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A hazard rate analysis of Russian commercial banks in the period 1994–1997

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Abstract

The number of commercial banks in Russia increased at a fast pace after the 1988 banking reform. Many of these banks lacked supervision and operated with dangerously low funding capital. After the 1995 liquidity crisis, many of these banks disappeared. In this paper, we investigate the determinants of the hazard rates of banks active on the Moscovian deposits market during the 1994–1997 period. We find that market share and duration have negatively affected the hazard rate, while the deposit interest rate has had a positive effect. The market share and interest rate effects are robust to controlling for 'financial clans'.

JEL classification: G21; L11; P34

Keywords: Banking; Hazard rates; Transition economies

1. Introduction

The banking sector was among the first to be confronted with a privatization process at the start of the transition period in Russia. The Gosbank was split up and privatised except for Sberbank (savings) and Vneshekonombank (international exchange). Many new commercial banks were founded following the 1988 banking reform. The consequence for the Russian savings market was a massive entry in the beginning of the 1990s. In the mid-1990s, however, many new banks had to leave the market again, either suddenly or because they failed to pay the claims of depositors. Buchs (1999) reports that the Central Bank of Russia withdrew about 1000 bank licences in the 1995–1998 period. These events had a dramatic

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impact on the lives of many Russian households loosing their deposits and plans attached to it, such as spending holidays abroad, or rebuilding their apartment. Bernstam and Rabushka (1998) claim that the Russian banking 'system' has been collectively insolvent since 1992 and that (privileged) banks have been kept afloat by injections of inflationary credit, by preferred sales of high interest GKO bonds and by sales of shares in state-owned natural resource firms at low prices to the banks.

The occurrence of high rates of exit after a period of entry is not uncommon in young industries. Gort and Klepper (1982) and Klepper and Graddy (1990) report on several industries in which such a 'shakeout' of producers has taken place. However, these industry shakeouts were documented only for technologically progressive manufacturing industries. Klepper (1996) explains such shakeouts occurring by stressing the role of economies of scale in R&D while Klepper and Miller (1995) discuss the possible role of 'overshooting'. Although manufacturing industries have been the main focus of research into shakeouts, there are exceptions like Fein (1998) documenting the shakeout in pharmaceutical wholesaling. The key features of a shakeout being a sharp drop in the number of firms and a virtual cessation of entry once the shakeout begins are also found in the Russian commercial banking industry. Another well-known characteristic of industry life cycles is that young and small firms are more likely to exit than their older and larger counterparts (see, e.g. Evans, 1987). In this paper we investigate whether this characteristic also holds for the Russian commercial banking industry.

There have been quite some periods in the early years of capitalism in which financial crises took place and banks went bankrupt (Canova, 1994). The August 1995 interbanking crisis in Russia may be compared to those 'banking panics'. In fact, Canova reports no less than eight crises during the 1880–1914 period, or about one every 4 years. Each of these episodes was characterized by skyrocketing interest rates. This was also the case in Russia during the interbanking crisis. The crisis was at least partly caused by the low entry barriers (weak enforcement of reserve requirements) for new commercial banks.[1] The question may remain whether it was a consequence of the massive entry of banks and therefore part of an 'endogenous' shakeout process of inefficient saving banks or whether it was a consequence of unprofessional and risky bank policies per se. By investigating which banks were the first to exit we may gain access to important information concerning the evolution of the Russian banking sector. This paper uses a hazard rate analysis of banks active on the Moscovian savings market for this purpose. The number of firms 'active' (licensed) on the deposits saving market in Moscow almost halved during the 1995–1997 period. This corresponds closely to the figures presented by Buchs (1999) for all licences of commercial banks issued by the Central Bank of Russia.

The data set used in this paper covers the period from the beginning of 1994 till mid-1997. The data set ends before the 1998 Rouble crisis causing very severe problems for the Russian banking system disrupting a normal evolutionary pattern. The focus of the analysis is on commercial banks performing tasks comparable to those in Western economies, hence including attracting (household) deposits. Therefore, we exclude the majority of licensed banks that are no more than money-changing boutiques or that are intimately connected to

[1] The possibility of too much entry in the context of banking in transition economies is also discussed by Schnitzer (1999).

one or more large firms providing cheap funding. In the analysis, we discriminate between the major (Moscow) banks in which the government (or state-owned enterprises) owned large stakes and smaller commercial banks. The major banks were privileged in many respects and, hence, less likely to go bankrupt.[2]

In Section 2, we discuss the proportional hazard rate model. This model has been used to predict hazard rates for many kinds of organizations including banks (Wheelock and Wilson, 2000). In Section 3, we discuss the hazards of Russian banking and derive our hypotheses. In Section 4, we discuss our data set of the Moscovian deposits market. The total number of banks we consider having been at risk during the 1994–1997 period was 74, of which 45 actually exited. Section 5 is used to discuss the empirical results of the hazard rate analysis. Section 6 concludes.

2. The proportional hazard rate model

We will derive our hypotheses in terms of hazard rates. Therefore, we will first briefly discuss the technique of hazard rate analysis. Hazard rate (or event history) analysis has been used extensively in the study of organizational mortality (Hannan and Carroll, 1992; Baum, 1996), new firm survival (Audretsch and Mahmood, 1995) and the probability of product exit (Greenstein and Wade, 1998; Lunde et al., 1999). In the current paper, we will apply this method to the discontinuance of licences of Moscow-based saving banks during the period from the third quarter of 1994 to the second quarter of 1997. The life time of a saving bank is assumed to start at the date of issue of the licence and to end when the bank fails to report deposits data, which is followed by withdrawal of the licence by the Central Bank. Banks that still had their licence at the end of the second quarter of 1997 are classified as right-censored. The licence duration data can be characterized in terms of the hazard function. In this section, we will discuss the Cox semiparametric proportional hazards regression model and the special parametric cases of the exponential, Weibull and Gompertz regression models.

Let T be a continuous random variable measuring the duration (or age) of a Central Bank licence. Define by $\boldsymbol{x}$ the vector of covariates and by β a corresponding vector of parameters to be estimated. Denote by $F(t|\boldsymbol{x}) = P[T \leq t|\boldsymbol{x}]$ the distribution function of duration T. The density and survivor functions are then equal to $f(t|\boldsymbol{x}) = \partial F(t|\boldsymbol{x})/\partial t$ and $S(t|\boldsymbol{x}) = P[T \geq t|\boldsymbol{x}] = 1 - F(t|\boldsymbol{x})$. The hazard rate $h(t|\boldsymbol{x})$ is determined by the ratio of the density function and the survivor function:

$$h(t|\boldsymbol{x}) = \lim_{\mathrm{d}t \to 0} \frac{P[t \leq T < t + \mathrm{d}t | T \geq t; \boldsymbol{x}]}{\mathrm{d}t} = \frac{f(t|\boldsymbol{x})}{S(t|\boldsymbol{x})} \tag{1}$$

The proportional hazards model proposed by Cox (1972) has the hazard rate equal to

$$h(t|\boldsymbol{x}) = \lambda(t) \exp(\boldsymbol{x}^{\mathrm{T}} \beta) \tag{2}$$

[2] Official statistics indicate that the Russian banking sector has been much less concentrated when compared to other transition economies. See, for example Table 2 in Gorton and Winton (1998, p. 627). However, these figures do not address the importance of the 'financial clans' (Buchs, 1999).

If we assume that $\lambda(t)$ has a Weibull parametric specification with shape parameter p, then it equals

$$\lambda(t) = pt^{p-1} \tag{3}$$

In case p equals one the base line hazard reduces to a constant (of unity) and we get the exponential parametric specification. In case $p > 1$ the base line hazard rate is increasing over time while in case $p < 1$ it is decreasing. An alternative to the one-parameter Weibull specification is the one-parameter Gompertz specification: $\lambda(t) = \exp(\gamma t)$. In case of $\gamma = 0$, this reduces again to the exponential specification. In case of $\gamma > 0$, the base line hazard rate is increasing over time and it is decreasing over time when $\gamma < 0$. Both the Weibull and Gompertz specifications exhibit monotonic hazard rates and are, therefore, well suited to test for the effect of duration on the hazard rate. Despite this, there is an important difference between the Weibull and Gompertz specification for new entrants, at least in theory.[3] For the Weibull specification the hazard rate will be infinite for $t = 0$ in case of negative duration dependence ($p < 1$) and zero for $t = 0$ in case of positive duration dependence ($p > 1$). The base line hazard rate is unity for the Gompertz specification when $t = 0$ (for all values of γ). There are no strong theoretical arguments to choose either the Weibull or Gompertz specification, so we will choose the specification with the best 'fit' of the data.

The hazard rate is closely related to the time to failure. We show this for the case of the Weibull specification. An expression for the hazard rate can be found by using regression on the natural logarithm of duration T. Assume that this regression has the following form:

$$\ln T = \boldsymbol{x}^{\mathrm{T}}\theta + \sigma W \tag{4}$$

where θ is a parameter vector, σ a scale parameter and W possesses a standard extreme value distribution, that is

$$f(w) = \exp(w - \exp(w)); \quad -\infty < w < \infty \tag{5}$$

The 'disturbance term' in Eq. (4) does not have expectancy zero, because the expected value of W equals: $E[W] = \Gamma'(1) \approx -0.5772$. From Eq. (4), one may derive that the corresponding hazard rate equals

$$h(t|\boldsymbol{x}) = \frac{1}{\sigma} t^{(1/\sigma)-1} \exp(\boldsymbol{x}^{\mathrm{T}}\theta)^{-1/\sigma} \tag{6}$$

Therefore, the regression approach of Eq. (4) leads to the Weibull specification case of the proportional hazards model with $1/\sigma = p$ and $\theta = -\beta/p$. The expected values of the duration and its natural logarithm are

$$E[T|\boldsymbol{x}] = \Gamma(1+\sigma)\exp(\boldsymbol{x}^{\mathrm{T}}\theta) \tag{7}$$

$$E[\ln T|\boldsymbol{x}] = \boldsymbol{x}^{\mathrm{T}}\theta + \sigma\Gamma'(1) \tag{8}$$

The linear model (4) is sometimes called the accelerated failure-time model. The likelihoods of the accelerated failure time-model and the Weibull proportional hazards model are identical (except for reparametrization).

[3] In this study, the failure data are discrete instead of continuous, so values of t close to zero are not recorded leaving the argument to be somewhat artificial.

3. The hazards of unregulated entry

The development of the Russian financial market has been probably the fastest among transition economies (Buchs, 1999). During a few years' time an enormous amount of commercial banks was founded. The European Bank for Reconstruction and Development (1997) reported that "extremely low minimum capital requirements in many former centrally planned economies, set at the equivalence of only a few thousand dollars in some countries, has resulted in the almost instant proliferation of often miniscule banks." (p. 84). The development of Russia's banking sector was regarded as a success until the 1995 liquidity crisis and the 1998 Rouble crisis showed some important instabilities in the financial system. An important structural reason for these instabilities is that even when the Russian banking sector was considered unusually successful, no less than four out of five banks conducted business with dangerously low funding capital, not hindered by enforcement of reserve requirements (Buchs, 1999, Section 4.2).[4]

The severity of the shakeout phase has been at least partly the consequence of the spectacular inflow of (registered) commercial banks in Russia following the 1988 banking reform. The number of commercial banks had increased to around 2500 in 1995 already, many of them being just money-changing boutiques. It was not so much a question of whether there would be a shakeout of commercial banks. It was just a question of when. After the 1995 liquidity crisis, the Central Bank withdrew about 1000 banks licences in 3 years' time (Buchs, 1999). The fact that many Russian banks were owned by one or a few (client) enterprises, which used them mainly as cheap sources of credit, also contributed to the instability of the banking system (Dittus and Prowse, 1996). This structure of bank ownership leads to a serious conflict of interest and has been, as such, a recipe for crisis (European Bank for Reconstruction and Development, 1997).

Massive entry implies that many banks are small and not experienced, the asset portfolio is one-sided and that management may be incompetent. Each of these reasons contributes to the increase of the probability of bank failures. The large majority of new and small banks fail to achieve a sound market position as they suffer from a liability of newness: "the new banks will be very risky and prone to failure, not only because of the risk of their loans, but because private agents such as depositors and established banks will demand premia if they are to invest in these new banks" (Gorton and Winton, 1998, p. 647). The higher probability of young and small firms is a characteristic of many industries.[5] A popular model to explain this phenomenon is Jovanovic's (1982) passive learning model. He argues that entrepreneurs are unaware of their (fixed) entrepreneurial ability before entering an industry and only find out after entry. Especially in the first couple of years after entry the

[4] The 1997 annual report of the Bank of Russia shows the problematic financial conditions of many banks (Statistical Addendum, Table 37, condition on 1st May 1997). Out of 2594 banks there were 706 (27%) whose licence was revoked. Their total assets amounted to 8% of the total assets in banks. Additionally, there were 540 banks (21%) that were in critical financial condition. Their total assets equaled 5% of the total assets in banks. These figures show that mostly small banks encountered financial problems (at least before the 1998 Rouble crisis). Bernstam and Rabushka (1998, p. 43) argue that virtually all banks were illiquid and technically insolvent, according to a 1995 study analyzing the books of 629 Moscow commercial banks.

[5] See Freeman et al. (1983), Evans (1987), Dunne et al. (1989), Audretsch and Mahmood (1995) and Davis et al. (1996) for studies into the liabilities of newness and smallness.

individual finds out whether his or her ability is relatively high making the firm to grow or relatively low making the firm to exit. We come to our first two hypotheses:

Hypothesis 1. The hazard rate of banks is negatively related to duration—liability of newness.

Hypothesis 2. The hazard rate of banks is negatively related to their size—liability of smallness.

Soft budget constraints were one of the most important incentive problems in socialist economies and have remained a major concern in transition economies (Roland, 2000). The willingness of government to intervene ex post to bail out unprofitable banks can be an important cause of soft budget constraints of banks. An important problem of unregulated privatization is that it is likely to lead to excessive risk-taking by managers in case their down side risk is partially covered by explicit or implicit deposit insurance. A successful transition towards a capitalist economy requires hardening of budget constraints to ensure healthy restructuring of unprofitable firms. Soft budget constraints have been a larger problem in Russia than in other eastern European countries. For example, the budgetary subsidies received by enterprises in Russia were about 8% of GDP in 1996 and 1997, while they were about 2–3% in countries like the Czech Republic, Hungary and Poland (Roland, p. 288). Another indication of soft budget constraints in Russia has been the increase in tax arrears. One measure of excessive risk-taking by savings banks is the level of deposit interest rates (relative to other banks). In case bank mangers opt for high deposit interest rates they are also likely to opt for high-risk investments.[6] It leads us to the next hypothesis:

Hypothesis 3. The hazard rate of banks is positively related to deposit interest rates.

The 1995 liquidity crisis contributed to a shift in government policy. In 1994, inflation was very high because the government was printing money to combat budget deficits. Banks were able to earn inflation rents transferring centralized credit from the government to state enterprises and other public institutions (Schleifer and Treisman, 1998, p. 44). In reaction to the financial crisis the government tightened its monetary policy successfully.[7] Commercial banks were forced to change their role from transferring subsidies to financing Russian government expenditures through the GKO market (short-term state securities).[8] GKOs were attractive to the banking sector because the government paid relatively high

[6] By offering interest rates higher than the Sberbank, many new banks were able to attract household deposits (Litwack, 1998). However, some (small and new) banks offered much higher rates, while others offered rates only somewhat higher than the Sberbank, indicating difference in the amount of risk-taking by banks.

[7] In July 1995, the Russian authorities introduced a fixed exchange corridor for the Rouble versus the US dollar. The exchange rate remained relatively stable as a result. See Buchs (1999), Chart 1a, p. 695.

[8] GKOs are federal treasury bills with a 3–6 months maturity, issued by the Ministry of Finance of the Russian Federation. The GKO market became increasingly important during the years 1995 and 1996. The total GKO and OFZ nominal outstanding in billion Roubels in January of the years 1994–1998 was 285; 15,314; 79,997; 248,449; and 390,890, respectively (*Source*: Russian Economic Trends (RET) of the Stockholm Institute of Transition Economics and East European Economies (SITE)).

interest rates. The decline of the GKO yield from mid-1996 on was an important reason for the liquidation of several hundred banks by the Central Bank of Russia (Bernstam and Rabushka, 1998, p. 73). The changing market circumstances for banks over the sample period 1994–1997 leads to the following hypothesis:

Hypothesis 4. The hazard rate of banks increased after the government tightened its monetary policy (July 1995).

Banks that were part of one of the "financial clans" received a privileged position in regard to trading in GKOs. These banks were not without any hazard as became all too clear in the 1998 crisis. An important problem for the large banks was the accumulation of unpaid debts by financially pressed (state) enterprises—the so-called 'bad loans' problem. Nevertheless, the mere influence (and size) of these banks may have made them likely to receive political protection. The privileged position of banks in "financial clans" is translated into the following hypothesis:

Hypothesis 5. Banks privileged in regard to trading in GKOs (part of a "financial clan") had lower hazard rates than other banks.

It could be argued that the financial position of the bank is a very important determinant of the probability of default.[9] However, it is very difficult to get accurate information on the balance sheets of the banks (see Bernstam and Rabushka, 1998). Commercial banks, for example have seriously underestimated the share of bad assets in their balances. Furthermore, there is little doubt about a causal link from a bad financial position to subsequent exit. Of more interest are the determinants of a bad financial position leading to default. The hypotheses can also be interpreted in this vein. In Table 1, the official accounts of credit institutions on 30 June 1995, 1996 and 1997 as published by the Central Bank of Russia are presented. These figures would suggest that the banking system was in good and even improving financial shape. The equity of banks was on the rise (even after adjusting for inflation). However, Bernstam and Rabushka (1998) claim that these figures clearly misrepresent the true financial situation. They derive that not only was equity actually negative but also decreasing over time (see their Tables 2 and 5).

We concentrate on banks that were actually active (and advertising) on the market for attracting deposits. This excludes the tiny money-changing boutiques and the dependent banks set up by one or a few large enterprises. As a result only a relatively small sample of 81 banks is under investigation. However, these banks fulfil at least to some extent tasks comparable to banking in capitalist countries and are, as a consequence, subject to similar internal (management) and external (market) forces affecting the chances of survival.

[9] Many studies have analyzed the relationship between financial health and failure in the banking industry in capitalist economies. See, for example Cole and Gunther (1995) showing that basic indicators of a bank's condition, like capital, troubled assets and net income are important determinants of the timing of bank failure.

Table 1
Analytical accounts of credit institutions 1995–1997 (in billion Roubles)

	June 1995	June 1996	June 1997
Reserves	32,918	37,199	50,935
Foreign assets	58,137	52,662	56,549
Claims on general government	34,056	93,403	187,093
Claims on state enterprises	52,801	74,981	72,035
Claims on private enterprises and households	114,503	148,190	179,619
Claims on other financial institutions	–	1,474	100
Demand deposits	52,746	74,706	104,011
Time and savings deposits	47,415	86,182	109,483
Deposits in foreign currency	60,275	63,460	71,274
Money market instruments	11,345	16,473	23,882
Foreign liabilities	22,303	39,686	67,268
General government deposits	12,907	11,769	20,936
Credits extended by monetary authorities	9,221	8,758	4,260
Undistributed liabilities (sundry)	23,582	14,624	5,010
Capital accounts (equity)	52,623	92,250	140,208

Note: The table is based on the consolidated balance sheet pertaining to credit institutions, Sberbank Savings Bank and (partly) Vneshekonombank. *Source*: Central Bank of the Russian Federation, Analytical Accounts of Credit Institutions in 1995–1997. Available from http://www.cbr.ru/eng/statistics/credit_statistics, updated 18 May 2000.

Table 2
Summary statistics

Quarter	Exits	$N(t-1)$	Mean exit S	Corr(S, INT)	Mean INT	Std. INT
1994.I				−0.56	133	16.3
1994.II	0	39	n.a.	−0.40	114	13.4
1994.III	3	48	0.001	−0.30	84	9.4
1994.IV	3	54	0.035*	−0.27	65	7.2
1995.I	5	56	0.015	−0.36	84	9.4
1995.II	2	55	0.011	−0.38	112	11.1
1995.III	4	56	0.012	−0.30	96	8.0
1995.IV	7	53	0.004	−0.36	78	6.9
1996.I	2	48	0.038*	−0.31	74	10.5
1996.II	3	48	0.019	−0.09	65	9.3
1996.III	7	45	0.008	0.06	62	6.0
1996.IV	3	39	0.007	−0.10	50	5.3
1997.I	5	36	0.005	0.18	36	3.8
1997.II	1	31	0.022	−0.06	26	1.9
Total	45	568				

Note: Exits is the number of exits in the quarter. $N(t-1)$ is the number of incumbents in the previous period. The Mean exit S is the average of the market shares in the previous quarter of the firms that exit in the quarter. An asterisk ($*$) means that the average size of the exiting firms is larger than the average size of the firms that remain in the market. The fifth column gives the correlation coefficient between market share and interest rate of incumbents. The last two columns give the mean and standard deviation of the deposit interest rates offered by the banks (excluding the Sberbank).

4. Data

The data set consists of banks active on the deposits market in Moscow during the 1994–mid-1997 period. A bank is considered 'active' when (i) it has got a licence from the Central Bank allowing customers to open saving accounts; (ii) it advertised at least once in one of the Moscow newspapers; (iii) it fulfilled its obligation to report deposits data to the Central Bank; (iv) it offered (the very common) 3 months' Rouble deposits saving accounts to the Moscow public. The licency date of a bank is its entry date. The withdrawal of licency date, however, is not identical to the exit date. The exit date is the first date for which the banks fail to report deposits data. Usually the withdrawal of licency follows swiftly (one quarter) thereafter. The data set was acquired by the ACE-project group 'role of information on Russian individuals' savings market' (Avdasheva, 1998). Data on interest rates, personal deposits and licency dates of the registered banks were derived from Finansovije Izvestia and Commersant Rating, based on information of the Central Bank of Russia.

In total there are 81 banks recorded to be or to have been 'active' on the Moscovian deposits market. Six of those banks were active on the deposits market at one time or another, but no information about the size of their deposits portfolio is available. These banks are removed from the sample. The Sberbank, being the Central Bank of Russia owned savings bank, is supposed not to have been at risk and is excluded when estimating the hazard rate equations. This leaves 74 commercial banks that were at risk, of which 45 have exited during the sample period.[10] In Fig. 1, we show the Kaplan-Meier survival estimate for the Moscovian bank industry corresponding to these 74 banks. We find that about 40% of the banks exited within 10 quarters and that about 60% exited within 20 quarters. After 20 quarters of duration no exits are observed and the survivor function is constant at 0.35. In the final quarter, 1997.II, 29 banks (and the Sberbank) remain in the market and are right-censored (i.e. we are unaware of their date of exit other than that it is later than 1997.II). In Table 2, we report the number of exits and the number of firms at risk in each of the quarters. In addition, we show the mean market share of the firms exiting. The number of banks was still increasing during 1994, but the August 1995 liquidity crisis marked a turning point. After this crisis the number of banks almost halved in 2 years time. The average size of the banks that exited was small. There have been two exceptions, though. In 1994.IV, the LLD-Bank (6% market share) exited and in 1996.I National Credit (7%) exited. In those two quarters the average market share of existing banks was higher than the average market share.

Before the 1995 liquidity crisis deposit interest rates were high. In Table 2, we show that the average deposit interest rates were on average 65–133% per annum in that period. The yield on GKOs (short-term government bonds) was even much higher allowing banks to make high profits (Warner, 1998). The 1995 liquidity crisis contributed to a shift in government policy. In 1994, inflation was very high because the government was printing money to combat budget deficits. Banks were able to earn inflation rents transferring centralized

[10] In the hazard rate analysis, we require data of interest rates (two quarters lagged) to be available. For five exits there is no information for this variable, so the number of exits reduces to 40. Two of these five banks did have some (pre-exit) periods for which the variable is available, though. It implies that for the hazard rate analysis, there have been 71 banks under risk, while 40 actual exits have been recorded.

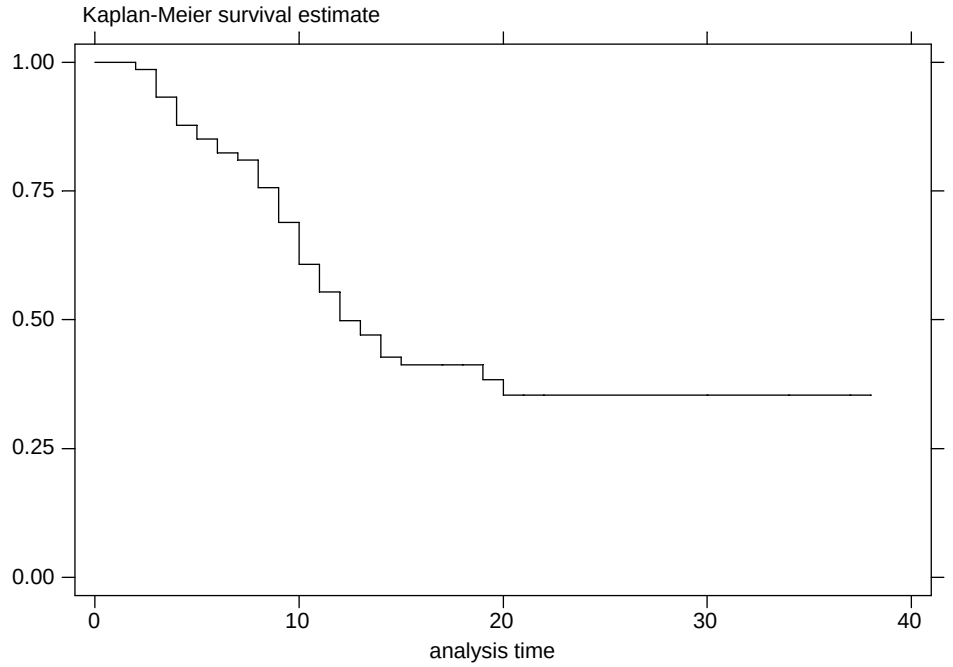

Fig. 1. Kaplan-Meier survival curve.

credit from the government to state enterprises and other public institutions (Schleifer and Treisman, 1998, p. 44). In reaction to the financial crisis the government tightened its monetary policy successfully. Commercial banks were forced to change their role from transferring subsidies to financing Russian government expenditures through the GKO market. GKOs were attractive to the banking sector because the government paid relatively high interest rates. After the crisis, interest rates dropped steadily over time and in the second quarter of 1997 the average deposits interest rate was 26% on a yearly basis. The standard deviation of the interest rates has been falling after the August 1995 crisis as well. However, the ratio of the standard deviation and the mean (i.e. the coefficient of variation) has remained relatively stable over time. It shows that in each quarter there is quite some variation in the deposits interest rates offered by banks.

5. Estimating the time to discontinuation: a hazard rate analysis

The hazard rate is assumed to depend upon four separate factors. The first factor is duration. In the Weibull and Gompertz specification cases, the hazard rate can monotonically increase or decrease with time present in the market. We expect banks that are present in the market for a longer time to have lower hazard than banks that have only recently entered (liability of newness). It implies that in case of the Weibull parameterization p is expected to be smaller than one and in case of the Gompertz parameterization γ is expected to be

negative. The second factor is the time period in which the bank is at risk. The default risk of saving banks will have increased following the August 1995 interbank crisis when it became apparent that many banks failed to meet their obligations. That is, the hazard rate is likely to (temporarily) increase from 1995.III on. We correct for the time dependence of the hazard rate by incorporating time dummies into the model.

The third factor is the market share of the bank (on the Moscovian 3 months Rouble deposits market). We expect large banks to be less likely to exit when compared to their smaller counterparts. This liability of smallness is a common finding in empirical studies. We incorporate the reciprocal market share in the previous period, RSHA, as the covariate measuring the liability of smallness.[11] We have deliberately chosen deposits data to measure size instead of total capital data that are less reliable. The fourth factor is the interest rate offered by the bank. Banks that offer rates much higher than average are likely either to have a low profit margin or to resort to high-risk investment projects. These banks are likely to have dangerously low funding capital. The fifth column of Table 2 shows that small banks were, on average, offering higher interest rates than their larger counterparts except after the first quarter of 1996 when there was little difference between banks with low and high market shares. We incorporate the ratio of the interest rate offered over the average interest rate offered, two periods lagged, RINT, as the covariate measuring the risk of offering high rates. We lag the relative interest rate two quarters because lagging it one quarter would cost an extra eight exit observations.[12] Banks that offer rates much lower than on average do not have risks similar to the high interest rate banks but appear to have little ambition to achieve growing market shares. In order to investigate this possibility, we incorporate RINT in a quadratic form into the hazard rate equation.

The summary statistics for the two explanatory variables for the 536 observations are as follows. The mean of the reciprocal market share (in the previous period), RSHA, is 279.75. The variable has a minimum of 4.37 and a maximum of 4198.97 and has a standard deviation of 507.37. The mean of the relative interest rate (two periods before), RINT, is 1.003. It ranges from 0.556 to 1.231 and has a standard deviation of 0.111.

The Grambsch and Therneau (1994) χ^2-test on the proportional hazards assumption has a value of 3.19 (2d.f.) when time dummies are excluded. The corresponding *P*-value is 0.20. When time dummies are included the value of the test statistic is 10.57 (13d.f.) with a corresponding *P*-value of 0.65. In both cases, the null hypothesis of proportional hazards cannot be rejected. This implies that we can proceed with the Cox proportional hazards framework as expressed in Eq. (2). The maximum likelihood ratio estimates of the parameter vector β and the parameters of the baseline hazard rate can be found in Table 3. The results were computed using the STREG procedure of Stata 6.0 for Windows.

The estimation results suggest that the Gompertz parameterization is the preferred assumption for the baseline hazard. The estimate for the parameter γ is significantly (at a 5% level) smaller than zero. This implies that the hazard is monotonically declining

[11] We have used different measures for the effect of market share (S). The variable RSHA $= 1/S$ outperformed alternatives like S, $1/S^{1/2}$ and $1/S^2$ in the proportional hazards regression model in terms of explanatory power.

[12] The relation between default probability and interest rates goes two ways: banks offering high rates are more likely to default, but banks which are in a category with relatively high default probabilities are forced to offer high rates to attract customers. We concentrate on the first causal link having interest rates measured half a year before the possible date of exit.

Table 3
Hazard rate estimation results

	Exponential	Weibull	Gompertz	
RSHA	0.00060 (0.00019)	0.00058 (0.00019)	0.00058 (0.00019)	0.00058 (0.00019)
RINT	5.113 (1.753)	5.034 (1.782)	4.801 (1.832)	−26.897 (16.683)
$RINT^2$				15.517 (8.159)
p		0.644 (0.233)		
$1/p$		1.553 (0.562)		
γ			−0.103 (0.040)	−0.115 (0.042)
$\log L$	−47.770	−47.030	−44.865	−43.711
χ^2_{dummies}	30.40	27.39	36.06	37.90

Note: Standard errors are in parentheses. The standard errors have been calculated using the robust method of Lin and Wei (1989). This is recommended if the same subjects appear repeatedly in the risk pools. Time dummies are included in all estimations. The χ^2_{dummies} is the likelihood ratio statistic for all constant time effects to be equal across the quarters. The corresponding number of d.f. is 11. The number of banks that have been at risk is 71, of which 40 actual exits are recorded. Total number of observations is 536.

with duration. This is also found in case of the Weibull parameterization because p is estimated to be below unity. The estimate is not significantly different from one, though. The results suggest that there was a liability of newness in the Moscovian Rouble deposits market for the period under investigation. It indicates support for Hypothesis 1. Time dummies are important in explaining the hazard rate as well. The likelihood ratio test for the hypothesis that time dummies can be excluded from the model is 36.06 for the Gompertz case (11d.f.). The lowest coefficients for the time dummies are for the first quarters of the sample before the 1995 liquidity crisis as expected. This provides support for Hypothesis 4.

The results also confirm the liability of smallness (Hypothesis 2). The reciprocal of market share, *RHSA*, has a significantly (at 5% level) positive effect on the hazard rate. The mean exit share data of Table 2 were already a strong indication for this finding. The relative interest rate, RINT, has a significant (at a 5% level) effect as well. Banks that offer high rates are more likely to leave the market than those that offer lower rates. This is in direct support of Hypothesis 3. We fail to find empirical evidence for this relation to have a quadratic component.

We now turn our attention to Hypothesis 5 claiming that the privileged position of some banks affected their chances of exit. Bernstam and Rabushka (1998) characterize the Russian banking sector of the early-1990s as an Ersatz Banking System, incapable of performing the role of a commercial banking system in capitalist economies. Many of the banks that were registered as private corporations were in fact largely government controlled and part of 'financial clans'. This does not necessarily imply that these banks have not been at risk, but that it is likely that such privileged banks will have been protected from bankruptcy even if illiquid and that deposits have been covered by a deposit insurance system. We divide the banks into a group of major banks and a group of other banks. A bank was classified as a major bank in case it was assigned by the Central Bank of Russia to be a primary dealer on the GKO (government bonds) market or to be on the Russian Stock Exchange (RTS). The 13 banks which were classified as major banks (with year of licency) are Promstroybank

Table 4
Hazard rate estimation results without privileged banks

	Exponential	Weibull	Gompertz	
RSHA	0.00046 (0.00020)	0.00046 (0.00019)	0.00047 (0.00019)	0.00047 (0.00020)
RINT	3.676 (1.739)	3.679 (1.741)	3.648 (1.759)	−22.993 (16.581)
$RINT^2$				13.114 (8.123)
p		0.962 (0.297)		
$1/p$		1.039 (0.321)		
γ			−0.040 (0.050)	−0.054 (0.052)
$\log L$	−39.210	−39.204	−38.934	−38.001
χ^2_{dummies}	26.24	17.73	22.62	23.71

Note: Standard errors are in parentheses. The standard errors have been calculated using the robust method of Lin and Wei (1989). This is recommended if the same subjects appear repeatedly in the risk pools. Time dummies are included in all estimations. The χ^2_{dummies} is the likelihood ratio statistic for all constant time effects to be equal across the quarters. The corresponding number of d.f. is 11. The number of banks that have been at risk is 58, of which 40 actual exits are recorded. Total number of observations is 379.

(1988), Vozrozshdeniye Bank (1988), Incombank (1989), Imperial Bank (1990), Alfa-Bank (1992), Avtobank (1992), Menatep-Bank (1992), Toribank (1992), MDM-Bank (1993), Most-Bank (1993), Promradtechbank (1993), Russian Credit (1993) and Stolichniy Saving Bank (SBS-Agro) (1993). None of those banks exited during the period under consideration. However, a majority of the major banks got into serious troubles after the 1998 Rouble crisis. This included some of the most important market participants like Incombank, SBS-Agro (Stolichniy), Menatep-Bank and Promstroybank. Hence, the major banks could certainly be considered to have been at risk. However, these banks were privileged in receiving political support and may therefore not have been in a position comparable to the other banks.

Because none of the 'privileged' banks exited during the period under investigation, this may indicate some support for our last hypothesis, at least in the period under investigation. The amount of support cannot be easily determined in a hazard rate analysis. The reason is that it is not possible to estimate the expected duration in case no exit is recorded. One important analysis that can be executed is to consider whether the support for the first four hypotheses is due to the presence of 'privileged' banks. To consider this, we exclude the major banks from the analysis and compare the hazard rate estimation results with those presented in Table 3. The results with the major banks removed from the sample are presented in Table 4.

The results in Table 4 show that the Gompertz parameterization fails to outperform the exponential case as it did in Table 3. The estimate of the parameter γ is insignificant at the 10% significance level. These results indicate that it is difficult to distinguish between an effect of duration or political protection on the hazard rate: many of the major banks were also early entrants. The effects of (reciprocal) market share and the relative interest rate are very similar to those found in Table 3. Therefore, these results appear to be robust against the presence of 'financial clans'. Small banks offering high interest rates were the earliest to default among the non-privileged banks.

6. Conclusion

Holding deposits at Russian saving banks has proved to be a risky venture. This paper finds that the lifespan of new and small banks has been limited and that banks which offered relatively high interest rates on the saving market were likely to be among the first to exit. Many of the small market participants offered interest rates higher than the larger banks to attract customers but it increased the likelihood of their default in addition to their 'standard' liabilities of newness and smallness. Many of the new commercial banks had their portfolios being dominated by risky loans made to unprofitable Russian enterprises (Buchs, 1999). People anxious to get high deposits interest rates were, therefore, confronted by a high hazard rate of losing their money.

The development of the Russian financial sector into a system with hundreds of very young and very small banks barely bothered by enforcement of reserve requirements contributed to its vulnerability.[13] The shakeout of almost half of the operating banks in Russia in the 1995–1998 period showed the extent of the instability that resulted from entry barriers for commercial banking being too low. Many small and medium-sized banks did not survive the aftermath of the avalanche of bad loans. The entry of new banks was also deterred because of the increased public suspicion in respect to banks. The financial crisis has, therefore, fastened the evolution process towards a more concentrated structure of the Moscovian saving market. The number of firms decreased and the spread in the interest rates of the saving banks diminished as well. In the meantime the Russians had to go through all the troubles of early capitalism which many Western countries experienced in the late-19th and early-20th century with an instable banking sector. As the 1998 Rouble crisis in the Russian banking system was to show, political intervention by the Russian government, protecting major (illiquid) banks, has not been very helpful to further the transition of the emerging commercial banks towards modern banks as found in market economies, fulfilling the normal role of intermediating household deposits to investing enterprises.

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[13] Estrin and Wright (1999) show that Russia has been performing relatively poor when it comes to progress in the transition of the financial institutions. They argue that there has been no effective bank supervision and little or no lending by financial institutions to the private sector. It strongly appears that a liberal entry policy during a period of economic turmoil provides little benefits in terms of efficiency while contributing to instability.

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