Income Smoothing and the Usefulness of Earnings for Monitoring in Debt Contracting*

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ABSTRACT

We investigate whether income smoothing affects the usefulness of earnings for contracting through the *monitoring* role of earnings-based debt covenants. First, we examine initial contract design and predict that income smoothing will increase (decrease) the use of earnings-based covenants if income smoothing improves (reduces) the usefulness of earnings to monitor borrowers. We find that private debt contracts to borrowers with greater income smoothing are more likely to include earnings-based covenants. A structural model that explores the cause of this relationship provides evidence that smoothing improves the ability of earnings to reflect credit risk. Second, we examine technical default following contract inception. We find that income smoothing is associated with a lower likelihood of spurious technical default (when the borrower's economic performance has not declined but the loan nevertheless enters technical default). In contrast, we find no association between income smoothing and performance technical default (when the borrower's economic performance has declined). Collectively, this evidence is consistent with income smoothing improving the effectiveness of earnings-based information in monitoring borrowers.

Nivellement des bénéfices et utilité des résultats dans le suivi de la solvabilité des emprunteurs

RÉSUMÉ

Les auteurs se demandent si le nivellement des bénéfices influe sur l'utilité des résultats dans l'établissement de contrats d'emprunt, grâce au *suivi* que permettent les ratios financiers dont les clauses restrictives des contrats d'emprunt exigent le respect. Ils étudient en premier lieu la conception du contrat initial et formulent l'hypothèse selon laquelle le nivellement des bénéfices augmentera (diminuera) le recours aux clauses restrictives fondées sur les ratios financiers si ce nivellement des bénéfices améliore (réduit) l'utilité des résultats pour assurer le suivi de la solvabilité des emprunteurs. Les auteurs constatent que les contrats d'emprunt privés octroyés à des emprunteurs qui nivellent davantage les bénéfices sont plus susceptibles de contenir des clauses restrictives exigeant le respect de ratios financiers. Un modèle structurel à l'aide duquel est analysée la cause de cette relation fournit des données indiquant que le nivellement améliore la faculté des résultats

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de refléter le risque de crédit. Ils étudient en second lieu la non-conformité après la passation du contrat. Ils constatent que le nivellement des bénéfices est associé à une probabilité plus faible de non-conformité douteuse (dans le cas où la performance économique de l'emprunteur n'a pas décliné mais que ce dernier transgresse néanmoins les clauses restrictives). En revanche, les auteurs ne relèvent aucun lien entre le nivellement des bénéfices et la non-conformité de la performance (dans le cas où la performance économique de l'emprunteur a décliné). Globalement, ces observations confirment l'hypothèse selon laquelle le nivellement des bénéfices améliore l'efficacité de l'information que procurent les ratios financiers dans le suivi de la solvabilité des emprunteurs.

1. Introduction

When preparing accounting reports, managers have considerable discretion (Watts and Zimmerman 1978, 1990). One area of literature in which researchers continue to debate the consequences of managerial discretion is income smoothing, which is generally defined as the purposeful intervention into the operating and reporting processes of the firm to lower the variance of reported earnings over time (Acharya and Lambrecht 2015; Beidleman 1973; Graham et al. 2005; Lambert 1984). Many studies demonstrate that income smoothing allows managers to introduce private information into the earnings stream, improving the usefulness of accounting disclosure for firm valuation (e.g., Badertscher et al. 2012; Gao and Zhan 2015; Tucker and Zarowin 2006). Others show that managers smooth income to distort reported performance, allowing them to extract economic rents from outside investors (Bushman and Williams 2012; Lang et al. 2012; Leuz et al. 2003).

We contribute to this debate and to the debt contracting literature by examining how income smoothing affects the usefulness of earnings for debt contracting. Prior research examines the relationship between earnings characteristics and lenders' initial risk assessments (i.e., Bharath et al. 2008; Costello and Wittenberg-Moerman 2011; Graham et al. 2008) but has not examined the influence of income smoothing on the monitoring effectiveness of earnings-based information following contract inception. In the context of monitoring borrowers, earnings are more useful when they provide a clearer reflection of the borrower's economic performance and changes in credit risk, allowing the contract to efficiently allocate contingent control rights between the borrower and the lender (Christensen et al. 2016; Dyreng et al. 2017).

To draw inferences about how income smoothing affects the usefulness of earnings in monitoring borrowers, we first observe contracting parties' revealed preferences based on the inclusion of earnings-based covenants in contracts. If income smoothing increases the usefulness of earnings for monitoring borrowers, then we expect that debt contracts to borrowers who smooth income are *more* likely to include earnings-based covenants. Alternatively, if income smoothing reduces the usefulness of earnings, then we expect that debt contracts to borrowers who exhibit greater income smoothing are *less* likely to include earnings-based covenants.

We test these competing hypotheses using a sample of DealScan private debt contracts from 1996 to 2017. We find that debt contracts to borrowers with greater levels of income smoothing are more likely to include earnings-based covenants. Borrowers at the top decile of income smoothing are, on average, 5 percent more likely to include an earnings-based covenant relative to borrowers at the bottom decile. These results are consistent with income smoothing improving the usefulness of earnings for monitoring borrowers.

To understand the channels through which income smoothing improves the usefulness of earnings in monitoring borrowers, we conduct a structural mediation (or path) analysis. We contend that earnings smoothing improves the ability of earnings to reflect the borrower's credit risk and that this is one reason that earnings-based covenants are used more extensively by firms who engage in greater amounts of income smoothing. We use the credit risk value (CRV) of earnings as the mediating variable in our path analysis. We measure CRV as the firm-specific relationship between the firm's earnings and the firm's expected default frequency (EDF; Merton 1974). The results provide evidence of both a direct path between income smoothing and the use of income

statement covenants and an indirect path through CRV. The results for the indirect path through CRV support the conclusion that debt contracts include income statement covenants more frequently because smoothing improves the correspondence between earnings and credit risk.

We also examine how income smoothing improves monitoring effectiveness by studying the incidence of technical default. Prior literature demonstrates that earnings-based covenants provide trip wires to allocate contingent control rights based on the observed performance of the borrower (Christensen and Nikolaev 2012). Technical default occurs when a borrower fails to maintain the threshold level of an accounting-based loan covenant, such as minimum interest coverage or maximum debt-to-EBITDA. The monitoring effectiveness of a financial covenant—the degree to which the covenant is triggered only when credit risk increases—is based on the precision with which the underlying accounting-based performance metric detects changes in the borrower's credit risk. Thus, to draw inferences regarding whether income smoothing improves or encumbers the monitoring effectiveness of earnings-based covenants, we examine the relationship between income smoothing and the likelihood of technical default conditional on the economic performance of the borrower.

We classify technical default into two distinct categories. The first, which we term *spurious technical default*, occurs when a transient shock reduces the borrower's reported performance to trigger a covenant violation even though the borrower's creditworthiness has not deteriorated (Type I error). The second, which we term *performance technical default*, occurs when a decline in the borrower's reported performance represents a material increase in credit risk. A covenant's failure to trigger technical default, following such an increase in credit risk, is a Type II error. Because the borrower predominately experiences the negative consequences from technical default (e.g., Nini et al. 2012), we expect that the borrower will bear costs associated primarily with Type I errors. Conversely, we expect that the lender will bear costs associated with both Type I and Type II errors. Overall, we expect that earnings characteristics that reduce the costs associated with both Type I and Type II errors improve the monitoring effectiveness of earnings-based covenants.

To examine the relationship between income smoothing and covenant violations, we supplement the DealScan data with a panel data set of technical defaults of financial covenants from 1996 to 2008 (Nini et al. 2012). We analyze the effects of income smoothing on spurious and performance technical default by sorting observations based on the current economic condition of the borrower as reflected by (i) stock returns (Goh and Ederington 1993; Shumway 2001; Zhang 2008), (ii) changes in S&P credit ratings, and (iii) EDFs (Merton 1974). We use three methods to identify spurious covenant violations. First, we select borrowers with two consecutive quarters of positive abnormal stock returns.[1] Second, we select borrowers who receive a credit rating upgrade. Third, we select borrowers in the lowest quintile of EDF. Our identification assumption is that technical default accompanied by positive returns or a credit rating upgrade or among firms with low EDF is more likely spurious, representing a greater frequency of Type I errors. Similarly, for the performance technical default subsample, we employ three methods to identify credit risk increases. First, we select borrowers with either negative abnormal stock returns in two consecutive periods or who experience a negative shock to stock returns in the previous six months (Zhang 2008). Second, we select borrowers who receive a credit rating downgrade. Third, we select borrowers in the highest quintile of EDF.

We find a significantly negative association between income smoothing and spurious technical default. In fact, borrowers at the bottom decile of income smoothing are nearly twice as likely to spuriously violate covenants relative to borrowers at the top decile. This result suggests that

1. When a technical violation occurs, it does so after the preparation of the financial statements (i.e., after the quarter end). Thus, returns associated with the disclosure of a violation are not included in the measure of economic performance.

income smoothing reduces the influence of transitory performance shocks on reported earnings (Chaney et al. 1998) and reduces the likelihood of Type I errors in covenant violations.

Next, we examine the association between income smoothing and performance technical default. If income smoothing allows the borrower to distort reported performance and obscure the firm's poor financial condition, then income smoothing will reduce the likelihood of performance technical default and increase the likelihood of a Type II error. In contrast, our results indicate an insignificant association between income smoothing and performance technical default across all subsamples. Thus, we find no evidence that income smoothing increases the frequency of Type II errors in technical default.

This study makes two primary contributions to the literature. First, we supplement the literature that examines the role of accounting information in debt contracts. This study is the first, to our knowledge, to examine directly how income smoothing is associated with the usefulness of earnings for monitoring borrowers. Our results are consistent with recent work that provides evidence of the contracting benefits of earnings that accurately reflect economic performance over earnings that are downwardly biased or conservative (Dyreng et al. 2017; Gigler et al. 2009). This prior work indicates that lenders adjust earnings to arrive at earnings metrics that more accurately reflect economic performance to avoid false alarms (Dyreng et al. 2017; Li 2010). Our results extend this literature by showing that firm-driven earnings characteristics that improve the ability of earnings to reflect economic performance are also important in debt contracting; this is likely because it is infeasible for contracts to anticipate all future transitory items.

Second, regarding the debate over the costs and benefits of income smoothing, our study adds to the literature that documents the benefits of income smoothing (e.g., Amiram and Owens 2018; Demerjian et al. 2017). Specifically, our evidence supports the view that income smoothing improves the usefulness of earnings for debt contracting by improving the usefulness of earnings-based information in monitoring borrowers. One implication of our results is that income smoothing does not appear to facilitate opportunistic earnings management as the borrower approaches covenant thresholds. This suggests that income smoothing improves the informational features of accounting by reducing the effect of transitory shocks but has limited use in reporting earnings that deviate significantly from economic performance.

2. Background and hypothesis development

Income smoothing

An ongoing debate in the literature concerns whether income smoothing is ultimately beneficial to the firm and its stakeholders (Demerjian et al. 2017). Numerous analytical studies show that smooth earnings are informative and useful in compensation contracting (Chaney and Lewis 1995; Demski 1998; Kirschenheiter and Melumad 2002; Lambert 1984). Several archival analyses suggest that income smoothing removes noise from the income stream, provides a better metric of true firm performance (Subramanyam 1996; Tucker and Zarowin 2006), and provides useful information for contracting (Dou et al. 2013; Gassen and Fulbier 2015). In a general sense, smoothing allows firms to report earnings that more accurately represent "permanent earnings" (Chaney et al. 1998). In contrast to the view that income smoothing reveals useful information about future performance and value, some argue that managers opportunistically smooth income, which introduces bias into the earnings stream (Bushman and Williams 2012; Fudenberg and Tirole 1995; Healy 1985; Jayaraman 2008; Lang et al. 2012; Levitt 1998; Leuz et al. 2003).

Although the bulk of the literature examines how income smoothing affects information used by equity market participants, fewer studies consider how smoothing is associated with the usefulness of information in other decision contexts. In the realm of debt, existing studies examine how smoothing is associated with credit risk assessments made by credit ratings agencies and creditors. Jung et al. (2013) find that "plus" notch firms (i.e., firms with ratings closest to the next

credit rating level) have higher levels of discretionary accruals than do "middle" or "minus" notch firms, consistent with the opportunistic use of smoothing related to credit ratings. In terms of the effect of smoothing on debt contracting directly, Trueman and Titman (1988) provide an analytical model that shows that managers have incentives to smooth income to benefit shareholders at the expense of lenders. This view is consistent with agency theory and suggests that smoothing is used to obscure information from lenders. Empirical analyses, however, are mixed (Amiram and Owens 2018). Thus, the literature has not provided a clear understanding of how income smoothing affects credit market participants and intermediaries.

Accounting information and debt contracting

We focus on the monitoring role of accounting information in debt contracting and, specifically, financial covenants. Financial covenants require the borrower to maintain a threshold level of an accounting-based metric, such as interest coverage or debt-to-EBITDA. If the borrower maintains the covenant threshold, the borrower has control rights and continues to make decisions for the firm (Aghion and Bolton 1992). If the borrower fails to maintain the threshold, the loan enters technical default and the lender receives control rights and can act to ensure that the value of the lender's claim is protected (Chava and Roberts 2008; Donovan et al. 2015; Nini et al. 2009, 2012). Because contracts include financial covenants based on reported accounting information, the borrower's accounting practices and choices affect reported earnings and covenant compliance (Armstrong et al. 2010). Financial covenants, therefore, provide an ideal setting to assess the usefulness of income smoothing for debt contracting.

We consider the *monitoring effectiveness* of financial covenants based on the frequency of errors in detection. A Type I error in detection, which we term *spurious technical default*, occurs when a covenant is violated even though the borrower's creditworthiness has not declined. A Type II error in detection occurs when the borrower's performance is poor and credit risk has increased but the covenant has not been violated. Both Type I and Type II errors reduce the effectiveness of financial covenants and increase contracting costs. We expect that borrowers are more likely to bear the costs associated with Type I errors. First, there are costs associated with communicating to the lender that the default does not indicate increased credit risk. For example, management may need to document economic performance using non-accounting-based metrics and then meet with the lender to communicate the firm's true economic position. Second, spurious violation of covenants may negatively affect the borrower's credit ratings because rating agencies consider consistency of performance when assigning credit ratings (Graham et al. 2005; Jung et al. 2013). Third, spurious technical defaults increase the risk of the lender holding up the borrower; that is, the lender could exercise control rights opportunistically to extract fees or other concessions from the borrower.

We expect that lenders bear costs associated with both Type I and Type II errors (although Type I errors are relatively less costly for lenders than for borrowers). Type I errors are costly to the lender due to the incremental monitoring necessary to classify the violation as spurious and, if so, the logistics associated with adjusting the contract to accommodate the violation. In addition, recent evidence provided by Demerjian et al. (2018) suggests that spurious covenant violations (Type I errors) impose incremental costs on lenders related to regulatory capital compliance. Type II errors are clearly costly to the lender, who may not have recourse to act in the face of deteriorating borrower performance. Finally, both Type I and Type II errors reduce the signaling value of a covenant violation, limiting the ability of the lender to rely on financial covenants in monitoring the borrower.

Hypothesis development

In equilibrium, borrowers and lenders design debt contracts to minimize contracting costs. In particular, contracting parties write covenants based on accounting information to allocate contingent control rights between the borrower and the lender following contract inception. For example, if a

borrower's performance following contract initiation is unexpectedly poor, a financial covenant allocates control rights to the lender, allowing the lender to limit the borrower's ability to take further value-destroying actions (Aghion and Bolton 1992). The effectiveness of this allocation depends critically on the extent to which the contractible signal—in most cases, information from the borrower's reported financial statements, such as earnings—reflects the underlying economics of the borrower (Christensen et al. 2016; Dyreng et al. 2017).

One argument for income smoothing is that it allows earnings to more accurately report the borrower's latent economic performance. Prior literature suggests that income smoothing mitigates the effects of transitory shocks to allow reported earnings to more accurately reflect permanent earnings (Chaney et al. 1998; Subramanyam 1996; Tucker and Zarowin 2006). If income smoothing removes uninformative transitory shocks and produces earnings that are more informative to lenders, we expect that smoothed earnings will better reflect the borrower's creditworthiness and improve the debt contracting usefulness of earnings.

Prior literature shows, however, that the contractual definition of earnings typically excludes transitory components (Dyreng et al. 2017; Li 2010). If the contracting parties remove transitory items when defining earnings, it may negate any benefits of income smoothing for debt contracting purposes. It is likely to be infeasible, however, for contracting parties to identify and eliminate the effect of all future transitory items at contract inception, given the incomplete nature of contracts. Thus, income smoothing may play an incremental role in removing transitory items from earnings even when contracts feature customized earnings definitions.[2]

A second stream of literature argues that income smoothing distorts reported performance and allows managers to extract wealth from other stakeholders (e.g., Bushman and Williams 2012; Jung et al. 2013; Lang et al. 2012; Leuz et al. 2003). If income smoothing results in earnings metrics that obscure the borrower's economic performance, then the reserves generated from income smoothing in prior periods may facilitate managers' ability to delay recognizing material economic losses when credit risk increases. If so, then income smoothing will decrease the effectiveness of covenants to allocate control rights when credit risk increases, leading to a reduction in the debt contracting usefulness of earnings-based covenants (DeFond and Jiambalvo 1994; Dichev and Skinner 2002; Franz et al. 2014; Sweeney 1994).

Our first testable hypothesis takes an ex ante approach, whereby we examine whether income smoothing is associated with initial contract design. If income smoothing improves the usefulness of earnings for contracting purposes, then we expect that lenders will be more likely to include earnings-based covenants in contracts to borrowers who engage in greater income smoothing. In contrast, if income smoothing distorts earnings, we expect that lenders will be less likely to include earnings-based covenants in debt contracts to borrowers who smooth income. We state our first hypothesis in null form:

HYPOTHESIS 1. *Income smoothing is not associated with the inclusion of earnings-based covenants in debt contracts.*

Our second hypothesis examines if income smoothing also increases the use of income statement covenants indirectly via a mediating variable. We define our mediating variable, the *CRV of earnings*, as the extent to which earnings reflects the borrower's creditworthiness. We expect that, if income smoothing improves the CRV of earnings, then income smoothing will be positively associated with the use of income statement covenants through the mediating variable. Alternatively, if income smoothing distorts economic performance and reduces the ability of earnings to

2. Demerjian and Owens (2016), Li (2016), and Dyreng et al. (2017) further show that contracts typically define earnings as some variant of EBITDA. We incorporate these aspects of earnings into our measurement of income smoothing, which we describe in the Measures of income smoothing section.

reflect the borrower's credit risk, income smoothing will be negatively associated with the CRV of earnings and the use of income statement covenants. Therefore, we state our second hypothesis in the alternative form:

HYPOTHESIS 2. *The CRV of earnings is a mediating variable between income smoothing and the inclusion of earnings-based covenants in debt contracts.*

Our third hypothesis considers the usefulness of accounting information from an ex post perspective. Specifically, we examine whether smoothing is associated with two mutually exclusive categories of technical default: (i) *spurious technical defaults* that occur when the borrower's underlying credit risk has not increased (i.e., a Type I error), and (ii) *performance technical defaults* that accompany material increases in the borrower's credit risk. The results of these tests can provide ex post evidence of how income smoothing alters the effectiveness of earnings in monitoring borrowers through debt covenants. Evidence that income smoothing is associated with fewer spurious technical defaults is consistent with income smoothing lowering contracting costs by reducing Type I errors. In contrast, evidence that income smoothing is associated with fewer performance technical defaults (i.e., increases the incidence of Type II errors) would suggest that income smoothing increases contracting costs by increasing Type II errors. We present our third hypothesis, conditional on each type of technical default, in null form:

HYPOTHESIS 3a. *Income smoothing is not associated with the likelihood of spurious technical default following debt contract inception.*

HYPOTHESIS 3b. *Income smoothing is not associated with the likelihood of performance technical default following debt contract inception.*

3. Data sources and measurement of income smoothing

Data sources

We construct a sample of private debt contracts in the intersection of DealScan and COMPUSTAT from 1996 to 2017.[3] DealScan contains detailed information about a firm's private credit agreements, including the face value, maturity, interest rate, and use of covenants. We measure all borrower-specific financial information, using COMPUSTAT data. We eliminate firms from the financial, banking (SIC 6000–6999), and utilities industries (SIC 4900–4999) because the operating decisions of heavily regulated industries differ significantly from those of other firms (Badertscher et al. 2013). We obtain stock return data from CRSP. Finally, we identify financial covenant violations from the period 1996 to 2008, using the quarterly panel data set of covenant violations provided by Nini et al. (2012).[4]

Measures of income smoothing

We construct two measures of income smoothing. First, following Tucker and Zarowin (2006), we measure *Smooth_TZ* as −1 multiplied by the correlation between changes in abnormal accruals and changes in pre-discretionary operating income before depreciation (COMPUSTAT

3. We thank Michael Roberts for providing the data set that links the COMPUSTAT and DealScan databases. See Chava and Roberts (2008) for details.

4. We thank Amir Sufi for providing financial covenant violation data, available on his website at http://faculty.chicagobooth.edu/amir.sufi/data.html. The Nini et al. (2012) data include reported technical defaults as well as technical defaults that the borrower avoided due to changes in the contract (e.g., waivers, amendments). As such, we believe that our data set captures the full set of borrower-quarters for which the underlying activities of the borrower indicate a violation of the original covenant.

data item *oibdp*). We modify the Tucker and Zarowin measure by using operating income rather than net income. This follows from Demerjian and Owens (2016), Li (2016), and Dyreng et al. (2017), who show that contractually defined earnings are typically a modified EBITDA metric. Furthermore, contracts typically exclude transitory items (Demerjian 2011; Li 2010), so that the resulting earnings number approximates operating income.

We estimate abnormal accruals (*AA*) as the unexplained portion of accruals based on the modified Jones (1991) model, estimated by 2-digit SIC industry and year supplemented with a control for ROA, following Kothari et al. (2005). We calculate pre-discretion income (*PDI*) as operating income before depreciation minus estimated abnormal accruals. As noted by Tucker and Zarowin (2006), a stronger negative correlation between changes in abnormal accruals and changes in pre-discretion income indicates greater smoothing. Therefore, *Smooth_TZ* equals *Corr* (*ΔAA, ΔPDI*), measured over the preceding five-year period, and multiplied by −1 so that higher values of *Smooth_TZ* represent more income smoothing.[5]

Our second measure of income smoothing compares the ratio of the variability in operating cash flows relative to the variability in earnings (Bowen et al. 2008; Francis et al. 2004; Leuz et al. 2003). Specifically, we measure *Smooth_Std_Ratio* as the ratio of the SD of seasonally adjusted quarterly operating cash flows to the SD of seasonally adjusted quarterly operating income over the previous five-year period. We seasonally adjust operating cash flows and operating income to ensure that this measure does not simply reflect inherent volatility in the firm's operations over a fiscal year. A greater value of *Smooth_Std_Ratio* suggests that the firm uses accruals to smooth income relative to the underlying variability in cash flows.

4. Income smoothing and initial debt contract design

Sample selection

To examine the relationship between income smoothing and the usefulness of earnings for initial debt contract design, we construct a loan-level sample that comprises all private debt contracts on DealScan to public borrowers over our sample period (1996–2017). Loan packages are sets of loan facilities (e.g., term loans, revolving lines of credit) issued by the same lead lender on the same date. Covenants are set at the package level (i.e., a single set of covenants applies to all facilities in a loan package); therefore, we perform our analysis at the package level. This sample consists of 13,708 debt contracts to 4,069 unique borrowers.

Descriptive statistics

In Table 1, we present descriptive statistics for the initial contract design sample.[6] Approximately 79 percent of private debt contracts have at least one income statement covenant (*IS Covenant*), a rate consistent with past research (Demerjian 2011). In the year prior to contract inception, borrowers are large, with mean total assets of $4.5 billion, leverage of 0.30 (*Leverage*), and quarterly ROA (*ROA*) of 0.02. The distribution of our income-smoothing proxies is consistent with prior literature (Bowen et al. 2008; Tucker and Zarowin 2006).

Research design

We examine the relationship between smoothing and the inclusion of earnings-based covenants with the following probit model:

5. We construct another variant that considers real earnings management, following the method of Black et al. (2017), and find similar results. We also find similar results when we measure accrual-based earnings management, using the method proposed by Stubben (2010).
6. We winsorize all continuous variables at the 1 and 99 percent levels. Results are unaffected by this choice.

TABLE 1
Descriptive statistics: Initial debt contract design sample

Variable	*n*	Mean	25th percentile	Median	75th percentile	SD
Dependent variable						
IS Covenant	13,708	0.790	1.000	1.000	1.000	0.407
Treatment variables						
Smooth_TZ	12,706	0.834	0.825	0.950	0.989	0.281
Smooth_Std_Ratio	12,226	2.679	1.328	2.059	3.252	2.113
Control variables						
Total Assets	13,708	4,497.580	302.358	1,064.890	3,717.300	9,312.800
Leverage	13,708	0.295	0.143	0.279	0.410	0.207
MTB	13,708	2.496	1.158	1.899	3.060	3.079
ROA	13,708	0.018	0.003	0.037	0.071	0.116
Sales Growth	13,708	0.130	−0.015	0.075	0.195	0.315
Ann Abnormal Accruals	13,708	−0.028	−0.072	−0.023	0.017	0.084
Std(Returns)	13,708	0.136	0.090	0.122	0.168	0.065
Relationship Bank	13,708	0.460	0.000	0.000	1.000	0.498
Revolver	13,708	0.829	1.000	1.000	1.000	0.377
PP	13,708	0.658	0.000	1.000	1.000	0.474
BS Covenant Prior Deal	13,708	0.288	0.000	0.000	1.000	0.453
IS Covenant Prior Deal	13,708	0.461	0.000	0.000	1.000	0.498
Syndicate Size	13,708	8.531	2.000	6.000	12.000	7.897
Capex Restrict	13,708	0.191	0.000	0.000	0.000	0.393
Inst Tranche	13,708	0.163	0.000	0.000	0.000	0.370
Sweep Covenant	13,708	0.410	0.000	0.000	1.000	0.492
Dividend Restrict	13,708	0.694	0.000	1.000	1.000	0.461
Collateral	13,708	0.588	0.000	1.000	1.000	0.492
Debt Size	13,708	612.356	75.000	250.000	640.000	1,431.290
Maturity	13,708	45.836	35.000	48.843	60.000	20.340
Spread	13,708	195.434	100.000	175.000	258.733	131.799

Notes: This table presents the descriptive statistics for all debt contracts used in the tests that examine the relationship between income smoothing and the use of income-statement financial covenants with available information in the intersection of the DealScan and COMPUSTAT data. We provide variable descriptions in the Appendix.

$$\begin{aligned} IS\,Covenant_{it} = {} & \alpha_0 + \delta_1 Income\,Smoothing_{it-1} + \delta_2 Size_{it-1} + \delta_3 Leverage_{it-1} + \delta_4 MTB_{it-1} \\ & + \delta_5 ROA_{it-1} + \delta_6 Sales\,Growth_{it-1} + \delta_7 Ann\,Abnormal\,Accruals_{it-1} \\ & + \delta_8 Std\,(Returns)_{it} + \delta_9 Relationship\,Bank_i + \delta_{10} Revolver_i + \delta_{11} PP_i \\ & + \delta_{12} BS\,Covenant\,Prior\,Deal_i + \delta_{13} IS\,Covenant\,Prior\,Deal_i \\ & + \delta_{14} Syndicate\,Size_i + \delta_{15} Capex\,Restrict_i + \delta_{16} Inst\,Tranche_i \\ & + \delta_{17} Sweep\,Covenant_i + \delta_{18} Dividend\,Restrict_i + \delta_{19} Collateral_i \\ & + \delta_{20} Log\,(Debt\,Size)_i + \delta_{21} Log\,(Maturity)_i + \delta_{22} Log\,(Spread)_i + \varepsilon_{it}. \end{aligned} \quad (1)$$

The dependent variable in this model is an indicator variable equal to one if the debt contract on DealScan includes an income statement covenant, and zero otherwise. Demerjian (2011) separates covenants into income statement covenants written directly on earnings (e.g., interest coverage, debt-to-EBITDA) and balance sheet covenants that do not include earnings (e.g., net worth, leverage, current ratio). We expect that income smoothing will have a relatively direct effect on income statement

covenants because each of these covenants includes either earnings or earnings components in the covenant metric. In contrast, income smoothing could affect balance sheet covenants, but other borrower activities, such as equity or debt issuance, also could affect covenant compliance, regardless of the usefulness of earnings in monitoring borrowers. Following Demerjian, we classify the following DealScan covenant classifications as income statement covenants: interest coverage, debt service coverage, fixed charge coverage, debt-to-EBITDA, senior debt-to-EBITDA, and EBITDA.

Our primary variables of interest are the two measures of income smoothing: *Smooth_TZ* and *Smooth_Std_Ratio.* If income smoothing improves (reduces) the debt contracting usefulness of reported earnings, we expect a positive (negative) coefficient on our measures of income smoothing. Following Demerjian (2011), we include numerous borrower-specific control variables, including borrower size (*Size*), leverage (*Leverage*), growth opportunities (*MTB*), profitability (*ROA*), sales growth (*Sales Growth*), and abnormal accruals (*Ann Abnormal Accruals*). We also include numerous contract-level controls, including the use of other nonfinancial covenants, the size of the lending syndicate (*Syndicate Size*), an indicator variable for the use of collateral (*Collateral*), and the size (*Log(Debt Size)*) and maturity (*Log(Maturity)*) of the debt contract. The Appendix provides additional details on variable measurement.

Results

Income smoothing and the use of income statement covenants (Hypothesis 1)

In Table 2, we report the results from estimating model (1). Both measures of income smoothing are positively associated with the inclusion of income statement covenants. In terms of economic significance, based on the marginal effect, borrowers at the top decile of *Smooth_TZ* are approximately 4.8 percent more likely to include an income statement covenant relative to borrowers at the bottom decile.[7] This result suggests that, based on contracting parties' revealed preferences, income smoothing improves the usefulness of earnings for monitoring borrowers and that debt contracts to borrowers that exhibit greater income smoothing are more likely to include income statement covenants. In additional analyses, seen in the online Appendix,[8] we also substitute the indicator *IS Covenant* with (i) the number of *IS Covenants* used in the contract and (ii) the proportion of financial covenants that are *IS Covenants.* Our inferences are unchanged in these specifications.

Mediation analysis (Hypothesis 2)

We test our second hypothesis using a mediation analysis that explores how income smoothing affects the usefulness of earnings in monitoring borrowers (similar approaches are used in Bonsall et al. 2018; Landsman et al. 2012; Lang et al. 2012). Figure 1 illustrates the predicted path for our hypothesis. We measure our mediating variable, the informativeness of earnings in debt contracting, with the *CRV* of earnings. We calculate *CRV* as the firm-specific relationship between the firm's earnings and the firm's EDF (Merton 1974), measured on a quarterly basis over the 12 preceding quarters (with a minimum of four quarters over this period). Specifically, *CRV* is equal to the decile rank of the adjusted R^2 from a firm-specific regression of *EDF* on operating income scaled by total assets. Therefore, higher values of *CRV* suggest that the firm's earnings explain greater variation in the borrower's credit risk, as measured by *EDF*. Our path analysis examines both the direct relation between income smoothing and income-statement covenant use and the indirect path that occurs via *CRV*.

Table 3 presents the results, which provide evidence of both a direct and indirect path. Specifically, in panel A of Table 3, we find that the direct effect of income smoothing on the use of income statement covenants is 0.218 (statistically significant at the 1 percent level), while the indirect effect

7. The economic significance is similar for *Smooth_Std_Ratio* (i.e., 4.3 percent). In addition, our models include year and industry fixed effects. We find similar results when we exclude from the model the year and industry fixed effects and when we estimate the model with OLS.

8. Please see supporting information, "Appendix S1: Income Smoothing and the Usefulness of Earnings for Monitoring in Debt Contracting" as an addition to the online article.

TABLE 2
Earnings smoothing and the use of income statement covenants

	(1) *IS Covenant*			(2) *IS Covenant*		
Variables	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat
Smooth_TZ	0.224	***	(3.73)			
Smooth_Std_Ratio				0.214	***	(3.39)
Size	−0.156	***	(−6.66)	−0.168	***	(−6.98)
Leverage	0.505	***	(4.66)	0.556	***	(5.23)
MTB	−0.000		(−0.05)	−0.003		(−0.52)
ROA	1.629	***	(10.37)	1.503	***	(9.39)
Sales Growth	0.123	**	(2.12)	0.212	***	(3.76)
Ann Abnormal Accruals	−0.891	***	(−4.42)	−0.974	***	(−4.74)
Std(Returns)	−1.177	***	(−3.24)	−1.391	***	(−3.91)
Relationship Bank	0.015		(0.47)	0.037		(1.05)
Revolver	0.204	***	(4.10)	0.258	***	(5.02)
PP	0.506	***	(13.32)	0.553	***	(14.27)
BS Covenant Prior Deal	−0.690	***	(−16.26)	−0.664	***	(−14.94)
IS Covenant Prior Deal	1.151	***	(24.81)	1.123	***	(23.79)
Syndicate Size	0.008	***	(2.58)	0.010	***	(3.05)
Capex Restrict	0.427	***	(7.34)	0.485	***	(7.94)
Inst Tranche	0.027		(0.45)	0.034		(0.55)
Sweep Covenant	0.041		(0.98)	0.046		(1.05)
Dividend Restrict	0.142	***	(3.49)	0.154	***	(3.65)
Collateral	−0.080	*	(−1.64)	−0.108	**	(−2.12)
Log(Debt Size)	0.045	*	(1.74)	0.029		(1.08)
Log(Maturity)	0.200	***	(6.30)	0.171	***	(5.27)
Log(Spread)	0.121	***	(3.51)	0.077	**	(2.11)
N	12,706			12,226		
Pseudo R^2	0.283			0.294		

Notes: This table presents the results of a probit model that estimates the likelihood of including an income statement covenant in the initial negotiation of the debt contract. This test uses a sample of debt packages available on DealScan with sufficient data to compute earnings smoothing and control variables. The dependent variable is an indicator variable equal to one if the debt contract includes an income statement covenant following Demerjian (2011), and zero otherwise. The model includes year and 48-industry fixed effects from Fama and French (1997), and standard errors are clustered by borrower. Variable descriptions are provided in the Appendix. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

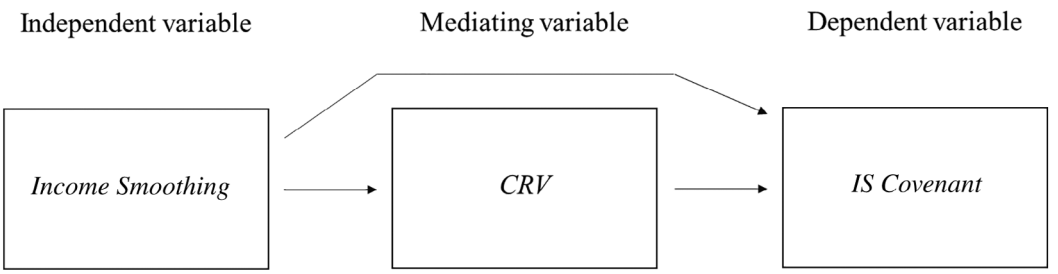
of income smoothing through *CRV* is 0.008 (statistically significant at the 5 percent level). We find similar results in panel B of Table 3, using *Smooth_Std_Ratio* as the measure of income smoothing. We note that the magnitude of the indirect effect is small relative to the direct effect of income smoothing; one reason for the relatively low indirect effect could be that our proxy for the mediating variable is measured with noise and imperfectly captures the CRV of earnings. Overall, however, the evidence suggests that one reason that income smoothing increases income-statement covenant use is that income smoothing increases the ability of earnings to reflect credit risk.

5. Income smoothing and ex post covenant compliance

Sample selection

Next, we examine the likelihood of covenant violation. We obtain data on technical default of financial covenants from a panel (borrower-quarter) data set available from Nini et al. (2012) for the years

Figure 1 Path analysis



Notes: This figure presents the path analysis of the relations between income smoothing, the *CRV* of earnings, and the use of income statement covenants in private debt contracts.

1996–2008. We set *Violation* equal to one if the borrower reported a new covenant violation, if the lender waived an imminent covenant violation, or if the borrower and lender agreed to amend the contract to avoid violation in quarter *t*, and zero otherwise.[9] Following Nini et al., we define a covenant violation as new if the borrower has no other violations (or waivers/amendments) in the preceding four quarters.

We note that the database provided by Nini et al. (2012) does not identify the exact type of covenant that was violated in each quarter, only that a covenant was violated. Including non-earnings-based covenants in our sample may add noise to our analysis, decreasing the likelihood that we can detect the relationship between income smoothing and covenant violation. Evidence from prior literature, however, mitigates this concern because contracts include earnings-based covenants to allocate contingent control rights when performance declines following debt contract inception and earnings-based covenants are the type of covenant most likely to be violated (Christensen and Nikolaev 2012). Furthermore, we examine SEC filings to assess the extent to which reported violations reflect noncompliance with earnings-based covenants. We present the results in Table 4, panel A. We can determine the type of covenant violated (income statement, balance sheet, or other) for approximately 58 percent of the sample.[10] For the subsample of firms for which we can identify the type of covenant that was violated, approximately 85 percent of firms violate earnings-based covenants. Among the remaining 15 percent of firms, the most commonly violated covenant is net worth, of which earnings is a component. This analysis leads us to conclude that earnings-derived covenants are the primary covenants violated by our sample firms.

Identification of spurious and performance technical default

We identify two mutually exclusive types of covenant violations: (i) *spurious technical default*, which occurs when a transient shock causes the borrower to report a covenant violation even though the borrower's creditworthiness has not deteriorated, and (ii) *performance technical default*, which occurs when a decline in the borrower's reported performance is not transient and represents a material increase in credit risk. We consider a variety of benchmarks to partition observations, ultimately selecting stock returns, credit rating changes, and expected default frequencies for numerous reasons, as discussed below.

9. Rule 4.08(c) of Regulation S-X (codified in ASC 235-10-899-1) specifies disclosure requirements following a debt covenant violation. Under these rules, the borrower should disclose the existence of the violation as well as the obligation and period of the waiver (Ernst & Young 2016). Therefore, reported covenant violations include both serious cases of covenant violations and less serious cases for which a waiver was granted because, by law, both types of violations are required to be disclosed.

10. For the remaining 42 percent for which we cannot determine the type of covenant violated, the company discloses only something along the lines of, "we were not in compliance with one or more of our financial covenants for the period ended 6/30/2008."

TABLE 3
Path analysis

Panel A: *Smooth_TZ*

		IS Covenant	
Effect	Coefficient	Significance	*z*-stat
Total effect	0.218	***	(3.99)
Direct effect *p*[*Smoothing*, *IS Covenant*]	0.210	***	(3.83)
Indirect effect *p*[*Smoothing*, *CRV*] × *p*[*CRV*, *IS Covenant*]	0.008	**	(2.13)
N	12,046		

Panel B: *Smooth_Std_Ratio*

		IS Covenant	
Effect	Coefficient	Significance	*z*-stat
Total effect	0.217	***	(3.94)
Direct effect *p*[*Smoothing*, *IS Covenant*]	0.195	***	(3.51)
Indirect effect *p*[*Smoothing*, *CRV*] × *p*[*CRV*, *IS Covenant*]	0.022	***	(3.13)
N	11,845		

Notes: This table presents the results of a structural probit model that examines the likelihood of including an income statement covenant in the initial negotiation of the debt contract. The dependent variable is an indicator variable equal to one if the debt contract includes an income statement covenant following Demerjian (2011), and zero otherwise. The model includes all control variables in our primary analysis presented in Table 2. We report the direct effect of income smoothing and the indirect effect of income smoothing through the *CRV* of earnings. Models include year and 48-industry fixed effects from Fama and French (1997). We provide variable descriptions in the Appendix. ** and *** indicate statistical significance at the 5 and 1 percent levels, respectively.

Stock returns have certain advantages and disadvantages as a proxy for changes in credit risk. First, stock returns reflect changes in the expected future cash flows of the borrower. Because the borrower's cash flows cover both equity and debt payments, we expect that, in many cases, stock returns and credit risk should move inversely. As such, to the extent that stock returns reflect changes in the expected future cash flows of the firm, they should also correlate inversely with changes in credit risk. An additional advantage is that stock prices are more widely available than are other measures of credit risk (e.g., CDS spreads).

A potential drawback of stock returns is that they do not necessarily reflect only changes in future cash flows. For example, stock returns also may reflect agency conflicts between equity investors and creditors. A firm may undertake a volatility-increasing investment policy following debt issuance; this *asset substitution* will lead to higher default risk for creditors, whereas equity investors enjoy the pricing benefits of the higher-variance projects (Smith and Warner 1979). In this case, stock prices will increase while credit risk also increases, potentially adding noise to our identification. Stock returns also may reflect changes in the equity cost of capital, and it is unclear how these changes influence credit risk.

Prior research examines the relationship between stock returns and changes in credit risk. Goh and Ederington (1993) find that 60 percent of rating downgrades are due to poor performance, while the remainder is due to changes in borrower leverage (i.e., possible agency

conflicts). Goh and Ederington (1993) also find that virtually all upgrades are due to improvements in expected cash flows. Thus, on average, we contend that changes in stock price are more likely to reflect the underlying economics of the firm than agency conflicts, making stock returns

TABLE 4
Descriptive statistics: Covenant compliance sample

Panel A: Classification of covenant violations into earnings and balance sheet violations

	n	Percentage
All covenant violations		
Total covenant violations	612	
Disclosure of covenant violation type	355	58.01
Type of covenant violation		
Income statement covenant violations	300	84.51
Balance sheet covenant violations	47	13.24
Other covenant violations	8	2.25
Total	355	100
Balance sheet covenant violations		
Net worth covenant violations	26	55.32
Leverage covenant violations	14	29.79
Other balance sheet covenant violations	7	14.89
Total	47	100

Panel B: Sample descriptive statistics

Variable	*n*	Mean	25th percentile	Median	75th percentile	SD
Dependent variable						
Violation	25,904	0.029	0.000	0.000	0.000	0.167
Treatment variables						
Smooth_TZ	25,750	0.821	0.800	0.940	0.985	0.293
Smooth_Std_Ratio	21,285	2.856	1.402	2.195	3.455	2.521
Control variables						
Total Assets	25,904	2,174.060	195.594	693.820	2,074.860	4,217.670
Leverage	25,904	0.310	0.174	0.287	0.416	0.197
MTB	25,904	4.598	1.079	1.895	3.142	245.580
ROA	25,904	0.004	0.000	0.010	0.019	0.055
Sales Growth	25,904	0.301	−0.025	0.076	0.202	12.332
Z-Score	25,904	61.264	1.207	2.471	5.208	1,638.590
Tangible	25,904	0.873	0.783	0.985	1.000	0.180
Abnormal Accruals	25,904	−0.007	−0.040	−0.007	0.024	0.087
Real EM	25,904	0.009	−0.056	0.003	0.066	0.121
Dividend	25,904	0.468	0.000	0.000	1.000	0.499
Investment	25,904	0.078	0.030	0.054	0.096	0.075
Std(Returns)	25,904	0.143	0.096	0.130	0.177	0.064
Std(Cash Flows)	25,904	0.036	0.019	0.028	0.043	0.028
Idiosyncratic Volatility	25,904	0.031	0.019	0.027	0.039	0.016
Rating	25,904	12.397	10.000	12.000	14.000	2.770
Log(Spread)	25,904	4.875	4.331	5.017	5.515	0.778
Collateral	25,904	0.654	0.000	1.000	1.000	0.476
IS Covenant	25,904	0.880	1.000	1.000	1.000	0.325
Covenant Strictness	25,904	0.500	0.222	0.444	0.778	0.319

(The table is continued on the next page.)

TABLE 4 (continued)

Panel C: Subsample descriptive statistics

Variable	(1) Positive returns sample	(2) Credit upgrade sample	(3) Low EDF sample	(4) Negative returns sample	(5) Shock returns sample	(6) Credit downgrade sample	(7) High EDF sample
Dependent variable							
Violation	0.012	0.017	0.010	0.044	0.066	0.055	0.032
Other variables							
Future ROA	0.036	0.028	0.062	−0.020	−0.099	−0.056	−0.013
Future Bankruptcy Rate (%)	0.178	0.296	0.103	1.387	4.100	2.499	4.467
Treatment variables							
Smooth_TZ	0.827	0.820	0.882	0.818	0.762	0.760	0.808
Smooth_Std_Ratio	2.901	2.890	3.253	2.830	2.278	2.410	2.541

Notes: Panel A provides a summary of the results from a hand collection of sample firms' disclosures of covenant violations. We define income statement covenants as interest coverage, debt service coverage, fixed charge coverage, debt-to-EBITDA, and senior debt-to-EBITDA and balance sheet covenants as net worth, tangible net worth, current ratio, quick ratio, leverage, senior leverage, debt-to-equity, and debt-to-tangible net worth (Demerjian 2011). Other covenants include covenants related to capital expenditures and covenants related to the timing of SEC filings. Panel B presents the descriptive statistics for all firm-quarters used in empirical tests with available information in the intersection of the DealScan, COMPUSTAT, and quarterly covenant violation data. Treatment and control variables are used to determine likelihood of covenant violation over the period 1996–2008. Panel C presents the descriptive statistics for each subsample used in empirical tests. Mean values for each subsample are presented for each variable.

a reasonable proxy for changes in credit risk. Nonetheless, we control for agency conflicts in our models.

As a second measure of changes in credit risk, we use changes in S&P credit ratings.[11] Like stock returns, credit rating changes have advantages and disadvantages in terms of detecting changes in borrower credit risk. An advantage of credit rating changes is that they represent an independent, third-party assessment of the borrower's creditworthiness. A second advantage is that, unlike stock returns, which suffer from potential measurement error due to agency conflicts, credit ratings pertain specifically to debt. In terms of drawbacks, credit ratings have been shown to lack timeliness (Cheng and Neamtiu 2009) and may be influenced by the borrower's reported accounting information (Alissa et al. 2013). Furthermore, not all firms with debt have credit ratings available.

Finally, we measure credit risk with EDF (Merton 1974), which measures the risk of borrower default in an options-pricing style framework; the model incorporates leverage, variability of the borrower's ROA, and the duration of debt to measure "distance to default," which, when transformed, reflects the expected frequency of borrower default. EDF is a popular measure of

11. In untabulated analysis, we find qualitatively similar results when we identify larger changes in credit risk, using a subsample of credit rating upgrades and downgrades by more than one notch. We note that only 236 (673) firms are upgraded (downgraded) by more than one notch. Therefore, we include only a limited set of control variables in the model (*Size*, *Leverage*, *MTB*, and *ROA*). We continue to find no evidence that income smoothing is significantly associated with performance technical default and that income smoothing is negatively associated with spurious technical default (*Smooth_TZ* coefficient = −2.06, *z*-statistic = −2.58; *Smooth_Std_Ratio* coefficient = −2.14, *t*-statistic = −2.24).

credit risk because it links credit risk to the underlying features of the borrower. Some drawbacks of the EDF model are that it requires simplifying assumptions (e.g., all bonds are zero coupon) and is computationally demanding.

Based on the discussion above, stock returns, S&P rating changes, and EDFs are all likely to provide information about changes in credit risk but are also subject to measurement error. To mitigate the effects of potential measurement error, we use all three proxies to define our spurious and performance technical default subsamples.

Spurious technical default subsamples

To test the relationship between income smoothing and spurious technical default, we require a subsample of borrowers whose credit risk has not increased. To identify our first spurious technical default subsample, we select firms with two consecutive quarters of positive cumulative abnormal stock returns (measured over the two preceding quarters; positive returns sample). We require two quarters of stock returns because the incorporation of news into financial accounting reports generally lags economic performance. For our second spurious technical default subsample, we select firm-quarters in the one year following an upgrade in the borrower's S&P senior unsecured debt rating (credit upgrade sample). For our third spurious technical default subsample, we select firm-quarters in the lowest quintile of estimated EDF (low EDF sample).

Performance technical default subsamples

To test the relationship between income smoothing and performance technical default, we require a subsample of firms in which the borrower's credit risk has increased. First, we select all firm-quarters with two consecutive quarters of negative cumulative abnormal stock returns (negative returns sample). Second, we select all firm-quarters that experience a negative shock, as evidenced by at least one month of abnormal stock returns less than or equal to −30 percent in the previous six months, following Zhang (2008) (shock return sample). Third, we select firm-quarters in which the borrower experienced an S&P senior unsecured debt rating downgrade in the prior year (credit downgrade sample). Finally, we select firm-quarters in the highest quintile of estimated EDF (high EDF sample). The positive returns sample comprises 32.5 percent of borrower-quarters, while the corresponding negative returns sample comprises 34.8 percent. The low EDF sample and high EDF sample each comprises approximately 26.3 percent of the sample. The more restrictive credit upgrade, credit downgrade, and shock returns samples comprise 9.1, 10.5, and 11.0 percent of borrower-quarters, respectively.

Descriptive statistics

In Table 4, panel B, we present descriptive statistics for the sample of borrower-quarters used to examine covenant violations. Technical defaults occur in 2.9 percent of borrower-quarters across all sample partitions. The statistics for other variables, including the smoothing proxies, are similar to those reported in Table 1 for the loan-level data set. The borrowers in the firm-quarter data set are, however, somewhat smaller (*Total Assets* = $2.2 billion), more highly levered (*Leverage* = 31.0 percent), and less profitable (*ROA* = 0.4 percent). We report a correlation matrix in the online Appendix.

If our partitions successfully separate borrowers with no change (or improvements) in creditworthiness from borrowers with declines in creditworthiness, then the spurious subsample should have superior future performance and lower bankruptcy rates relative to the poor performance subsample. In Table 4, panel C, we present the results of an examination of these expectations. We find that borrowers in the spurious subsample have significantly higher future ROA than do borrowers in the negative return, shock return, and credit downgrade subsamples. Similarly, borrowers in the spurious subsample go bankrupt at a significantly lower rate than do the negative return, shock return, and credit downgrade subsamples. Finally, we note that the magnitude of smoothing is similar across each of our partitions.

Research design

To test the relationship between income smoothing and the likelihood of covenant violation, we estimate the following probit model:

$$\begin{aligned} Violation_{iq} = {} & \alpha_0 + \beta_1 Income\ Smoothing_{it-1} + \beta_2 Size_{iq} + \beta_3 Leverage_{iq} + \beta_4 MTB_{iq} \\ & + \beta_5 ROA_{iq} + \beta_6 Sales\ Growth_{iq} + \beta_7 Z\text{-}Score_{iq} + \beta_8 Tangible_{iq} \\ & + \beta_9 Abnormal\ Accruals_{iq} + \beta_{10} Real\ EM_{iq} + \beta_{11} Dividend_{iq} \\ & + \beta_{12} Investment_{iq} + \beta_{13} Std(Returns)_{iq} + \beta_{14} Std(Cash\ Flows)_{iq} \\ & + \beta_{15} Rating_{iq} + \beta_{16} Idiosyncratic\ Volatility_{iq} + \beta_{17} Log(Spread)_{iq-1} \\ & + \beta_{18} Collateral_{iq-1} + \beta_{19} IS\ Covenant_{iq-1} + \beta_{20} Covenant\ Strictness_{iq-1} \\ & + \varepsilon_{iq}. \end{aligned} \tag{2}$$

The dependent variable is an indicator equal to one if the borrower reports a new covenant violation in the current quarter, and zero otherwise *(Violation)*.[12] Our primary variable of interest is our proxy for income smoothing: *Smooth_TZ* or *Smooth_Std_Ratio*. We measure income smoothing as of the most recent period ending prior to the current quarter.[13] In all multivariate analyses, we decile rank our measures of income smoothing to range between zero and one.

We include numerous borrower-specific financial control variables, measured as of the beginning of quarter q, to isolate the effect of income smoothing on the likelihood of technical default. Similar to Zhang (2008), we include total assets (*Size*), leverage (*Leverage*), growth opportunities (*MTB*), profitability (*ROA*), realized growth (*Sales Growth*), default risk (*Z-Score*), and tangible assets (*Tangible*). We control for earnings management (*Abnormal Accruals, Real EM*), as prior research provides evidence that borrowers will engage in earnings management prior to debt covenant violation (Defond and Jiambalvo 1994; Franz et al. 2014).[14] We control for potential agency conflicts. Prior literature argues that borrowers can transfer wealth from creditors to shareholders by paying dividends or by increasing risky investments (Armstrong et al. 2010; Jensen and Meckling 1976; Smith and Warner 1979). Therefore, we include an indicator variable equal to one for dividend-paying firms (*Dividend*) and control for research and development and capital expenditures, our proxy for risky investments (*Investment*).

We control for the borrower's economic volatility, using the SD of stock returns (*Std(Returns)*), the SD of quarterly operating cash flows (*Std(Cash Flows)*) and estimated credit ratings, following Barth et al. (2008) and Beatty et al. (2008) (*Rating*). To further control for borrower fundamentals, we include a control for idiosyncratic risk (*Idiosyncratic Volatility*), which we measure following Chen et al. (2012). We also control for debt contract characteristics that reflect the unobservable riskiness of the borrower: interest rates (*Log(Spread)*) and an indicator variable equal to one if the debt contract requires collateral (*Collateral*). We expect that risky borrowers are more likely to report covenant violations in the current quarter. Finally, we control for the use of income statement covenants (*IS Covenant*) and the decile rank of the borrower's debt covenant strictness (*Covenant Strictness*). We expect a positive relationship between these contract features and the likelihood of violating a covenant (Christensen and Nikolaev 2012; Demerjian and Owens 2016).

12. We replicate our main result: (i) using only those sample firms that have at least one *IS Covenant* reported on DealScan and (ii) excluding from our sample those firms that violate a non-income statement covenant (i.e., a balance sheet or other non-income statement covenant). Please refer to the online Appendix for additional details.
13. We measure *Smooth_TZ* over the five years ending as of the most recent annual period prior to quarter q, and we measure *Smooth_Std_Ratio* over the five-year period ending in quarter $q - 1$.
14. Inclusion of these control variables does not affect our inferences. In untabulated analysis, we interact income smoothing and current period earnings management; we find no evidence of a negative association between this interaction variable and performance technical default. Thus, income smoothing does not appear to facilitate current-period earnings management that delays performance technical default.

Results

Income smoothing and spurious technical default (Hypothesis 3a)

In Table 5 we present the results of our examination of the relationship between income smoothing and spurious technical default. In all subsamples, we find a negative relationship between income smoothing and the likelihood of spurious technical default.[15] We report the results from the estimation of equation (2) for the positive returns sample in columns (1) and (2). The average marginal effect of income smoothing is −0.010 and −0.008 based on *Smooth_TZ* and *Smooth_Std_Ratio*, respectively. These results suggest that moving from the bottom to the top decile of smoothing decreases the likelihood of spurious covenant violation by at least 67 percent relative to the subsample mean of 0.012.

In columns (3) and (4), we present regression results for the credit upgrade sample.[16] The results for this partition are consistent with the positive returns sample; we find marginal effects of −0.023 and −0.024 for *Smooth_TZ* and *Smooth_Std_Ratio*, respectively, which suggests considerable economic significance based on the rate of covenant violations reported for the credit upgrade sample in panel C of Table 4 (0.017). In columns (5) and (6), we report the results for the low EDF sample. Again, we find a negative and statistically significant relationship between income smoothing and the likelihood of spurious technical default. Based on the results in column (5), we find that borrowers in the bottom decile of *Smooth_TZ* are approximately 120 percent more likely to have spurious violations relative to borrowers in the top decile. Overall, the results suggest that income smoothing is associated with a reduced likelihood of spurious technical default. The evidence suggests that income smoothing reduces Type I errors.

Income smoothing and performance technical default (Hypothesis 3b)

In Table 6, we present the results of an examination of the relationship between income smoothing and performance technical default. In columns (1) and (2) of panel A we report the coefficient estimates of equation (2) for the negative returns sample. We find no relationship between income smoothing and the likelihood of performance technical default. In addition, we determine that, based on our sample of 8,950 observations in column (1), the power to detect a 1 percent difference in the frequency of performance technical default is approximately 0.996. Therefore, we do not believe that the insignificant coefficients for income smoothing are due to insufficient power. In columns (3) and (4) of panel A, we use the subsample of borrowers that experience a negative shock (shock returns sample). Again, we find no evidence that income smoothing reduces the likelihood of performance technical default. Finally, in columns (1) and (2) and columns (3) and (4) of panel B of Table 6, we use the credit downgrade sample and the high EDF sample, respectively. In both cases, we do not find a significant association. Thus, the results in Table 6 collectively provide no evidence that income smoothing is associated with a lower likelihood of performance technical default.

Overall, the covenant compliance results in Tables 5 and 6 provide evidence of a *differential* relationship between income smoothing and technical default, conditional on the economic performance of the borrower. Thus, it is unlikely that an unobserved correlated omitted variable explains our results by affecting the relationship between smoothing and spurious technical default but not the relationship between smoothing and performance technical default. For example, if firms with low innate volatility are less likely to violate loan covenants, and our smoothing

15. We include in the model industry and year fixed effects to alleviate concerns that our results are attributable to particular years or industries. One concern, noted by Greene (2004), is that maximum likelihood estimations with fixed effects may result in inconsistent parameter estimates. We perform three analyses to investigate this issue. Specifically, we estimate the equation for all subsamples with (i) a conditional logistic model, which is not subject to the incidental parameters concern (Allison 2009), (ii) a linear regression model, and (iii) a probit model, which excludes fixed effects from the model. All untabulated results are consistent with those reported.

16. The variable *IS Covenant* is omitted because it perfectly predicts the dependent variable for this subsample.

TABLE 5
Earnings smoothing and likelihood of spurious covenant violation

	Positive returns sample						Credit upgrade sample						Low EDF sample					
	(1) *Violation*			(2) *Violation*			(3) *Violation*			(4) *Violation*			(5) *Violation*			(6) *Violation*		
Variable	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat
Smooth_TZ	−0.355	**	(−2.30)				−0.632	**	(−2.42)				−0.441	**	(−2.48)			
Smooth_Std_Ratio				−0.323	**	(−1.99)				−0.697	**	(−2.42)				−0.639	***	(−3.25)
Size	−0.171	***	(−3.03)	−0.261	***	(−3.95)	−0.007		(−0.08)	0.007		(0.07)	−0.062		(−0.88)	−0.093		(−1.17)
Leverage	0.385	*	(1.68)	0.425		(1.51)	−0.982	**	(−2.06)	−0.957	*	(−1.73)	0.535		(1.35)	0.426		(0.92)
MTB	0.009		(0.78)	0.006		(0.45)	0.011		(0.95)	0.005		(0.45)	0.001		(0.07)	0.002		(0.14)
ROA	−7.125	***	(−6.76)	−7.511	***	(−5.67)	−10.82	***	(−6.69)	−11.15	***	(−5.69)	−11.04	***	(−5.69)	−12.00	***	(−5.45)
Sales Growth	−0.073		(−0.54)	−0.078		(−0.44)	0.022		(0.16)	−0.020		(−0.13)	−0.104		(−0.81)	−0.036		(−0.30)
Z-Score	−0.001		(−0.75)	−0.000		(−0.46)	−0.051		(−1.44)	−0.048		(−1.14)	−0.000		(−0.33)	−0.000		(−0.27)
Tangible	0.297		(0.97)	0.475		(1.25)	0.438		(0.83)	0.003		(0.01)	0.114		(0.33)	−0.048		(−0.13)
Abnormal Accruals	0.728		(1.38)	0.954		(1.45)	0.957		(1.28)	0.421		(0.47)	0.609		(1.15)	0.637		(1.07)
Real EM	−0.295		(−0.79)	−0.074		(−0.17)	−0.877		(−1.31)	−1.093		(−1.58)	−0.006		(−0.02)	−0.274		(−0.60)
Dividend	−0.299	***	(−2.71)	−0.426	***	(−3.17)	0.065		(0.41)	0.104		(0.61)	0.159		(1.18)	0.114		(0.79)
Investment	−0.368		(−0.58)	−0.058		(−0.08)	−0.594		(−0.58)	−0.436		(−0.35)	−0.755		(−0.96)	−0.940		(−1.04)
Std(Returns)	0.103		(0.08)	0.074		(0.06)	−1.405		(−0.57)	2.834		(1.26)	1.093		(0.54)	2.361		(1.11)
Std(Cash Flows)	0.093		(0.06)	1.061		(0.59)	3.532		(1.19)	8.152	***	(2.59)	−2.416		(−1.12)	0.058		(0.03)
Idiosyncratic Volatility	−4.065		(−0.75)	0.710		(0.12)	11.22		(0.90)	−7.226		(−0.70)	1.017		(0.10)	−7.373		(−0.61)
Rating	−0.029		(−0.78)	−0.091	*	(−1.90)	0.076		(1.43)	0.098	*	(1.80)	0.107	**	(2.05)	0.072		(1.30)
Log(Spread)	0.108		(1.18)	0.056		(0.52)	−0.037		(−0.19)	−0.121		(−0.58)	−0.047		(−0.45)	−0.016		(−0.13)
Collateral	−0.034		(−0.31)	0.006		(0.06)	0.190		(0.80)	0.331		(1.24)	−0.086		(−0.74)	−0.065		(−0.51)
IS Covenant	0.304		(1.51)	0.665	**	(2.22)							0.244		(1.19)	0.279		(1.18)
Covenant Strictness	0.030		(0.19)	0.044		(0.24)	0.351		(1.15)	0.280		(0.83)	0.463	**	(2.20)	0.402	*	(1.78)
Observation	8,386			7,001			2,354			2,021			6,795			5,862		
Pseudo R^2	0.138			0.182			0.249			0.250			0.211			0.212		

Notes: This table presents the results of a probit model that estimates the likelihood of covenant violation. The dependent variable is an indicator variable equal to one if the firm reported a new covenant violation in quarter *t*, following Nini et al. (2012). Columns (1) and (2) use a sample of firm-quarters with two consecutive quarters of positive cumulative abnormal stock returns so that a higher likelihood of covenant violation represents spurious covenant violation (positive returns sample). Columns (3) and (4) use a sample of firm-quarters within a one-year period, immediately following a credit rating upgrade, so that a higher likelihood of covenant violation represents spurious covenant violation (credit upgrade sample). Columns (5) and (6) use a sample of firm-quarters in the lowest quintile of estimated EDF, derived from Merton (1974), so that a higher likelihood of covenant violation represents a spurious covenant violation (low EDF sample). Models include year and 48-industry fixed effects from Fama and French (1997), and standard errors are clustered by firm. We provide variable descriptions in the Appendix. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

TABLE 6
Earnings smoothing and likelihood of missed detection of increased credit risk

Panel A: Negative returns sample and shock return sample

	Negative returns sample						Shock return sample					
	(1) *Violation*			(2) *Violation*			(3) *Violation*			(4) *Violation*		
Variable	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat
Smooth_TZ	−0.033		(−0.41)				0.052		(0.42)			
Smooth_Std_Ratio				−0.080		(−0.83)				−0.088		(−0.58)
Size	−0.142	***	(−4.56)	−0.153	***	(−4.28)	−0.042		(−0.94)	−0.064		(−1.21)
Leverage	0.222		(1.61)	0.334	**	(2.10)	−0.113		(−0.59)	−0.134		(−0.60)
MTB	−0.003		(−0.47)	−0.013		(−1.20)	0.003		(0.28)	−0.000		(−0.07)
ROA	−3.877	***	(−7.95)	−3.853	***	(−6.66)	−2.928	***	(−4.61)	−3.555	***	(−4.66)
Sales Growth	−0.141	*	(−1.79)	−0.205	**	(−2.28)	0.025		(0.27)	0.015		(0.13)
Z-Score	−0.002		(−1.58)	−0.002		(−1.39)	−0.010		(−1.45)	−0.008		(−1.32)
Tangible	−0.557	***	(−3.12)	−0.571	***	(−2.84)	0.325		(0.98)	0.360		(0.99)
Abnormal Accruals	0.887	***	(3.10)	0.928	***	(2.78)	1.318	***	(3.86)	1.375	***	(3.34)
Real EM	0.211		(0.95)	0.231		(0.91)	−0.049		(−0.16)	−0.222		(−0.63)
Dividend	−0.037		(−0.59)	0.020		(0.29)	0.057		(0.64)	0.214	**	(2.08)
Investment	0.026		(0.08)	0.137		(0.33)	−0.211		(−0.49)	−0.416		(−0.64)
Std(Returns)	1.561	**	(2.44)	1.336	*	(1.84)	0.766		(0.92)	0.948		(0.93)
Std(Cash Flows)	0.621		(0.70)	0.861		(0.83)	1.097		(0.89)	1.219		(0.87)
Idiosyncratic Volatility	−4.980	*	(−1.64)	−5.103		(−1.41)	−6.317		(−1.58)	−9.883	**	(−1.99)
Rating	−0.054	**	(−2.54)	−0.048	*	(−1.98)	−0.058	*	(−1.83)	−0.042		(−1.15)
Log(Spread)	0.169	***	(3.38)	0.137	**	(2.39)	0.154	*	(1.92)	0.141		(1.48)
Collateral	−0.028		(−0.42)	0.010		(0.13)	0.307	**	(2.22)	0.364	**	(2.28)
IS Covenant	0.162	*	(1.91)	0.173	*	(1.70)	0.038		(0.31)	0.095		(0.60)
Covenant Strictness	0.099		(1.12)	0.090		(0.88)	−0.171		(−1.26)	−0.169		(−1.06)
Observation	8,950			7,348			2,831			2,174		
Pseudo R^2	0.095			0.100			0.096			0.116		

(The table is continued on the next page.)

TABLE 6 (continued)

Panel B: Credit downgrade sample and high EDF sample

	Credit downgrade sample						High EDF sample					
	(1) *Violation*			(2) *Violation*			(3) *Violation*			(4) *Violation*		
Variables	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat	Coefficient	Significance	*z*-stat
Smooth_TZ	−0.121		(−0.73)				0.024		(0.32)			
Smooth_Std_Ratio				−0.132		(−0.67)				−0.033		(−0.36)
Size	−0.134	*	(−1.88)	−0.158	*	(−1.79)	−0.118	***	(−4.03)	−0.110	***	(−3.36)
Leverage	0.040		(0.14)	0.025		(0.07)	0.051		(0.40)	0.014		(0.09)
MTB	−0.002		(−0.17)	0.004		(0.23)	0.000		(0.03)	−0.007		(−0.75)
ROA	−3.197	***	(−3.04)	−3.668	***	(−3.02)	−3.602	***	(−8.06)	−3.868	***	(−7.47)
Sales Growth	−0.149		(−0.76)	−0.051		(−0.26)	−0.078		(−0.87)	−0.073		(−0.73)
Z-Score	−0.049		(−1.44)	−0.030		(−0.96)	−0.007	*	(−1.70)	−0.010		(−1.30)
Tangible	0.323		(1.09)	0.314		(0.89)	−0.356		(−1.55)	−0.626	**	(−2.40)
Abnormal Accruals	0.706		(1.38)	0.867		(1.43)	1.244	***	(4.45)	1.240	***	(3.78)
Real EM	0.337		(0.70)	0.617		(1.01)	0.366		(1.61)	0.121		(0.45)
Dividend	0.024		(0.18)	0.004		(0.03)	−0.168	***	(−2.58)	−0.174	**	(−2.34)
Investment	0.110		(0.12)	−0.251		(−0.24)	0.429		(1.22)	0.711	*	(1.79)
Std(Returns)	1.611		(1.10)	3.524	**	(2.09)	−0.004		(−0.01)	−0.139		(−0.22)
Std(Cash Flows)	−0.780		(−0.36)	−2.057		(−0.73)	0.003		(0.00)	0.744		(0.74)
Idiosyncratic Volatility	2.272		(0.30)	−6.293		(−0.76)	−1.613		(−0.65)	1.180		(0.41)
Rating	−0.070		(−1.61)	−0.065		(−1.33)	−0.080	***	(−4.10)	−0.077	***	(−3.45)
Log(Spread)	0.049		(0.45)	0.037		(0.29)	0.156	***	(2.76)	0.129	**	(2.00)
Collateral	0.090		(0.67)	0.213		(1.36)	0.022		(0.26)	0.066		(0.70)
IS Covenant	0.443	**	(2.19)	0.557	**	(2.11)	0.158	**	(2.01)	0.149	*	(1.65)
Covenant Strictness	−0.353	*	(−1.93)	−0.341	*	(−1.82)	−0.204	**	(−2.41)	−0.121		(−1.28)
Observation	2,691			2,153			6,729			5,272		
Pseudo R^2	0.092			0.103			0.064			0.065		

Notes: This table presents the results of a probit model that estimates the likelihood of covenant violation. The dependent variable is an indicator variable equal to one if the firm reported a new covenant violation in quarter *t*, following Nini et al. (2012). Columns (1) and (2) of panel A use a sample of firm-quarters with two consecutive quarters of negative cumulative abnormal stock returns (negative returns sample). Columns (3) and (4) of panel A use a sample of firm-quarters that experience a negative shock, with one month of cumulative abnormal stock returns less than or equal to −30 percent in the previous six months, following Zhang (2008) (shock return sample). Columns (1) and (2) of panel B use a sample of firm-quarters within a one-year period immediately following a credit downgrade (credit downgrade sample). Columns (3) and (4) of panel B use a sample of firm-quarters in the highest quintile of estimated EDF, derived from Merton (1974) (high EDF sample). A lower likelihood of covenant violation in these samples indicates a missed detection of increased credit risk. Models include year and 48-industry fixed effects from Fama and French (1997), and standard errors are clustered by firm. We provide variable descriptions in the Appendix. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

metrics reflect this omitted variable, then the results would be similar across both the spurious and performance subsamples. Collectively, the inferences from our tests that examine ex post covenant compliance are consistent with our tests that examine initial debt contract design. These results suggest that income smoothing improves the usefulness of earnings for monitoring borrowers following debt contract inception by reducing the likelihood of spurious technical default but not affecting the likelihood of performance technical default.

6. Robustness tests

Controlling for innate volatility

To provide evidence of the extent to which our results are robust to controlling for innate volatility, we reestimate our models within subsamples of high and low ex ante innate volatility. We follow Hribar and Nichols (2007) and measure innate volatility with the SD of cash flow from operating activities (CFO) measured, using quarterly data over the two-year period ending just prior to the start of our five-year period for measuring income smoothing. We use two years of data rather than five to retain as much of our sample as possible. We then separate our sample firms into two groups: (i) high ex ante CFO volatility firms and (ii) low ex ante CFO volatility firms, where high (low) volatility firms are those with ex ante CFO volatility above (below) the sample median. Finally, we reestimate our analyses separately for each subsample. In the online Appendix, we find that our results are consistent in both samples.

Alternative measures of increases in credit risk

In additional analyses in the online Appendix, we use two methods to identify firms with increases in credit risk. First, we identify borrowers in bankruptcy using two sources: (i) Moody's Ultimate Recovery Rate Database (URD) and (ii) the UCLA Bankruptcy Research Database over the period 1994–2011.[17,18] We find no evidence that smoothing reduces the likelihood of a covenant violation in the year preceding bankruptcy. We also examine the relationship between income smoothing and creditor recovery rates in bankruptcy and find no evidence that borrowers use income smoothing to extract wealth from creditors.[19] Second, we identify quarters in which the consensus annual forecast for the next fiscal year (year $t + 1$) is lower than the actual earnings reported in the prior year (year $t - 1$), using unadjusted I/B/E/S data. Prior literature demonstrates analysts' incentives to bias their forecasts optimistically (e.g., Bradshaw 2011). Therefore, if the consensus analyst forecast suggests a *decline* in the borrower's profitability from the prior year, we expect that the borrower's performance has declined significantly and, as a result, credit risk has increased. Using this sample, we examine the likelihood of performance technical default and find qualitatively similar results. Please refer to the online Appendix for additional details regarding these tests.

7. Conclusion

We examine whether income smoothing is associated with the usefulness of earnings in monitoring borrowers subsequent to loan initiation. We view the totality of evidence as providing robust and appropriate conclusions that income smoothing improves the monitoring effectiveness of earnings-based covenants. Nonetheless, we acknowledge that we do not attempt to quantify the total costs and benefits of income smoothing. By providing empirical evidence that income smoothing increases the use of earnings-based covenants and is associated with a reduced

17. Moody's URD includes data on firms that file for financial distress over the period 1987–2011. We use a sample of bankrupt firms over the period 1994–2011 because we hand-collect data from SEC filings, following Donovan et al. (2015). Recovery rates are available for only 129 firms in Moody's URD.
18. We thank Lynn LoPucki for providing his data, available at http://lopucki.law.ucla.edu/index.htm.
19. In additional analysis in the online Appendix, we find that income smoothing amplifies the negative relationship between earnings and future bankruptcy.

likelihood of Type I errors without an accompanying increase in the likelihood of Type II errors, however, we conclude that income smoothing provides net benefits for debt contracting *monitoring* purposes, which we view as an important contribution to the literature. In addition, although the results suggest contracting benefits to income smoothing, we cannot determine whether these benefits motivate firms to smooth income, or whether other factors incentivize smoothing and the debt contracting effects we document are of second-order importance. Thus, readers should interpret our evidence with these caveats in mind.

We contribute to the literature that considers the role of accounting information in debt contracts by providing evidence that income smoothing improves the usefulness of earnings in assessing changes in borrowers' economic performance following contract inception. Our results suggest that income smoothing can be beneficial by reducing the effect of transitory shocks on the reported earnings stream while not aiding managers in reporting earnings that are substantially higher than economic performance when credit risk increases. In addition, our results suggest that smoothing may be a channel through which private information is integrated into reported financials and thus improves the usefulness of earnings for monitoring the borrower.

Finally, these findings also contribute to the ongoing debate over income smoothing. Our evidence supports the view that smoothing is beneficial: Income smoothing appears to improve the usefulness of earnings by increasing the correspondence between reported earnings and economic performance, which improves the usefulness of earnings in debt contracting.

Appendix

Definition of variables

Variable	Definition
Abnormal Accruals	The unexplained portion of quarterly accruals based on the modified Jones (1991) model supplemented with income before extraordinary items, estimated by 2-digit SIC industry and year with quarter fixed effects
Ann Abnormal Accruals	The unexplained portion of annual accruals based on the modified Jones (1991) model supplemented with income before extraordinary items, estimated by 2-digit SIC industry and year
BS Covenant	Indicator variable equal to one if the debt contract available on DealScan includes a leverage ratio, debt-to-equity ratio, net worth, current ratio, or quick ratio covenant, and zero otherwise
BS Covenant Prior Deal	Indicator variable equal to one if the prior debt contract available on DealScan includes a leverage ratio, debt-to-equity ratio, net worth, current ratio, or quick ratio covenant, and zero otherwise
Capex Restrict	Indicator variable equal to one if the debt contract available on DealScan includes a covenant restricting the level of capital expenditures, and zero otherwise
Collateral	Indicator variable equal to one for secured debt contracts available on DealScan, and zero otherwise
Covenant Strictness	Decile rank of the borrower's binding financial covenant slack; in each quarter, we measure covenant slack for all outstanding financial covenants in the most recent annual period, using standard covenant definitions provided by Demerjian and Owens (2016), and standardize each covenant by the level of the accounting ratio. We then identify the binding covenant with the minimum slack (strictness) and decile rank strictness
Dip Loan	Indicator variable equal to one if the borrower obtains debt-in-possession financing, and zero otherwise

(The Appendix is continued on the next page.)

Appendix (continued)

Variable	Definition
Dividend	Indicator variable equal to one for firm quarters with non-zero dividends in the most recent annual period on COMPUSTAT (*dvt*)
Dividend Restrict	Indicator variable equal to one if the debt contract available on DealScan includes a dividend restriction, and zero otherwise
Future Bankruptcy Rate	Percentage of borrowers in each subgroup that files for bankruptcy in the one-year period following the current quarter
Future ROA	Firm-year measure of income before extraordinary items (*ib*) scaled by total assets (*at*), measured in the first annual period beginning after the current quarter
GDP Growth	Trailing four-quarter U.S. GDP growth rate, measured at the date of default
Idiosyncratic Volatility	Idiosyncratic return volatility, averaged over the previous three years, following Chen et al. (2012)
Inst Tranche	Indicator variable equal to one if the debt contract available on DealScan has a Term Loan B or higher, and zero otherwise
Interest Miss	Indicator variable equal to one if the borrower discloses missing an interest payment in SEC filings prior to bankruptcy, and zero otherwise
Investment	Firm-quarter measure of total research and development (*xrdq*) and capital expenditure (*capxq*), scaled by total assets
IS Covenant	Indicator variable equal to one if the borrower has an outstanding debt contract available on DealScan with an interest coverage ratio, fixed charge, debt service, minimum EBITDA, or debt-to-earnings covenant, and zero otherwise
IS Covenant Prior Deal	Indicator variable equal to one if the prior debt contract available on DealScan includes an interest coverage ratio, fixed charge, debt service, minimum EBITDA, or debt-to-earnings covenant, and zero otherwise
Leverage	Firm-quarter measure of total debt scaled by total assets ((*dlcq* + *dlttq*)/*atq*)
Log(Debt Size)	Natural log of the face value (in millions) of the debt contract available on DealScan (*FacilityAmt*)
Log(Maturity)	Natural log of the maturity (in months) of the debt contract available on DealScan (*Maturity*)
Log(Spread)	Natural log of interest spread available on DealScan (*AllInDrawn*)
MTB	Firm-quarter measure of market value of equity scaled by book value of equity ((*prccq* × *cshoq*)/*ceqq*)
Net Worth	Indicator variable equal to one if the borrower has a net worth ratio covenant, and zero otherwise
PP	Indicator variable equal to one if the debt contract available on DealScan includes a performance pricing provision, and zero otherwise
Rating	Estimated creditworthiness based on the predicted value of a regression of credit ratings on firm size, ROA, leverage, and indicator variables for loss-making firms, firms that pay dividends, and firms with subordinated debt, following Barth et al. (2008) and Beatty et al. (2008)
Real EM	Total quarterly real earnings management, measured following Black et al. (2017)
Recovery Rate	Firm-wide recovery rate from Moody's Ultimate Recovery Database, calculated as the percentage of total value distributed to creditors in bankruptcy resolution relative to the total debt outstanding at default
Redeemable	Indicator variable equal to one if the borrower has redeemable debt, and zero otherwise

(The Appendix is continued on the next page.)

Appendix (continued)

Variable	Definition
Relationship Bank	Indicator variable equal to one if the borrower has a debt contract with the same lender available on DealScan prior to loan initiation, and zero otherwise
Revolver	Indicator variable equal to one if the debt contract available on DealScan is a revolving credit facility, and zero otherwise
ROA	Firm-quarter measure of income before extraordinary items scaled by total assets (*ibq/atq*)
Sales Growth	Percentage change in quarterly revenue (*revtq*) from the same quarter, prior year
Sinking Fund	Indicator variable equal to one if the borrower has sinking fund debt, and zero otherwise
Size	Firm-quarter measure of size defined as the natural log of one plus total assets (*atq*)
Smooth_Std_Ratio	Earnings smoothing calculated as the ratio of the SD of seasonally adjusted quarterly operating cash flows to the SD of seasonally adjusted quarterly operating income, measured over the five-year period ending in quarter $q - 1$
Smooth_TZ	Earnings smoothing calculated following Tucker and Zarowin (2006), but using operating income (*oibdp*) instead of net income, measured as of the most recent annual year-end date occurring prior to quarter *q*. Specifically, *Smooth_TZ* equals *Corr*(*ΔAbnormal Accruals, ΔPre-Discretion Operating Income* 1), measured over the preceding five-year period and multiplied by −1 so that higher values represent more income smoothing
S&P 500 *Ret*	Trailing 12-month returns of the S&P 500 index, measured at the date of default
Std(Cash Flows)	SD of COMPUSTAT quarterly operating cash flows (*oancfy*), measured over the previous five years
Std(Returns)	SD of CRSP monthly stock returns (*ret*), measured over the previous five years
Sweep Covenant	Indicator variable equal to one if the debt contract available on DealScan includes an excess cash flow sweep, asset sales sweep, debt issuance sweep, equity issuance sweep, or insurance proceeds sweep, and zero otherwise
Syndicate Size	Natural log of the number of syndicate lenders in the syndicated debt contract available on DealScan
Tangible	Firm-quarter measure of total tangible assets (*atq* − *intanq*) scaled by total assets
Total Assets	Firm-quarter measure of total assets (*atq*)
Violation	Indicator variable equal to one if the borrower reported a new covenant violation, if an imminent covenant violation was waived, or if the contract was amended to avoid violation in quarter *t*, and zero otherwise. Following the recommendation of Nini et al. (2012), we define a covenant violation as new if the borrower has no other violations (or waivers/amendments) in the preceding four quarters
Yield Spread	Bond yield spread between Moody's BAA-rated and AAA-rated corporate bonds, measured at the date of default.
Z-Score	Quarterly measure of bankruptcy risk, equal to $1.2 \times X_1 + 1.4 \times X_2 + 3.3 \times X_3 + 0.6 \times X_4 + 0.99 \times X_5$, where X_1 = current assets (*actq*) minus current liabilities (*lctq*) scaled by total assets (*atq*); X_2 = retained earnings (*req*) scaled by total assets; X_3 = earnings before interest and taxes (*niq* − *xintq* − *txtq*) scaled by total assets; X_4 = market value of equity scaled by total debt ((*prccq* × *cshoq*)/(*dlcq* + *dlttq*)); and X_5 = sales (*revtq*) scaled by total assets

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article.

Appendix S1: Income Smoothing and the Usefulness of Earnings for Monitoring in Debt Contracting.