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Measuring the probability of financial covenant violation in private debt contracts ☆

Peter R. Demerjian [a,*], Edward L. Owens [b,1]

[a] Foster School of Business, University of Washington, 470 Paccar Hall, Box 353226, Seattle, WA 98195, USA
[b] Goizueta Business School, Emory University, 1300 Clifton Road, Atlanta, GA 30322, USA

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ABSTRACT

We measure the probability that a borrower will violate financial covenants in private debt contracts. We analyze hand-coded data and specify standard covenant definitions using Compustat data that minimize measurement error for all individual Dealscan covenants. We use these definitions to create a measure of aggregate probability of violation, which can be used across all covenants in a loan or among covenant subsets of interest. We provide evidence that our aggregate probability measure is superior to alternatives used in prior literature.

1. Introduction

Recent years have seen a renewed interest in accounting research on debt contracting and, in particular, in studies that examine the inclusion of accounting-based financial covenants and their implications. Many debt contracting studies test theories about the probability that borrowers will violate a financial covenant on their loan contract, either in aggregate (e.g., DeFond and Jiambalvo, 1994; Dichev and Skinner, 2002; Sweeney, 1994) or among certain subsets of covenants (e.g., Christensen and Nikolaev, 2012; Demerjian, 2011).[2] The probability of financial covenant violation holds a significant place in positive accounting theory. For example, the debt covenant hypothesis predicts that borrowers close to covenant

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* Corresponding author. Tel.: +1 206 221 1648.
E-mail addresses: pdemerj@uw.edu (P.R. Demerjian), ed.owens@emory.edu (E.L. Owens).
[1] Tel.: +1 404 727 6642.

[2] Many studies refer to this construct as financial covenant "slack," "tightness," or "strictness." We believe, however, that "probability of violation" is the best term to describe this construct. We reserve the term "slack" to refer to the unscaled distance between the actual realization of a covenant variable and its specified threshold, whereas the probability of violation depends not only on the level of covenant slack but also on underlying measure variability. Managers' incentives likely depend more on probability of violation than slack, per se.

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thresholds will make accounting choices to avoid technical default (Watts and Zimmerman, 1978, 1986). More generally, the probability of covenant violation is often considered a proxy for borrower riskiness or the degree of agency conflicts.

Early empirical work on debt covenants operationalized the construct of the comprehensive probability of covenant violation using borrower leverage (Duke and Hunt, 1990; Press and Weintrop, 1990; Watts and Zimmerman, 1986). The introduction of Dealscan, a machine-readable database of private loan agreements, which includes the details of covenant inclusion, greatly assisted research efforts in this area. Dealscan provides details on thousands of private loan contracts and allows researchers to test hypotheses in large-sample, generalizable settings (e.g., Dichev and Skinner, 2002). Although Dealscan provides information on the general types of covenants that are used and their violation threshold values, it does not provide definitional details of the actual construction of the covenant in the loan contract, which inhibits precise calculation of violation probability. For example, suppose that Dealscan indicates that a given loan includes an interest coverage covenant with a threshold value of three (i.e., if the borrower's interest coverage ratio dips below three, the covenant is violated). To calculate violation probability, the researcher must be able to measure the borrower's actual interest coverage ratio and to compare it to the threshold value of three. Dealscan, however, does not provide the actual definition of interest coverage used in the contract. Although loan contracts generally define interest coverage as the ratio of earnings to interest expense, earnings could take on many different definitions (e.g., net income, EBIT, EBITDA), and interest could be accrual- or cash-basis. This is of particular concern, given that covenants are frequently customized (El-Gazzar and Pastena, 1991; Leftwich 1983), and there is variation in the definitions of various contract variables based on features of the borrower and the loan (Li, 2010, 2015).

Researchers acknowledge this lack of detail and its potential to introduce measurement error. For instance, Zhang (2008) notes, "Due to the diversified nature of financial covenants and the customized definition of covenant items, such an ideal measure [of covenant tightness] is difficult to calculate" (p. 36). Frankel and Litov (2007) state, "As the exact nature of individual covenants can be quite intricate, a valid continuous measure, reflecting the details of each covenant is unrealistic" (p. 16).

Due to this perceived measurement error in Dealscan covenant data, researchers have not developed measures of covenant violation probability using the full set of Dealscan covenants. Instead, researchers commonly use two other proxies built from Dealscan data. First, some studies restrict attention to a small number of covenants for which measurement error is presumed to be minimal and implicitly assume that these few covenants reflect the overall probability of covenant violation. For example, Dichev and Skinner (2002) conduct their analysis using only current ratio and net worth covenants, noting that their analysis "require[s] covenant measures that are standardized and relatively unambiguous" (p. 1101).[3] Second, some studies do not attempt to measure covenant slack at all and, instead, use a count of the number of financial covenants attached to a loan as a measure of violation probability. For example, Demerjian (2011) predicts that the "balance sheet perspective" has affected both the use and the probability of violation of balance sheet covenants. Lacking actual covenant definitions, however, Demerjian focuses on the use of covenants and does not attempt to analyze the probability of violation. As another example, Christensen and Nikolaev (2012) develop a theory that relates to the restrictions put on borrowers through performance vs. capital covenants but measure intensity of covenant use through covenant counts rather than through violation probability.[4]

Murfin (2012), in a study that posits a theory about the relation between lender-specific shocks and probability of covenant violation, uses Dealscan to develop an aggregate probability of violation measure (i.e., covenant "strictness") based on the number of covenants in a loan, the estimated slack of these covenants, and the covariance between the financial measures that underlie the covenants. Although the Murfin measure has many appealing characteristics, Murfin does not address the Dealscan covenant measurement error problem. Rather, Murfin suggests that any measurement error will be absorbed in the model's error, as his study uses aggregate strictness as a dependent variable. This provides little comfort to researchers who want to use an aggregate measure of violation probability as an independent variable. Moreover, the Murfin measure is computationally cumbersome and imposes parametric assumptions that limit estimation flexibility and result in loss of observations.

In this paper, we develop a measure of aggregate covenant violation probability that is superior to commonly used alternatives, while simultaneously addressing measurement error concerns that are inherent in working with Dealscan. Specifically, we propose a measure that incorporates the logic of the Murfin (2012) measure, includes more covenant categories, uses covenant-specific definitions that minimize measurement error, and uses a nonparametric estimation approach, which is more flexible, easier to implement, and calculable for a larger sample of loans.

Our aggregate measure incorporates individual covenant violation probabilities for all covenants included in a loan. Thus, a prerequisite to computing our measure is the determination of "standard definitions" for each covenant category in Dealscan that can be applied to minimize measurement error. We use a hand-coded sample of loans for which actual covenant definitions are available to determine the best definition for each covenant category, which, for most covenant categories, is simply the most frequent definition used in the hand-coded sample. Then, we compare the expected likelihood of violation using the standard definition to the violation likelihood based on the actual definition. We find that, for most covenants, the average error is insignificantly different from zero, suggesting that, in most cases, our standard definition serves as a reasonable proxy when the actual contract-level covenant definition is not known (i.e., when working with Dealscan data). We elaborate on this analysis in Section 2 of the paper. In Section 3, we explain the computation of our aggregate probability of violation measure using Dealscan and Compustat data and include a discussion of key research design choices.

[3] Other studies that follow this approach include Frankel and Litov (2007), Chava and Roberts (2008), Demiroglu and James (2010), and Franz et al. (2014).

[4] Other examples include Bradley and Roberts (2004) and Billett et al. (2007).