending short and borrowing long from the NBU and the government, making use of galloping hyperinflation (see table 1).

Table 1. Interest rates on hryvnia loans and deposits, 1993–2000

	NBU'S REFINANCE RATE, YEARLY %	COMMERCIAL BANKS INTEREST RATES, YEARLY %	
		On loans	On deposits
1993	240.0	184.3	148.6
1994	252.0	250.3	208.6
1995	110.0	122.7	70.3
1996	40.0	79.9	33.6
1997	35.0	49.1	18.2
1998	60.0	54.5	22.3
1999	45.0	54.9	20.7
2000	27.0	41.5	13.7

Source: Bulletin of the National Bank of Ukraine 2 (February, 2001): 143.

They also earned large profit margins in the FX market (thanks to the existence of multiple exchange rates) and lent to the government at high interest rates[3]. In 1995, the situation started to change. The NBU stepped in and restricted speculative transactions in the FX and money markets, forcing banks to change the style of asset management. This is exactly the point when poorly-managed banks started revealing their malperformance. Inability to earn fair profits in traditional markets, raise capital and the net asset value resulted in wide-scale collapses and insolvencies (20 banks closed over the year) (ibid., 43).

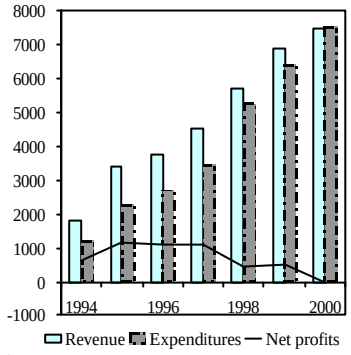
Beginning 1995, the NBU, concerned with the sector's malfunctioning, started to strengthen its monitoring and regulatory powers. Firstly, the NBU determined terms and conditions when the license for operations in the FX

[2] However, all of them could hardly be called broad and deep. Still, it is beyond the scope of this paper to discuss the pitfalls of these markets and banks' limited role in their development. Comprehensive discussion of limitations to banks' performance can be found in Roe, 2000.

[3] Before December 1995, banks did not need to create reserves for the borrowed funds in foreign currencies. To develop the primary market for the short-term government paper, the NBU guaranteed the yield on *OVDPs* not lower than the refinance rate, plus tax and reserve allowances (Drobiazko, Kudelia, and Matveichuk 1996, 44).

market and the banking license could be withdrawn, as well as determined the liquidation procedure and its duration by adopting the Instruction #115 "On the procedure of applying sanctions to banks which infringe the banking regulation" dated May 16, 1995.

Figure 1. Performance of commercial banks, millions UAH



Source: NBU.

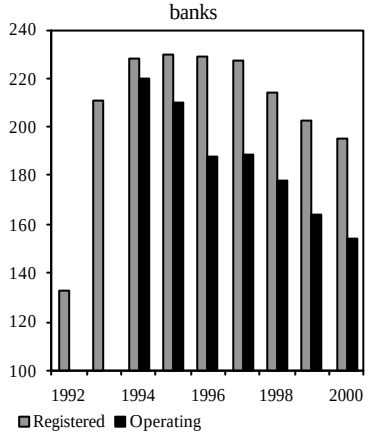
According to this document, the duration of the liquidation procedure could not exceed six months[4]. In the early 1996, according to the Resolution of the Parliament of Ukraine #24/96-ÂÐ "On amending the Law of Ukraine "On banks and banking activities" dated February 1, 1996, the NBU introduced new, stricter capital requirements for commercial banks. Thus, the entrance requirement for banks was raised: from now on, the statutory capital of a new bank could not be less than ECU 3mn; the existing banks were obliged to increase their capital up to ECU 1mn by January 1, 1998 according to the following schedule: June 1, 1996 - ECU 100,000; Oct. 1, 1996 – ECU 250,000; January 1, 1997 – ECU 500,000; July 1, 1997 – ECU 750,000; and January 1, 1998 – ECU 1,000,000. In addition, the NBU was authorized to withdraw the license for banking operations from banks which would not be able to meet the capital requirement. Further, the NBU started issuing licenses for some 37 banking operations and obtained the right to develop qualification requirements for banks applying for these licenses[5]. Finally, it introduced new sanctions for infringing the banking regulation and developed

[4] According to other decisions of the NBU regarding failing banks, the liquidation procedure hardly ever was completed over this short period. The new law on banks and banking activities requires that the liquidation procedure must be completed within three years after the date of the license withdrawal, which is more realistic.

[5] Resolution of the Board of the National Bank of Ukraine #77 "The rules of issuing licenses to banks" dated March 27, 1996.

21 performance norms[6]. In 1997, the NBU introduced the Electronic Funds Transfer System for collecting balances of commercial banks on a daily basis and thus attained almost perfect screening of banks' activities. In December 1997, it developed new, based-on-international-standards rules of regulating and analysing activities of commercial banks (Gros and Steinherr 1998, 223), and approved the corresponding instruction in April 1998.

Figure 2. Number of commercial banks



Source: NBU

Along with these changes, we can observe an increase in the number of banks that the NBU diagnosed as problematic: in 1996, 45 banks lost some of their licenses (ibid, 224), while in 1998 the number of initiated liquidation procedures and closures grew threefold, compared to 1996 and 1997 (see Table A1 of the Appendix)! That is, these tools allowed the central bank to explicitly deal with poorly performing and unsound financial institutions, while previously it lacked instruments to force them to close.

Still, the NBU never realized these powers on the full scale. The main reasons are:

(1) Undetermined timing in the application of the licensing and liquidation rules. According to the Resolution of the NBU's Board #268, the NBU adopts a decision to liquidate or reorganize a bank if it incurs losses over three consecutive months or 6 months over the year; inability to fulfill capital requirements; recall of the banking license. Even if after the maximum term of a year the NBU issues a

[6] Resolution of the Board of the National Bank of Ukraine #268 "On amending the procedure of applying sanctions to banks which infringe the banking regulation" dated October 16, 1996 and Instruction #10 "On the order of regulating and analyzing activities of commercial banks" dated December 30, 1996 (suspended in April 1998), respectively.

liquidation decision, the bank can retain the right to provide a restricted number of banking operations under the control of the local branch of the NBU. Besides, a term to the appointment of the liquidation commission (implying the full suspension of operations) is not determined by law and may become quite long. As to the fulfillment of capital requirement, the NBU have rarely, if ever used this instrument to initiate the closure, since the majority of banks (including systemic financial institutions) breached this requirement at least once. Rather, the NBU preferred to recall licenses for some banking operations from undercapitalized banks.

(2) Rationing in the application of liquidation procedures. Banks with a high lobbying power (especially big systemic banks and privately owned large banks) would be less likely to be declared bankrupt or insolvent due to their importance in financial intermediation and servicing of government and vested interest accounts. These banks are also less likely to become insolvent, as they have easier access (compared to small private banks) to government subsidies.

(3) the underdeveloped judiciary system and thus weak enforcement of bankruptcy law. No mechanisms and markets for selling banks' assets have been developed yet.

Summarizing, the year of 1995 can be considered a turning point at which the banking sector changed the direction towards the market-based operations. Implicit bailing out of poorly performing banks on the part of the government became less attractive in the conditions of more transparent banking regulation and concerned primarily large institutions, which we excluded from our sample. Thus, the medium-sized banks faced the need to improve their performance characteristics in order to survive. This allows us to apply the common Western theory of bankruptcy to the Ukrainian financial system with some modifications, the discussion of which follows.

Theoretical Model, Data Issues, and Specification

Method chosen: justification. In this part we explain why the pooled time-series probabilistic model, which is the most suitable for answering our question (stated at the beginning of this chapter) cannot be used due to data limitations and how we can overcome the problem using the available data.

The reviewed literature suggests that the probability of bankruptcy can be best identified by the pooled time-series limited dependent variable model, such as:

$$y_{it}^{*} = x_{it}^{'} b + a_i + e_{it},$$

where, y_{it}^{*} - the probability for bank *i* of becoming bankrupt (taking on 1) or staying sound (0) at time *t*, $x_{it}^{'}$ - vector of factors that affect and change this probability within a given time period, and a_i - either fixed unknown parameters or random error terms, depending on the underlying assumptions. Maximizing the loglikelihood function, we would receive consistent estima tors of betas (given that the specification is correct), which show how the probability of bankruptcy is affected by changes in X-vector over time. Unfortunately, we found it impossible to utilise the pooled time-series probabilistic model based on data available for Ukrainian banks. The reason follows.

Among other things, a binary-choice pooled time-series model requires the variation in the dependent variable, y_{it}. In particular, there is a point in time when y_{it} changes from 0 to 1, that is, sound bank *i* (assigned 0) becomes insolvent in period *t* (and takes on 1). In developed economies, this point can be identified on the basis of banks' annual reports, made available to rating agencies, industry groups, research and monitoring companies[7]. In Ukraine, there were no such publications before 1998, when NBU adopted stricter reporting rules for banks.

[7] In the US, for example, the reports can be obtained from the Securities and Exchange Commission, directly from the bank, or its web site).

Although the NBU was screening banks and calculating financial requirements, it kept them (and unfortunately, still keeps) in secrecy. Over 1995–1998, Finansovye Riski analytical review was the only comprehensive, yet not complete, source of information on banks performance. Commercial banks' managers could either send quarterly reports to editors or not, but usually stopped delivering them to the review as the performance of their banks worsened. Therefore, although we know the date when the NBU issued a decision to liquidate or reorganize an insolvent commercial bank, we cannot identify exactly when a particular bank reported marginal or negative performance, and can only guess which factor provoked the suit. This is exactly the point that brings limitations to the use of the pooled time-series model in our case and poses a challenge to the model specification.

Still, a roundabout way was found to deal with the problem[8]. A reasonable assumption is that statements of banks that would become insolvent were worsening over time. That is, the closer these banks are to the date of bankruptcy, the poorer their performance is. Therefore, we can substitute a pooled time-series model with several cross-section regressions (waves), each estimated for a single period, which we then compare over time.

Using the waves, we can think of both advantages and disadvantages of this alternative method. On the one hand, we can observe whether the probability of becoming bankrupt grows over time for a certain bank; whether all financial indicators worsen, or the effects of some of them change over time. For example, in more distant time periods, poor asset management may signal about forthcoming insolvency. As time passes, the bank can either improve its performance or suffer from a liquidity crunch and realize the dangerous potential (making profitability or other proxies for the quality of management even weightier). On the other hand, simple analysis of cross sections, or waves,

[8] The author is grateful to Prof. Lehmann for this suggestion.

restricts us to using only microeconomic indicators. That is, changes in macroeconomic environment cannot be accounted for explicitly (put in the model as dummy variables) and can only be present in the model as factors that affect changes in banks' performance indicators. Unfortunately, as we show in Chapter 3, the model containing such indicators did not bring any significant results. Therefore, our model will lack the flexibility with respect to macroeconomic environment, and this is the area for further research if one holds more data than we do.

For the purpose of current research we chose to use the probit model. There was no reason for rejecting the logit model: as Greene (2000, 815) notes, "it is difficult to justify the choice of one distribution or another on theoretical grounds". In binary choice models based on microeconomic data, the effect of heteroscedasticity or non-normality (in the probit case) is the most dangerous, for the maximum likelihood estimators of coefficients become inconsistent (Verbeek, 2000). This issue is controlled by the use of robust estimation techniques as proposed in Greene (2000), a so-called robust "sandwich' estimator for the asymptotic covariance matrix of the quasi-maximum likelihood. It allows receiving "…an asymptotic covariance matrix for an estimator that is biased in an unknown direction" (Greene 2000, 824). Thus, the model we are going to estimate looks as follows:

$$y_i = x_i^{'}\boldsymbol{b} + \boldsymbol{e}_i$$

$y_i = 1$ if bank *i* goes bankrupt

$y_i = 0$ if bank *i* stays sound

Here, the vector of $\boldsymbol{b}$ is estimated by using the method of maximum likelihood from the following function:

$$\log L(\boldsymbol{b}) = \sum_{i=1}^{N} y_i \log F(x_i^{/}\boldsymbol{b}) + \sum_{i=1}^{N} (1 - y_i) \log(1 - F(x_i^{/}\boldsymbol{b})),$$ where F(.) is the standard normal distribution function.

Data used. We analyze financial statements of medium-sized banks over the 2-year period, including 91 sound banks and 20 problem banks, based on their annual reports dated January 1996 and January 1997.

For the binary variable, we determine bankruptcy as inability to meet liabilities on time and in the full amount. According to Article 7 of the Instruction of the Board of the National Bank of Ukraine "On the procedure of applying sanctions to banks which infringe the banking regulation" #115 dated May 16, 1995, effective during 1995–1998, this was a sufficient reason for NBU to withdraw the license for banking operations. Therefore, we determine bank as bankrupt in case the NBU issues a decision to withdraw the license for banking operations and appoints the liquidation commission.

At the start, we will explain why we do not consider large banks in this work. There were 7 large banks over the discussion period[9], which assets accounted for some 80% of all bank assets (see table 2).

These banks were different from other banks in the following important aspects. Being the backbone of the financial system, these institutions would never be sued for bankruptcy, that is, they were too big to fail. They were so-called systemic banks that serviced current accounts of system institutions (nation-wide government programs, social, and pension funds) and accounts of the largest industrial enterprises. Consequently, sources of income in these banks were stable and sizeable, which in many cases led to the moral hazard with respect to the use of the available assets. On the other hand, the optimal allocation of funds in these banks was not achieved due to (1) the pressure on the part of the government, which, as the main provider of funds, had the power to influence managers' investment decisions and (2) the lack of adequate training (following Soviet-style allocation plans). The main confirmation to this story is a

[9] These include (sources of funds in brackets): Prominvestbank [services to the industrial sector], Ukraina bank [agriculture], Ukrsotsbank [social services], Oschadbank [savings accounts and the electricity sector accounts], UkrEksImbank [foreign trade], Pyvatbank [services to small businesses], and Aval [pension accounts and accounts of the State Mailing Service].

huge bulk of non-performing loans accumulated by these banks, which follow irreparably insolvent bank Ukraina.

Table 2. Assets of 7 largest banks as of January 1, 1996

	Assets, thousands UAH	% in total banking system assets
UkrEksImbank	2,923,159*	22.41
Prominvestbank	2,383,950	18.27
Ukraina	1,769,682	13.56
Ukrsotsbank	1,203,265	9.22
Oschadbank	1,100,463	8.44
Pryvatbank	599,017	4.59
Aval	399,749	3.06
Total	10,378,283	79.55
Banking system total	13,046,240	—

*including the government credit line of UAH 1,422,470

Source: Kalyna Information Agency.

In addition, systemic banks have an already established pan-national branch network. Thus, they do not need to compete for the market share and spend money for attracting new clients. For example, Ukraina bank and Oschadbank had their representative offices in every small village and town already in 1991, capturing all the market and leaving no space for other financial institutions to compete. Summarizing, the largest banks comprise a different sample which needs separate consideration.

Therefore, we concentrate on analyzing financial statements of medium-sized banks (assets<=UAH 100mn) and use only data on these banks in the regression analysis. We assume these banks to be homogenous and being profit-maximizers.

The choice of a period for the analysis has been made on the basis of the similar research in the Western economies, as well as in the context of the Ukrainian banking sector development, which we discussed in the previous section. On the one hand, previous studies, irrespective of the method used, strongly emphasized the need to utilize performance indicators available for periods, reasonably prior to the bankruptcy suit. For example, Altman (1968)

bases his corporate bankruptcy research on data available on 7.5 months prior to the date of bankruptcy; Ohlson (1980) uses the average lead time of three years; Meyer and Pifer (1970) test performance indicators over six preceding periods. However, the latter study concludes that the difference between financial statements of the two groups of banks becomes insignificant already in the third year, weakening further to the sixth. We decided to rest the analysis on the lead time, which is less/equal to two years, in particular 1995 and 1996.

Table 3. Dynamic of bank liquidations over 1996–2000

	Liquidated banks	Liquidation committee
1996	11	8
1997	10	6
1998	**16**	7
1999	11	8
2000	5	9
Total	52	38

Source: *Herald of the National Bank of Ukraine* 5 (May, 2000): 22-33.

On the other hand, we analyzed the dynamic of bank liquidations over the period 1996–2000 as shown in Table 3. Bank liquidations peaked in 1998, while the number of appointed liquidation committees was the highest in the after-crisis period. Thus, it seems natural to analyze the reasons for banks' aggravated mal-performance in 1998. At this point, we want to question a commonly accepted tale that banks liquidations in 1998 peaked in response to the August financial crisis, due to weighty holdings of government paper in banks' portfolios. As Table A1 of the Appendix shows, the majority of them were liquidated well before the crisis burst out.

Specification of the model: justification. We chose regressors for our model based on the frequency of their occurrence in the literature on early warning models, their relevance for the Ukrainian context, and data availability. As we have already noted, the early warning models are not homogenous in the use of financial indicators. To test their hypotheses, researchers rely on different specifications of the model and thus on various indicators. Usually, these indicators fall into two categories: microeconomic factors and structural

characteristics of the home economy (Demirgüç-Kunt and Detrigiache, 1998a). The first category comprises CAMEL-style indicators that reflect five aspects of banks' performance: capital adequacy, asset quality, management, earnings, and liquidity. The second category comprises characteristics that have a direct impact on the development of the banking sector: real GDP growth, GDP per capita, current account imbalance, the rate of inflation, growth rate of household deposits and loans extended to businesses (Lindgren and Saal, 1996).

According to Ukrainian legislation, Ukrainian banks should meet 18 performance norms (see Table A2 of the Appendix for the full list, the calculation method, and indicators' target values), which are divided into 3 groups and assess liquidity, capital adequacy, and riskiness. We found it difficult to obtain information only on the third group of indicators and could measure only three of them, including the maximum volume of inter-bank bans extended, the maximum volume of inter-bank loans payable; open foreign exchange position. Since these norms do not mirror all aspects of bank performance (and they should not), we add some other indicators, which provide information on banks' size, asset management, location, branch network, and ownership. In our one-period regressions we also cannot control for changes in macroeconomic and institutional environment and thus have to use some proxies. The description of indicators, mnemonics for the regressions, and expectation regarding the signs follow in Table 4. To adequately compare the two cross-sections, we adjust all 1996 indicators for inflation.

With time, the scale of effect of different factors may change. In particular, larger and better managed banks are more likely to overcome liquidity problems or meet capital requirements: creditors are not likely to immediately close their doors in front of reputable clients. Besides, efficient banks are better at detecting potential causes of future problems and therefore react faster. For example, they may decrease the risk exposure by adjusting the composition of their asset portfolios or reduce costs by closing loss-making regional branches. In

addition, private banks are more likely to be well managed and flexible. In line with this reasoning, we expect that the effect of structural and liquidity indicators will be greater in more distant-from-failure periods, while performance and size indicators will dominate in closer periods. Meantime, changes in the capital adequacy ratio had primarily been driven by the legislation and NBU's interim schedule of increasing the capital size, which we presented above. We expect that less capitalized and smaller banks would raise their capital by a larger proportion than sound and sizable banks. Besides, if interim requirements are not fulfilled, it becomes harder to keep to the schedule in the future. Thus, the capital adequacy ratio may become a more significant factor the closer the date of bankruptcy is.

Table 4. Indicators that affect the probability of failure

Variable (mnemonics)	Description	Expected sign
	Microeconomic factors	
Liquidity (LIQ_TOT, LIQ_IM, REC_PAY)	Liquidity indicates bank's ability to meet liabilities on time. We use both the immediate liquidity ratio ((cash+correspondent account in the central bank)/clients' checking accounts) and the overall liquidity ratio (net assets/net liabilities).[10] According to the effective law, the ratios should not be less than 20% and 100%, respectively. Sometimes, receivables-to-payables ratios are used in this context	–
Capital adequacy (CAD)	Size of capital/total assets net of reserves. Indicates the degree to which bank's shareholders and lenders are protected against potential losses. According to the effective law, cannot be less than 4%.	–
Size (SIZE)	Size is a measure of bank's financial stability and therefore is best analysed in levels.	–
Asset management (ROA, ROE)	The quality of bank asset management is best measured by profitability ratios: return on assets (ROA) or return on equity (ROE). The effective law recommends the levels of 1% and 15%, respectively. Sometimes, change in loans/total assets and change in deposits/total assets ratios are used in this context.	–

[10] We use the net assets and liabilities instead of the total because banks used the Soviet accounting rules and performed double accounting of the following entries: interbranch fund turnover, foreign currency position, expenditures of the future periods, uncollected revenues, and profits.

Table 4—*Continued*

Variable (mnemonics)	Description	Expected sign
Securitisation of assets (L_CAP, RECE_RES, OVDP_CAP, PAY_CAP)	Loans-to-capital, receivables-to-reserves, and OVDP-to-capital ratios show the degree to which a bank secures potential defaults on the part of its clients. The greater the ratios, the less protected against losses the bank is. Also, banks usually create reserves to be able to meet their liabilities in front of depositors and creditors, as reflected by the payables-to-capital ratio. This indicator also shows which policy the bank chooses: either to work with borrowed funds or with its own capital. Initially, when the bank is not mature, the ratio can be large, because the bank needs to accumulate profits to reduce its exposure to the lenders' demand.	+
Structure of assets (IEA_A, OVDP_IEA, RECE_A IBL_E, IBL_P)	The structure indicators measure bank's ability to diversify risks and manage assets. We constructed the following ratios: income-earning assets/total assets (IEA_A), government paper/income-earning assets (OVDP_IEA), receivables/total assets, and inter-bank loans/income-earning assets (IBL). In line with the effective law, we could measure only two out of NBU's ten risk normatives: maximum amount of inter-bank loans extended (IBL_E) and payable (IBL_P), calculated as shown in Table A2 of the Appendix. According to the law, IBL_E cannot exceed 200% and IBL_P cannot be more than 300%. Some of these indicators raise the riskiness of operations, while the other decrease it.	+/–
Ownership (OWNERSHIP)	The potential of becoming bankrupt can be explained through the form of bank ownership in two ways. On the one hand, state banks are usually less efficient and therefore more "bankruptcy-prone". On the other, state bank might be more likely to avoid the license recall, being supported by the government. The latter would breach our assumption about banks' homogeneity and equal access to information. Estimated as a dummy variable: 0 stands for state banks, while 1 for commercial banks.	+/–
Region (REGION)	Banks established in developed regions are more likely to survive compared to the depression regions. Estimated as a dummy variable: 1 if bank is located in Kyiv city and other 6 most developed regions[11], 0 otherwise.	–

[11] As taken from Economic Essays, 2000. Study identifies the regional development on the basis of a set of macroeconomic indicators, including GDP per capita, GDP growth rate, wage arrears, revenues of the local budget etc. 6 most developed regions include: Dnipropetrovsk, Donetsk, Kharkiv, Lviv, Odessa, and Luhansk.

Branches (BRANCH)	The number of branches can either add to or subtract from the bank's success. On the one hand, a developed branch network allows a bank to attract more clients and earn higher profits, while on the other it can be costly to maintain branches in distant and less-developed regions. Estimated as a dummy variable: 0 if bank has no regional branches, 1 – otherwise.	+/–
Years in business (Y_BUSI)	A bank that has been operating for a longer time period is less likely to go insolvent, for it had more time to accumulate profits, work on management styles, and improve performance. Estimated as a dummy variable: 0 if bank has been operating less than 3 years, 1 – more than 3 years[12].	–
Macroeconomic factors		
Deposit and loan growth rates (DSUM2, L2)	In a cross-section model, these ratios may reflect the investment and borrowing potential of economic agents (and thus serve as a proxy for economic growth), who (being rational) would borrow more from successful banks. On the other hand, rapid growth of loans extended may reflect higher riskiness of bank's investment policies	+/–
Capital growth rate (CGR)	This ratio may reflect banks' ability to meet the central bank's capital requirements. We assume that less successful banks will need to raise their capital by a higher proportion.	+/–
Securities growth rate (SGR)	A change in holdings of securities may reflect the development of the securities primary and secondary market. We consider this as a positive factor for performance, for it enables banks to diversify their assets.	–

Now we turn to econometrics to test our preliminary hypotheses.

[12] As of January 1996, the earliest period we consider, there had already been 5 years of market reforms. On the average, three years seems to be a lengthy period of operation in the new environment.

Chapter 3

EMPIRICAL RESULTS

Profile analysis. Firstly, we would like to turn to the profile analysis of financial indicators chosen for our regressions. In Table 5, four sets of data are presented, including financial indicators for sound banks over 1995 and 1996 and performance indicators for the problem banks for two and one years prior to bankruptcy.

Table 5. Profile analysis for 91 sound and 20 problem banks over 1995–1996, indicators adjusted for inflation

VARIABLE	NON-BANKRUPT FIRMS (1995)	NON-BANKRUPT FIRMS (1996)	TWO YEARS PRIOR TO BANKRUPTCY	ONE YEAR PRIOR TO BANKRUPTCY
Y_BUSI	0.59	0.62	0.42	0.47
REGION	0.35	0.35	0.13	0.13
BRANCH	0.46	0.47	0.56	0.57
OWNERSHIP	0.54	0.54	0.68	0.68
SIZE, hryvnias	18 257 807	16 647 848	4 230 665	5 401 730
SIZE_ln	16.72	16.63	15.26	15.50
ROA, %	11.53	12.46	8.46	5.92
ROE, %	38.40	34.47	28.10	16.24
L_CAP, %	151.53	122.95	180.05	149.19
PAY_CAP, %	23.01	18.26	9.62	31.23
LIQ_IM, %	175.37	83.47	67.91	251.88
LIQ_TOT, %	102.20	102.76	104.17	102.77
RECE_RES, times	48.53	27.20	11.13	25.27
RECE_A, %	6.85	7.59	3.74	8.23
REC_PAY, times	54.67	4.08	4.47	1.84
IBL_E, %	25.56	19.92	24.04	16.98
IBL_P, %	30.77	38.04	55.79	11.56
CAD, %	39.05	41.28	37.92	47.70
IEA_A, %	62.45	67.68	62.29	69.81
OVDP_CAP, %		22.97		4.72
OVDP_IEA, %		8.86		3.11
CGR, times		1.84		2.19
SGR, times		28.52		5.15
DSUM2, %		34.70		49.74
L2, %		104.88		530.66

Firstly, the average size of sound banks was greater than the size of the problem banks over 1995–1996. A larger proportion of well-performing institutions were state-owned, located in the Kyiv-city or other 6 developed regions; and operating for a longer time period. In each period, the number of branches kept by the problem banks exceeded that by the sound banks. Over the two years, the return on assets and capital increased for the first group of banks (ROA and ROE), but decreased for the second and amounted to roughly 50% of the return earned by viable banks. In 1996, sound banks kept a much higher proportion of the government paper in their asset portfolios (OVDP_IEA), as well as raised their holdings of securities 29 times (SGR).

Although the share of income-earning assets in total assets was roughly the same across the groups, viable banks performed better asset management. Thus, loans extended by sound banks were more secured against the default risk, for they secured each hryvnia of loans by 0.68 hryvnias of their capital in 1995 and by 0.82 in 1996 (L_CAP), while the problem banks secured each lent hryvnia by only 0.5 and 0.67, respectively. On the other hand, loans extended by the problem institutions increased by impressive 530% over the year compared to 105% by the sound banks. The same concerns the government paper, which was backed by more reserves in the first group of banks than in the second (OVDP_CAP). Meantime, the resource base differed significantly for the groups: sound banks attracted 3 times as many deposits as the problem banks over 1996.

Over the two years, the amount of extended inter-bank loans decreased for both groups of banks, still by a larger amount for the second group. A possible explanation may by the availability of more attractive money market instruments, such as operations in the FX or securities markets. Far more impressive is the difference in the dynamic of inter-bank loans payable. Thus, while sound institutions borrowed more from other banks in 1996 compared to 1995, the problem banks cut their dependence on this source of financing fivefold! This may be explained by the shrinking potential in paying back the

increasing debts by the problem banks (accounts payable (PAY_CAP) grew three times y/y) and the banking community reluctance to lend to these banks.

Meantime, according to our prior expectations, the problem banks raised their capital more rapidly than the sound ones (as reflected by CGR). This may be explained by the fact that the latter were larger on the average and better capitalized initially. That is, the smaller (and potentially less stable) banks were making more effort to meet the NBU's requirement of raising the size of capital. As a result, the capital adequacy ratio grew by only 2% for the group of sound banks and by impressive 10% for the problem institutions.

Based on the above, we can conclude that performance indicators of the problem banks did worsen over time, while sound banks were better at optimizing the structure of their assets and at improving their performance measures. On the average, sound medium-sized banks were larger than the problem banks; a larger proportion of them were in state ownership; located in better developed regions; and being more years in business. To test the scale of the effect of these indicators, we turn to the regression analysis.

Regression results: major findings. The regression results are shown in Table 6 below. We found it a fairly difficult task to develop a unique specification for the two time periods: the "best specification" for 1995 data did not suit 1996 data, and vice versa. As we pointed out earlier, this may happen because the influence of different factors changes over time, which the cross-section model cannot account for. Thus, we firstly present specifications for 1995 and 1996 years, which are not directly comparable, but have the best properties among the alternatively estimated regressions. These appear in columns 1 and 3 for 1995 and 1996, respectively. Then, we fit our data for 1996 into the specification for the year of 1995 (which is simpler and thus reflects factors that influence failure better) to examine possible changes in the scale of effects of similar variables. The result is shown in Column 2. Column 4 is the 1996 model where we include

loans, deposits, and securities growth rates, to control for changes in the macroeconomic environment.

Table 6. Probit estimates of the bankruptcy probability function, as reported by Stata program

VARIABLE	OUTPUT FOR 1995 (I)	OUTPUT FOR 1996 (I)	OUTPUT FOR 1996 (II)	OUTPUT FOR 1996 (III)
	(1)	(2)	(3)	(4)
Y_BUSI	-.0143 (.060)	-.094* (.061)	-.062* (.059)	-.071* (.058)
REGION	-.065 (.057)	-.096* (.042)	-.072* (.043)	-.082* (.044)
BRANCH	.106* (.069)	.077* (.068)	.055* (.055)	.076* (.067)
OWNERSHIP	.100* (.059)	.039 (.037)	.018 (.025)	.050 (.035)
SIZE_ln	-.073* (.033)	-.040* (.030)	-.025* (.020)	-.030* (.025)
ROA	-.376 (.433)	-.316 (.261)		
ROE			-.151* (.090)	-.158 (.102)
L_CAP	.062* (.023)	.048* (.030)	.059* (.035)	.055* (.029)
PAY_CAP	-.219* (.133)	-.096 (.212)		
LIQ_TOT			-.185 (.247)	-.078 (.379)
IBL_P			-.063* (.045)	
RECE_RES			-0.0001 (0.0002)	
OVDP_IEA			.044 (.153)	
L2				.006* (.003)
DSUM2				-.016 (.017)
SGR				-.0002* (.0001)
Regression statistics	Wald chi2(8) =16.21 Prob>chi2 =0.0394 Pseudo R2 = 0.22 Log L = -34.1 obs. P .17 pred. P.10 (at x-bar)	Wald chi2(8) =23.61 Prob>chi2 =0.0027 Pseudo R2=0.30 Log L= -21.39 obs. P.13 pred. P.04	Wald chi2(11) =34.09 Prob>chi2 =0.0003 Pseudo R2= 0.36 Log L = -19.32 obsP .13 pred P .04	Wald chi2(11) =37.15 Prob>chi2 =0.0001 Pseudo R2= 0.36 Log L = -19.22 obs. P .13 pred. P.04

Note. We give marginal effect probit estimates[13]. Robust standard errors are shown in brackets.
*Significant at 10% level.

[13] Marginal effect, unlike the slope coefficient, shows how a unit change in the variable (keeping all other variables unchanged) adds to the probability of bankruptcy measured by the conventional bound [0,1].

First, in all our models the signs of variables turned to be as expected. Thus, there is a strong evidence that the location in a distant region and maintenance of regional branches raise the probability of failure, while an increase in assets reduces it. On the other hand, stability of a bank is positively related to the securitisation of risks and asset diversification, as measured by loans/capital and growth rate variables.

Second, across different specifications for the two years, only several variables showed significant robustness. These include banks' number of branches, size, loans growth rate, securities growth rate and, to a lesser extent, years in business and location variables. Profitability, securitization of assets, and ownership variables showed marginal robustness. Throughout the tests, only the liquidity measure and deposits growth rate turned out to be insignificant.

Third, in the 1995 regression, the branch network has the heaviest positive effect on the bankruptcy potential among the robust variables, followed by the negative effect of size. Among the marginally significant indicators, payables-to-capital ratio and ownership indicator were the most important. In a comparable regression on the 1996 data and the best-specified regression for 1996 we found new variables, which significantly explain bank's soundness, including location and years in business. Meantime, the effect of the branch network and size variables weakened in 1996, while the scale of the loans-to-capital ratio remained relatively unchanged.

Finally, our best specification for 1996 showed a dominance of asset management measures (with the profitability ratio at the top of the list) over bank's innate characteristics. However, the specification that controls for changes in macroeconomic environment (column 4 in table 6) did not support this outcome. At the same time, the impact of the ownership dummy sufficed in all regressions on the 1996 data.

Interpretation of the results. Let us now take a closer look at the regressions. In the group of our robust variables estimated in the 1995 model, the effect of the branch network variable on the bankruptcy potential was the largest. As it weakened over time, we suspected that banks cut on their high-cost branches over 1996. However, we could not find a supportive evidence to this idea, as our profile analysis showed an increase in the branch network for both groups in 1996. Since this number reflects only the net change in branch closures and openings, it does not allow tracing the dynamic of this indicator. Therefore, our suggestion is that only branches in some regions (probably, underdeveloped ones) were causing losses to banks.

A heavy impact of the marginally significant payables-to-capital ratio (PAY_CAP) in the 1995 model may be explained as follows. Banks transfer payables into income-earning assets which generate either profits or losses in the next periods. In the Ukrainian case, taking into account the marginal effect of the profitability ratios and insignificant PAY_CAP variable in the 1996 comparable model, these were likely to translate into non-performing loans (as reflected by the significant positive loans-to-capital ratio), and represent a substantial risk for bank's stability. A large positive effect of the ownership variable in the 1995 regression suggests that these were private commercial banks, which involved in risky operations.

In the regressions on the 1996 data the location and years in business dummies became important for explaining bank's soundness. While the former is a choice characteristic, the latter explains the importance of bank's reputation and quality of asset management. To illustrate the importance of these factors, we use a stylised example presented below. Meantime, the effect of the size variable weakened in 1996. We thought of reasonable explanations for this phenomenon and ended up with a technical one: inflation reduced assets of viable banks (as suggested by the profile analysis at the beginning of the chapter) and thus negatively influenced the scale of the coefficient.

In our opinion, the specification that controls for changes in macroeconomic environment (Column 4 in Table 6) is the most enlightening. Firstly, it explains the differences in banks' performance across Ukraine's regions, as well as the positive effect of the extensive branch network on the bankruptcy potential: with the deposits growth rate being insignificant and the loans growth rate being very small, banks cannot expect successful performance in depressive regions. Branches in these regions would not be able either to raise funds by attracting deposits or earn profits by lending to businesses. That is, banks are likely to survive in more developed regions, which offer other means to existence and development

Secondly, the positive sign of the loans growth rate variable suggests that banks rather implemented poor monitoring policies and undertook risky investment plans than created profits and attracted solvent clients. The positive effect of the loans/capital ratio on the probability of failure also supports this conclusion.

Finally, the securities growth rate turned to be the least significant (in terms of the scale) measure of banks' stability. Thus, although the development of the securities market proved to be a positive factor for banks' ability to diversify their assets and thus reduce their fragility, it still had a very limited effect on the bankruptcy potential. Besides, the effect of the government paper holdings by banks did not prove to be significantly affecting banks' stability in any model for 1996 data.

Surprisingly, we did not find any sure confirmation regarding our prior expectations of the impact of ownership on bank's soundness. The measure turned to be only marginally significant, implying that either bank's form of ownership does not have a decisive effect on the central bank's resolution to initiate a bankruptcy suit or this indicator does not reveal the true information. For example, some commercial banks may be governed by people who are closely connected to the government. On the other hand, the sign of the

ownership measure is positive, suggesting that a private bank is more likely to be filed for bankruptcy. Thus, it may be the case that a private bank is more aggressive and risky in developing and implementing its investment schemes.

We would also like to comment on the insignificance of the liquidity measure and deposits growth rate. With the former it could be the case that it does not vary significantly between the two groups of banks. While Ukrainian sound banks normally keep a large proportion of cash in their assets (17% in 1995) because of the changing NBU regulations and the need to cover numerous risks, failing banks might keep their assets in cash because they lost licenses for operations in the money and capital markets or face other restrictions. As to the latter, which we interpret as a control variable for the change in household welfare (DSUM2), it may reflect a poor potential of banks to attract households' savings, as well as reluctance of households to provide banks with their precious assets.

Based on this, we can conclude that such a-priori characteristics of a bank as ownership and concentration of assets (controlled by the branch network indicator) dominate the performance measures in more distant-from-bankruptcy periods. As time passes, the quality of asset management becomes more important, as well as bank's location and years in business. Throughout the time span, however, the effect of banks' choice and inner characteristics (controlled by dummy variables in the regressions) dominate the effect of asset management measures.

Stylised example. To reinforce our conclusions and throw the light on the importance of bank's location and years in operation, we set up a small example. Let us take bank 1, which is senior, small, poorly managed and located in a developed region and bank 2, which is new, large, well-managed and located in the provinces. Initially, only a change in the size may avert bankruptcy in the next two years for both banks. However, already in the following year bank 1 can

reduce the probability of bankruptcy by one fifth simply by virtue of its years in business and location, while bank 2 can only make advantage of its size by raising it fivefold to get a comparable effect (with the profitability measure being only marginally significant). Even if the profitability measure is significant, bank 2 will experience bankruptcy on equal terms with bank 1. Is this the optimal outcome? Perhaps not, because bank 1 "buys" efficiency through its connections, which proved not to be stable in the uncertain political environment of Ukraine. Connections are also not a better warranty for potential bank creditors, including investors and depositors, than traditional guarantees of stability provided by bank 2. Who suffers then? Both bank 2, which struggles hard to remain afloat, and potential creditors, which have equal chances of picking up a "lemon" or a "peach". What is the outcome? Founders of potentially profitable and successful financial institutions do not enter the market, while creditors look for more profitable and less risky investment opportunities in other than the financial sectors. Even with this small amount of information at hand, we described the current state of affairs in the banking sector of Ukraine quite closely.

Chapter 4

CONCLUSIONS

In this work, we attempted to determine indicators that affect the probability of bankruptcy of a Ukrainian medium-sized bank. Our analysis showed that in the Ukrainian banking sector, unlike in that of developed Western economies, a relationship between bankruptcy and performance measures is rather weak. Rather, innate characteristics, such as location, reputation, and ownership determine stability of a bank and dominate the effect of size and asset management measures. In our model, the latter becomes important only in the immediate vicinity of bankruptcy. Therefore, our conclusion is that a large (within the group of medium-sized banks), well-managed new bank located in a distant region has almost equal or lower chances to survive compared to a smaller, poorly managed senior bank located in a developed region of Ukraine.

In Ukraine, it is perhaps the case that after the collapse of socialism the developed urban areas became wealthier, while rural areas became poorer than before. As a result, there was no way for a profit-oriented financial institution to survive in the distant regions, where barter transactions prevailed and cash incomes were rare. On the other hand, location in a developed region contributed to the stability of a bank through an easier access to information and an opportunity to establish close connections with decision-makers.

Meantime, we did not find a confirmation that bank's form of ownership significantly affects the potential of being filed for bankruptcy. The reasons may be that the central bank does not decide to initiate a bankruptcy suit on the basis of this information or this indicator does not reveal the true information and some commercial banks serve as pocket banks to crony government servants.

In general, information about bank's bankruptcy potential is revealed neither by its financial statements, nor by its status. This implies that even if a smart economist has the whole bunch of financial indicators reported by a bank, he or she will not be able to judge about bank's prospects to survive. This is also reflected in rather weak predictive properties of our models as shown by the number of predicted failures in Table 6. The pool of sound banks can contain failing banks, which financial indicators simply do not reflect their bankruptcy potential. We believe that banks' disaggregated financial statements would tell us a bit more about this potential, but such statements were not available to us. On the other hand, the incorporation of changes in macroeconomic environment in our model was rather limited, which also subtracts from the quality of research.

What are the implications of our conclusions? Strict policies of NBU regarding commercial banks is a necessary but not a sufficient condition for improving the performance of the banking sector. A no less important condition is the availability of information on banks and thus the creation of equal conditions for their operations. This would help attract investors and creditors' funds into the sector and establish the sector as a true mediator between entrepreneurs who demand investments and agents who are willing to invest their savings. On the other hand, further development of the banking sector in a more transparent environment is not possible without the consolidation of their resources. This conclusion stems from banks' inability to enjoy the economies of scale in the conditions of high operational costs, combined with a narrow clientele base and limited investment opportunities. By consolidating their assets and efforts, banks would reduce costs per client and per branch, engage in the wholesale market operations, which are usually more profitable, and as a result, raise profitability and increase capital. In addition, larger banks are more likely to establish reputation and attract solvent borrowers and wealthy clients. Definitely, the speed of this change depends on the macroeconomic environment, acceleration of reforms, and a rapid growth of viable businesses. This would help

reduce the risk of default on loans, reduce the monitoring costs, and guarantee more stable operational conditions for banks.

Ability to pursue further research depends on data availability. So far, we have been restricted to one-time cross-section estimations, making a poor account of changes in macroeconomic environment. As a result, our initial idea to develop an early warning tool for policy makers remained unrealized. Undertaking country-wide measure research to the effect of various macroeconomic policies on home banking sectors would also be interesting. This, we believe, would bring about more discussions and research in this field.

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APPENDIX

Table A1. Dates of liquidation and appointment of the liquidation commissions

	1996	1997	1998	1999	2000
Vidrodzhennia	*LC 07/96				
Azcherkombank	LC 07/96				
Lisbank	LC 08/96				
Promin	**L 12/96				
Liko		LC 06/97			
Obolon		LC 08/97			
Vuhleprogresbank		L 02/97			
Kharkivlegbank		L 03/97			
Krym-bank			LC 07/98		
Ukrkharchoprombank			LC 10/98		
Zavodbank			LC 11/98		
Krymkredyt			LC 12/98		
Geobank			L 03/98		
Dnipro			L 03/98		
Ros			L 03/98		
Monolitbank			L 04/98		
Dnisterbank			L 07/98		
Ekonombank			L 07/98		
Ternopilkredyt			L 08/98		
Universbank			L 11/98		
Shakhtekonombank				LC 02/99	
Agroinvestbank				LC 03/99	
Azovbank				LC 04/99	
Torhovo-promyslovy				LC 05/99	
Volyntorhinvest				LC 10/99	
Halytsky				L 07/99	
Armand				L 07/99	
Trast				L 08/99	
Antek				L 10/99	
Budmbank					L 02/00
Podillia					L 02/00
Arkadia					L 03/00
Ukrnaftohazbank					L 03/00
Era					N/A
Kniazhy					N/A
Inko					N/A
Gradobank					N/A
Mykkombank					N/A

Note: *LC – date of the Liquidation commission appointment, **L – date of bank's liquidation

Source: *Herald of the National Bank of Ukraine* 5 (May, 2000): 22-33.

Table A2. Performance norms of the National Bank of Ukraine

#	NORMATIVE	FORMULA	TARGET VALUE:
1.	Bank capital		UAH 10mn*
2.	Minimal size of the statutory fund		UAH 27.3mn**
3.	Solvency	(Capital/risk-weighted assets)*100%	Not lower than 8%
4.	Capital adequacy	(Capital/assets)*100% (both net of reserves)	Not lower than 4%
5.	Immediate liquidity	((Cash+reserves in NBU)/checkable deposits)*100%	Not lower than 20%
6.	Total liquidity	(Total assets/Total liabilities)*100%	Not lower than 100%
7.	Liquid assets-to-operating assets ratio	Liquid assets/operating assets	Not lower than 20%
8.	Maximum risk per depositor	(Accounts receivable/Capital)*100%	Not greater than 25%
9.	Big credit risk	(Sizable loans/capital)*100%	Not greater than the capital size multiplied by 8
10.	Maximum amount of loans to one insider	(Loans per insider/Capital)*100%	Not greater than 5%
11.	Maximum amount of loans to all insiders	(Total loans to insiders/Capital)*100%	Not greater than 40%
12.	Maximum amount of extended inter-bank loans	(Extended inter-bank loans/capital)*100%	Not greater than 200%
13.	Maximum amount of payable inter-bank loans	(Payable inter-bank loans/capital)*100%	Not greater than 300%
14.	Investment position	Bank investment/(Capital+Securities+shares)*100%	Not greater than 50%
15.	Open FX position	Foreign currencies position/capital	—
16.	Open FX position in fully convertible currencies	Foreign currencies position in fully convertible currencies/capital	—
17.	Open FX position in non-convertible currencies	Foreign currencies position in non-convertible currencies/capital	—
18.	Open FX position in all bank metals	—	—

* As of April 1, 2000

**EUR 5mn, calculated by the NBU current exchange rate

Source: Board of the National Bank of Ukraine, 1998. *Instruction on the regulation and analysis of commercial banks' performance*Serial #141.

Table A3. Probit estimates for the 1995 regression (as reported by Stata program)

```
. dprobit  y y_busi region branch ownshp  size_ln roa  l_cap   pay_cap, robust

Iteration 0:   log likelihood = -43.435164
Iteration 1:   log likelihood = -35.174274
Iteration 2:   log likelihood =  -34.17385
Iteration 3:   log likelihood = -34.098203
Iteration 4:   log likelihood = -34.097507
Iteration 5:   log likelihood = -34.097507

Wald chi2(8)  =  16.21
Prob > chi2   = 0.0394
Log likelihood = -34.097507
Pseudo R2     = 0.2150

------------------------------------------------------------------------------
             |               Robust
           y |      dF/dx   Std. Err.      z    P>|z|     x-bar  [    95% C.I.   ]
-------------+----------------------------------------------------------------
  y_busi*|  -.0142894   .0602931    -0.24   0.812    .57732  -.132462  .103883
  region*|  -.0647277   .0568078    -0.96   0.337   .309278  -.176069  .046614
  branch*|   .1063773   .0688333     1.61   0.107   .474227  -.028534  .241288
  ownshp*|   .1001427   .0590183     1.68   0.093    .56701  -.015531  .215816
 size_ln |  -.0731845    .032525    -2.42   0.015   15.4883  -.136932 -.009437
     roa |  -.3764258   .4326881    -0.86   0.392   .110235  -1.22448  .471627
   l_cap |    .061848    .023394     2.67   0.008   1.56233   .015997  .107699
 pay_cap |  -.2188969   .1329467    -1.65   0.099   .208029  -.479468  .041674
-------------+----------------------------------------------------------------
  obs. P |   .1649485
 pred. P |   .0964862  (at x-bar)
------------------------------------------------------------------------------
(*) dF/dx is for discrete change of dummy variable from 0 to 1
    z and P>|z| are the test of the underlying coefficient being 0
```

Table A4. Probit estimates for the 1996 regression (as reported by Stata program)

```
dprobit  y y_busi region branch ownshp  size_ln roe  liq_tot   ibl_p  l_cap
ovdp_iea rece_res, robust

Iteration 0:   log likelihood = -30.007181
Iteration 1:   log likelihood =   -21.6158
Iteration 2:   log likelihood = -19.878869
Iteration 3:   log likelihood =  -19.35983
Iteration 4:   log likelihood = -19.316451
Iteration 5:   log likelihood = -19.315892
Iteration 6:   log likelihood = -19.315892

Probit estimates
Wald chi2(11) =  34.09
Prob > chi2   = 0.0003
Log likelihood = -19.315892
Pseudo R2     = 0.3563

------------------------------------------------------------------------------
             |               Robust
           y |      dF/dx   Std. Err.      z    P>|z|     x-bar  [    95% C.I.   ]
-------------+----------------------------------------------------------------
  y_busi*|  -.0622232   .0597507    -1.64   0.100   .594937  -.179332  .054886
  region*|  -.0720015   .0439472    -2.13   0.033   .329114  -.158136  .014134
  branch*|   .0559033   .0553842     1.69   0.092   .506329  -.052648  .164454
  ownshp*|   .0185188   .0259403     0.71   0.480   .582278  -.032323  .069361
 size_ln |  -.0250377   .0207357    -1.89   0.058    15.895  -.065679  .015604
     roe |  -.1515293   .0900863    -1.77   0.077   .331204  -.328095  .025037
 liq_tot |  -.1856832   .2470253    -0.78   0.436   1.02745  -.669844  .298477
   ibl_p |  -.0629069   .0453817    -1.63   0.104   .356479  -.151853   .02604
   l_cap |   .0591454   .0351937     2.51   0.012   1.28483  -.009833  .128124
ovdp_iea |   .0440725   .1534819     0.29   0.771   .081097  -.256746  .344891
rece_res |  -.0001397    .000154    -1.01   0.312   27.1137  -.000441  .000162
-------------+----------------------------------------------------------------
  obs. P |   .1265823
 pred. P |   .0357673  (at x-bar)
------------------------------------------------------------------------------
(*) dF/dx is for discrete change of dummy variable from 0 to 1
    z and P>|z| are the test of the underlying coefficient being 0
```

Table A5. Probit estimates for the 1996 regression including proxies for macroeconomic environment (as reported by Stata program)

```
dprobit  y y_busi region branch ownshp  size_ln roe  l_cap  liq_tot  l2   dsum2
sgr, robust

Iteration 0:   log likelihood = -30.007181
Iteration 1:   log likelihood = -20.833338
Iteration 2:   log likelihood = -19.477939
Iteration 3:   log likelihood =  -19.23172
Iteration 4:   log likelihood = -19.220947
Iteration 5:   log likelihood = -19.220927

Probit estimates
Wald chi2(11) =  37.15
Prob > chi2   = 0.0001
Log likelihood = -19.220927
Pseudo R2     = 0.3595

------------------------------------------------------------------------------
             |               Robust
           y |      dF/dx   Std. Err.      z    P>|z|     x-bar  [    95% C.I.   ]
-------------+----------------------------------------------------------------
  y_busi*|  -.0708279   .0582164    -1.61   0.107   .582278   -.18493  .043274
  region*|  -.0821231   .0447484    -2.02   0.043   .329114  -.169828  .005582
  branch*|   .0755954   .0668631     1.73   0.084   .506329  -.055454  .206645
  ownshp*|   .0501615   .0353475     1.37   0.171    .56962  -.019118  .119441
 size_ln |  -.0302738   .0253347    -1.71   0.087   15.9038  -.079929  .019381
     roe |  -.1583302    .102166    -1.40   0.163   .321612  -.358572  .041911
   l_cap |   .0550088   .0292851     1.89   0.059   1.28187  -.002389  .112407
 liq_tot |  -.0779102   .3797131    -0.21   0.836   1.02459  -.822134  .666314
      l2 |   .0055386   .0030477     2.90   0.004   1.68798  -.000435  .011512
   dsum2 |  -.0162271   .0173259    -1.11   0.268   .381267  -.050185  .017731
     sgr |  -.0002051    .000145    -1.89   0.058   25.7606  -.000489  .000079
-------------+----------------------------------------------------------------
  obs. P |   .1265823
 pred. P |   .0382529  (at x-bar)
------------------------------------------------------------------------------
(*) dF/dx is for discrete change of dummy variable from 0 to 1
    z and P>|z| are the test of the underlying coefficient being 0
```