



Default matrices: A complete measurement of banks' consumer credit delinquency[☆]



Ricardo Schechtman*

Research Department, Central Bank of Brazil, Brazil

ARTICLE INFO

Article history:

Received 15 March 2012

Received in revised form 11 January 2013

Accepted 3 July 2013

Available online 13 July 2013

JEL classification:

C13

C41

G21

G32

Keywords:

Default severities

Transition matrices

Mobility metrics

Banks

ABSTRACT

Despite the manifold utilities of monitoring credit default rates, little attention is usually devoted to the underlying default definition. This paper proposes working simultaneously with different default severities, related to several past-due ranges, by means of transition matrices (to be named default matrices). In this way, default, as well as recovery, is depicted in a multidimensional flow, with the purpose of avoiding missing relevant information. The challenge lies on performing comparisons between default matrices, for which new metrics are proposed. In this paper, default matrices are built to measure consumer credit delinquency at four large Brazilian banks, allowing a detailed comparison of their credit migration experiences. The study is also able to draw relevant information from comparisons between estimations techniques (discrete and survival approaches) and between default criteria.

© 2013 Published by Elsevier B.V.

1. Introduction

Default rate is a term frequently used in financial and economic circles to designate the percentage of borrowers of a given universe (e.g. a specific bank portfolio) that have not or will not comply to their credit obligations. Measuring and monitoring historic loan default rates is important for several reasons. Based on past default data, expectations of future delinquency is one of the components that usually explains the level of bank spreads (see [BCB, 1999](#)). Also, the monitoring of default rate time series makes it possible to draw relationships with business cycles (e.g. [Bangia et al., 2002](#)) and may assist in constructing anti-cyclical regulations dealing with

bank provision or capital (e.g. [Jiménez and Saurina, 2006](#)). Further, measuring default rates is a problem closely related to that of estimating PDs (probabilities of default) in credit rating models, which is required by Basel II (e.g. [BCBS, 2004](#)). Finally, monitoring default rates is generally part of the financial stability task of supervisory authorities and Central Banks. In Brazil in particular, the years of economic expansion before the recent financial crisis have observed a sharp increase in credit volumes and in the number of borrowers, with little research devoted to the consequences of that to the behavior of default rates.

In a flow approach, the default rate could be measured by the percentage of borrowers that become 90-days past-due during the course of a specific year.¹ This is an example of a univariate flow

[☆] The views expressed herein are those of the author and do not necessarily reflect those of the Central Bank of Brazil. The author is grateful to the valuable collaboration of Paulo Henrique and Plínio Romanini, from the off-site supervision department, and of Marcelo Aragão and Aline Moraes, from the information technology department. The author would also like to thank the anonymous reviewer, the editor (Iftexhar Hasan) and participants of the Credit Scoring and Credit Control XI Conference at the University of Edinburgh and of the Central Bank of Brazil research seminars, for all comments and suggestions.

* Correspondence address: Av. Presidente Vargas, 730, 14th floor, Centro, 20071-900 Rio de Janeiro, Brazil. Tel.: +55 21 21895384; fax: +55 21 21895092.

E-mail addresses: ricardo.schechtman@bcb.gov.br, rische@impa.br

¹ Generally, default rates can be measured either following a stock approach or a flow approach. In the stock approach, both the numerator and the denominator of the default rate refer to quantities of borrowers at the same point in time (e.g. a selected month). An example of such measurement could be the percentage of outstanding borrowers that is 90 days past-due in a specific month. However, default stock rates are affected by non-default events such as variations on the number of borrowers being granted loans or on the maturity of new loans. For example, an increase in the number of borrowers in the early stages of a credit boom could reduce default stock rates simply due to an increase in the denominator base, a phenomenon not related necessarily to any improvement in individual credit risk.

that considers only one criterion of default (90 days). If, instead, several default severities are simultaneously considered to avoid missing relevant information (e.g. several past-due ranges), one arrives at a multivariate flow description of default. That is precisely the notion of transition matrices where the underlying states being transited are the different default severities (besides the non-default states). This paper investigates the use of such matrices (to be named default matrices) as a more complete measurement of default, as well as of recovery, of several banks. Results based on default matrices reveal indeed that the measurement of credit delinquency may vary considerably depending on the criteria used.

Matrices built on different default severities are not new in the consumer credit literature. [Cyert et al. \(1962\)](#) was the first paper to work on such matrices in that literature but their focus was on steady state results rather than on measuring flows. Besides, part of that consumer credit literature has dealt with flows of money amounts, rather than of accounts or borrowers, between the severity states (e.g. [Cyert et al., 1962](#); [Corcoran, 1978](#); [van Kuelen et al., 1981](#)). It has therefore been oriented toward cash forecasting and not toward measuring payment behavior. Also, this literature has only applied discrete methods on the estimation of such matrices and not the more modern and recent survival techniques. This is in part due to the strong focus of this literature on short time horizons (typically monthly) of the estimated transition matrices (e.g. [Corcoran, 1978](#); [Kallberg and Saunders, 1983](#)), where the two approaches produce similar or even identical results.

On its turn, the more recent literature on credit risk transition matrices basically concentrates on matrices of rating agencies (where the states are the external credit ratings) and has, to a great extent, applied survival based estimations besides the discrete ones. Initial works have been [Bangia et al. \(2002\)](#) and [Nickell et al. \(2000\)](#), both discussing the sensitivities on these matrices to phases of the business cycle. Point estimation, including discrete and survival estimation, and confidence interval estimation of rating matrices have been discussed by [Lando and Skodeberg \(2002\)](#), [Christensen et al. \(2004\)](#), [Hanson and Schuermann \(2006\)](#) and [Gagliardini and Gouriéroux \(2005\)](#).² This paper draws upon this more recent literature to estimating default matrices.

Comparison between transitions matrices (e.g. over time) is much more complex than the trivial comparison between default rates and requires specific metrics. [Geweke et al. \(1986\)](#) and [Jafry and Schuermann \(2004\)](#) discuss some metrics. However, the applied literature is scarce on the investigation of variations of such metrics. Also, comparison of transition matrices (e.g. default matrices) of different banks is not analyzed in the literature, to the best of the author's knowledge. In this regard, this paper contributes to the literature by proposing new metrics, in part building on that proposed by [Jafry and Schuermann \(2004\)](#), and by exploring their usefulness through a unique large dataset that allows a detailed comparison of credit migration experiences of different banks.

More concretely, this study employs the proposed default matrices to measure default risk in consumer credit at large Brazilian banks.³ Consumer credit is well suited to the purposes of this study

since it is a typical form of retail credit, where the number of borrowers is large and the management practices are more uniform across banks. As with other types of credit, consumer credit has experienced a large increase over the last years before the international financial crisis. [Fig. 1](#) shows that the number of loans at four large Brazilian banks has almost tripled over a period of five years.

In measuring the default risk of Brazilian consumer credit through the use of default matrices, this paper has both methodological and practical (or policy-oriented) goals. Related to the former, this paper contributes to the literature by applying survival based estimation to default matrices. It then investigates how the different methods of estimation compare to each other specifically in the case of default matrices, a topic not analyzed previously in the applied literature. It also studies how default matrices compare to rating agencies' matrices. From a practical point of view, this study aims at extracting relevant information from comparisons between the different default criteria underlying the default matrices, from the time evolution of default in Brazilian consumer credit over the period of high Brazilian credit growth and from how it behaved differently between banks along this period. As previously pointed out, a detailed comparison of the credit migration experiences of four large Brazilian banks represents another novel major contribution of this article.

Section 2 presents the data used in the estimation. Section 3 discusses several approaches to estimating default matrices and comparing them. Section 4 contains a varied selection of the results produced while Section 5 concludes.

2. Data

The database used in this study is based on data drawn from the Brazilian Public Credit Register. It consists of time series of regulatory credit risk classifications of consumer loans at four large Brazilian banks from January 2003 until January 2008.⁴ The database includes loans started before January 2003, but still in effect during the time span of the study, or started within that period.⁵ Almost all of the loans do not stay in the database until January 2008, for a series of reasons presented below. For estimation purposes, the database is consolidated by borrower within each bank, taking the worst loan classification as the borrower classification when distinct contemporaneous classifications are found.⁶

In order to increase comparability between classifications and, therefore, between default matrices of different banks, this study is restricted to borrowers with small loans (e.g. smaller than R\$50,000 in the initial month), that, according to Brazilian regulation, can be subject to review solely as a result of arrears. Besides, those reviews must happen on a monthly basis, so that the problem raised by [Mahlmann \(2006\)](#), relative to the non-observation of the precise months in which classification transitions indeed occur, is not relevant to the present study. Finally, I carry out reclassifications of the original regulatory classifications in order to increase the interpretation of the former as occurrences of brackets of arrears, according to [Table 1](#). At the end of the process, the resulting classifications are expected to portray information on arrears according

Therefore, though computationally more demanding, this study favors the measurement of default rates using a flow approach. In a flow approach, the numerator and the denominator of the default rate refer to different points in time but to the same group of borrowers.

² There are also some studies on credit risk transition matrices whose underlying states are neither external ratings nor default severities. [Mahlmann \(2006\)](#) for example deals with matrices derived from banks' internal ratings.

³ At this paper, consumer credit refers to non-revolving, non-payroll guaranteed credit and excludes auto, house and other types of financing. Consumer credit represents the largest percentage stock of Brazilian bank retail credit, ranging from 16% to 25% since 2004.

⁴ Regulatory classifications are regulated by Resolution 2682/99 of the Central Bank of Brazil. Only consumer loans without payroll-deduction and without earmarked funds are considered. The four large banks refer to four large financial conglomerates with their constitutions restricted to their most representative financial institutions in consumer credit (typically two institutions per conglomerate).

⁵ The creation of a database on a time-series format, suitable to this study, is a very lengthy and demanding computational task.

⁶ That multiplicity is, however, very rare ($\approx 2\%$).

Download English Version:

<https://daneshyari.com/en/article/10487989>

Download Persian Version:

<https://daneshyari.com/article/10487989>

[Daneshyari.com](https://daneshyari.com)