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Journal of Banking & Finance 27 (2003) 615–633

Journal of BANKING & FINANCE

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Bank lending policy, credit scoring and value-at-risk

Tor Jacobson *, Kasper Roszbach

Research Department, Sveriges riksbank, 103 37 Stockholm, Sweden

Received 12 January 2001; accepted 10 September 2001

Abstract

This paper builds on the credit-scoring literature and proposes a method to calculate portfolio credit risk. Individual default risk estimates are used to compose a value-at-risk (VaR) measure of credit risk. In general, credit-scoring models suffer from a sample-selection bias. The starting point is therefore to estimate an unbiased scoring model using the bivariate probit approach. The paper uses a large data set with Swedish consumer credit data that contains extensive financial and personal information on both rejected and approved applicants. We study how marginal changes in a default-risk-based acceptance rule would shift the size of the bank's loan portfolio, its VaR exposure and average credit losses. Finally, we compare the risk in the sample portfolio with that in an efficiently provided portfolio of equal size. The results show that the size of a small consumer loan does not affect associated default risk, implying that the bank provides loans in a way that is not consistent with default-risk minimization. VaR calculations indicate that an efficient selection (by means of a default-risk-based rule) of loan applicants can reduce credit risk by up to 80%.

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JEL classification: C35; D61; D81; G21; G33

Keywords: Banks; Lending policy; Credit scoring; Credit risk; Value-at-risk; Bivariate probit

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1. Introduction

Consumer credit has come to play an increasingly important role, both as an instrument in the financial planning of households and as an asset on the balance sheet

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* Corresponding author. Tel.: +46-8-787-000; fax: +46-8-210-531.

E-mail addresses: tor.jacobson@riksbank.se (T. Jacobson), kasper.roszbach@riksbank.se (K. Roszbach).

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doi:10.1016/S0378-4266(01)00254-0

of financial institutions. By the end of 1999, Swedish consumer credit made up 31% of total lending to the public when excluding residential loans and amounted to the equivalent of 15% of Swedish GDP, or 29% of total private consumption. [1] Consequently, investigating the properties of banks' lending policies is of interest because of both the "household channel" and the "financial market channel". Despite the increasing importance of consumer credit, it is common to see households being rationed in financial markets. [2] When rationing is the mechanism that allocates resources in credit markets, some applicants will be excluded from credit despite being equally creditworthy as those granted a loan, making the equilibrium that results inefficient. Since a lender cannot observe borrowers' probabilities of default, credit-scoring models—by enabling a lending institution to rank potential customers according to their default risk—can improve the allocation of resources, from a second best towards the first best equilibrium.

In practice, most credit-scoring models suffer from a sample-selection bias because they are estimated from a sample of *granted* loans and the criteria by which applicants are rejected are not taken into account. [3] Boyes et al. (1989) avoided this bias by designing a bivariate probit model with two sequential events as the dependent variables: the lender's decision to grant the loan or not, and—conditional on the loan having been provided—the borrower's ability to pay it off or not. Boyes et al. used their unbiased credit-scoring model to examine the provision of credit by banks and found that it takes place in a way that is not consistent with default-risk minimization. [4]

The contribution of this paper is to augment the usage of credit-scoring models. We propose that individual estimates of default risk be used to compose a measure of credit-risk exposure resembling the value-at-risk (VaR) concept. The paper shows how such a risk measure can be constructed for a portfolio of loans and presents two problems to which it can be applied. A value-weighted, instead of an unweighted-sum, of all individual default risks is a more suitable measure of the risk in a portfolio of loans for a financial institution to consider when it needs to balance risk and return.

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[1] The results in Sections 3 and 4 of this paper are based on a sample of Swedish consumer loans. See Section 2 for a description of the data.

[2] Several different definitions of credit rationing exist. Here, we have in mind the unequal treatment of ex-ante equal people due to an asymmetry in information sets. Jaffee and Stiglitz (1990), Stiglitz and Weiss (1981) and Williamson (1987) discuss some different definitions and explanations of this phenomenon.

[3] Presumably, the main reason for this deficiency is the lack of publicly available data on rejected loan applicants. In Sweden, for example, banks are only allowed to store data on rejected loan applicants for commercial purposes for a period of three months. Banks can obtain a special permit to store reject data for analytical purposes from the Swedish Data Inspection Board.

[4] In a bivariate probit model, variables that increase (decrease) the probability of positive granting decision should reduce (raise) the likelihood of a default. Boyes et al. (1989) found that coefficients for variables like duration of job tenure, education and credit-card ownership carried equal signs in both equations. In addition, *unexplained* tendencies to extend credit, as measured by the regression error, were positively correlated with default frequencies. Both observations are inconsistent with a policy of default-risk minimization.

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