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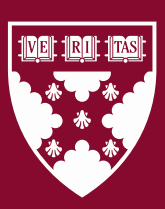

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Transitory and Permanent Cash Flow Shocks in Debt Contract Design*

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Abstract

We examine how lenders design contracts when borrowers are exposed to volatile transitory or permanent cash flow shocks. We find that volatile transitory shocks are associated with fewer liquidity covenants, indicating financial flexibility that can enable firms to survive temporary shocks. The opposite is true for volatile permanent shocks, suggesting that borrowers' economic fundamentals are important credit risk factors. Subsequent tests show that borrowers exposed to volatile transitory (permanent) shocks face less (more) severe consequences after covenant violations. We also find that lenders design contracts to control for agency risk, especially when borrowers are prone to gamble by delaying default.

Keywords: cash flow shocks; debt contracting; debt covenants; likelihood of default; credit ratings

Declarations of interest: none.

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1 Introduction

A firm's cash flow is considered by managers and investors as one of the most important factors affecting their financial and investment decisions (Graham and Harvey, 2001). However, in modeling and analyzing cash flow, academic literature has long ignored the intuitive characteristic that the nature of shocks to a firm's cash flow can be transitory or permanent, with different and sometimes opposing implications for corporate policies and investor choices (Gorbenko and Strebulaev, 2010; Décamps et al., 2016). Transitory shocks affect short-term cash flow and are uninformative about firms' future performance, whereas permanent shocks affect both short-term cash flow and long-term productivity. Business and investor decisions are expected to respond differently to transitory than to permanent shocks. Accordingly, there have been increasing calls for research to incorporate the distinction between transitory and permanent cash flow shocks (Gorbenko and Strebulaev, 2010; Décamps et al., 2016).

Motivated by these calls, our study aims to empirically investigate how the choice and use of debt covenants in loan agreements respond to variations in borrowing firms' transitory and permanent cash flow. While prior studies explore the influence of temporary and permanent cash flow on corporate financial policies (Byun et al., 2019b; Décamps et al., 2016; Gorbenko and Strebulaev, 2010; Gryglewicz et al., 2021), no studies have examined how the two types of shocks affect creditors' evaluation of borrower risk. To bridge this gap in the literature, we focus on covenants in debt contracts because they are a major tool used by lenders to control agency problems and mitigate risk in lending relationship. They impose restrictions on a borrower's capital structure or transfer control rights to lenders in states where the value of lender claims are at risk (Fama et al., 1972; Smith Jr and Warner, 1979; Leftwich, 1983; Dichev and Skinner, 2002; Christensen and Nikolaev, 2012).

Gorbenko and Strebulaev (2010) discuss the potential implications of temporary and permanent cash flow shocks on firms' financing decisions. They postulate that it is optimal for firms not to default if their future prospects are bright conditional on surviving a current

liquidity crunch. To facilitate this decision, lenders and borrowers can gain insights from decomposing cash flow into permanent and transitory components to determine whether low performance is a result of temporary shocks that warrant no immediate action or permanent shocks that reflect bleak future prospects for the firms and warrant corrective actions. In line with this, our baseline proposition is two fold. First, we test the proposition that debt contracts use fewer short-term financial performance focused (i.e., liquidity-based) covenants in the presence of transitory shocks because doing so would avoid inefficient or costly renegotiations or premature default triggered by covenant violations due to volatile transitory shocks. Second, we expect contracts to include more liquidity-based covenants when shocks are permanent, allowing lenders to intervene in a more timely manner if the firms' prospects deteriorate (Dichev and Skinner, 2002; Christensen and Nikolaev, 2012).

We test our proposition using a sample of U.S. firms that issued private debt from the years 1981–2017 and examine the relation between liquidity-based covenants and variations in transitory and permanent cash flow shocks. Akin to performance-based covenants in Christensen and Nikolaev (2012), our liquidity-based covenant measure is based on the aggregation of the following covenant types: Debt-to-EBITDA, Senior Debt-to-EBIDTA, Cash Interest Coverage, Debt Service Coverage, EBIDTA, Fixed Charge Coverage, Interest Coverage. We capture variations in transitory and permanent cash flow shocks using the volatilities of the cyclical and trend components of cash flow (e.g., Décamps et al., 2016). Consistent with our predictions, we find a negative (positive) association between liquidity-based covenants and volatility of transitory (permanent) cash flow shocks. These results indicate that lenders use fewer liquidity-based covenants in debt contracts with borrowers exposed to high transitory cash flow volatility, and more liquidity-based covenants when permanent cash flow volatility is high. Overall, these results support our proposition that covenants are designed to facilitate optimal default, which would allow firms to survive transitory shocks.

For debt contracts that use liquidity-based covenants, we further examine the covenant slack in relation to borrowers' exposure to transitory cash flow. The theoretical work of Gor-

benko and Strebulaev (2010) implies that it is costly for lenders and borrowers to set tight benchmarks around covenants when borrowers are exposed to volatile transitory shocks. Tighter covenants increase the probability of covenant violation and excessive lender intervention (Infuehr and Laux, 2022). Thus, to avoid costly renegotiations or premature defaults, debt contracts are likely to have greater covenant slack when a borrower is exposed to high volatility of transitory cash flow shocks. Our results are somewhat consistent with this expectation. Using reported accounting measures and covenant thresholds to compute covenant tightness (Dichev and Skinner, 2002; Demerjian and Owens, 2016), we find some evidence of greater covenant slack as borrowers' volatility of transitory shocks increases but less covenant slack as permanent cash flow volatility increases.[1]

We also conduct tests to explore alternative contract design employing performance pricing, a provision used in debt contracts to address unanticipated risk changes. It links interest rate to a borrower's performance, either by reducing the rate if credit quality improves or by increasing it if credit quality deteriorates (Asquith et al., 2005; Manso et al., 2010). We expect less frequent performance pricing when borrowers are exposed to volatile transitory shocks because this would unnecessarily penalize borrowers for short-lived negative shocks or reward them for short-lived positive shocks, both of which may have nothing to do with fundamental credit risk changes. Conversely, performance pricing is more likely when a borrower is exposed to variations in permanent cash flow shocks as these better reflect a firm's economic prospect and credit quality, and performance pricing would address any unanticipated changes. Our results are consistent with these predictions. We find that transitory shocks are associated with lower likelihood of performance pricing which is not the case for permanent shocks.

Next, we examine the consequences of covenant violation in the wake of transitory and permanent shocks. As covenants are frequently violated and renegotiated (Dichev and Skin-

[1]Covenant tightness is based on interest coverage ratio covenant type. We select interest coverage ratio because it is the most frequently used liquidity covenant in debt contracts that is purely based on periodic financial performance information.

ner, 2002; Roberts and Sufi, 2009a; Infuehr and Laux, 2022), if covenants are designed with the intent to allow borrowing firms to survive a liquidity crunch, then we expect less severe consequences when the covenant violation is likely to result from transitory shocks. To test this, we examine disclosures of serious covenant violations in company annual reports. We find that transitory cash flow shocks are negatively associated with the disclosure of serious violations while permanent cash flow shocks are positively associated with it. We also examine the changes in the borrowers' long-term credit ratings, with the view that credit rating changes fairly represent how lenders would react to borrowers' transitory and permanent cash flow shocks.[2] We find that credit ratings are more likely to change for firms exposed to permanent shocks when lenders are likely to take corrective actions, but less so for firms exposed to temporary shocks when it is less optimal for lenders to take immediate actions.

Our results suggest that lenders give borrowers greater financial flexibility by using fewer and less tight liquidity-based covenants in debt contracts in order to avoid inefficient renegotiations or premature default from transitory shocks. However, agency risk may arise from the borrowing firm's liquidity position. Specifically, if their future prospects are poor, borrowers are more prone to gamble by delaying their default and achieving wealth substitution (Gorbenko and Strebulaev, 2010; Davydenko, 2012). Accordingly, we perform an additional set of tests to investigate how lenders can control borrowers' risk appetite.

Gorbenko and Strebulaev (2010) theoretically demonstrate that solvency-based covenants should be used in debt contracts to control the borrowers' appetite for risk. Hence, we investigate whether and how solvency covenants are used to cope with the agency risk in debt contracting. Solvency covenants are based on accounting measures of the firms' long-term financial position (i.e., Debt-to-equity, Debt-to-tangible networth, Leverage ratio, Loan-to-value, Net debt-to-assets, Senior leverage, Total debt-to-tangible networth, Equity-to-asset ratio, Networth-to-total asset, Networth, Tangible networth). We find that solvency-based

[2]Long-term credit ratings reflect rating agencies' current opinions of a borrower's overall creditworthiness, focusing on the borrower's capacity and willingness to meet its long-term financial obligations as agreed upon with the creditors (Moody's, 2021; S&P, 2021).

covenants increase (decrease) for firms exposed to more volatile transitory (permanent) shocks, which is opposite to the relations documented for liquidity-based covenants. These results are consistent with evidence reported in prior studies that solvency-based covenants are generally used as a substitute of liquidity-based covenants (e.g. Christensen and Nikolaev, 2012). However, when borrowers experience positive transitory cash flow but negative permanent cash flow, we find that more solvency covenants are used in debt contracting. In other words, if borrowers have weak economic fundamentals but have available resources to delay default because of temporary liquidity improvement, lenders tend to use more solvency covenants to restrict borrowers' gambling and risk-taking behavior, which is consistent with the arguments of Gorbenko and Strebulaev (2010). In addition, we explore the use of cash-proceeds sweeps, which restrict the borrower's use of excess cash flow for certain actions that could transfer wealth from creditors to shareholders (Dey et al., 2016; Lou and Otto, 2020). We show that when future prospects are uncertain, as captured by the volatility of permanent shocks, contracts are more likely to include cash sweeps that require excess cash or proceeds from assets sales, debt issuance, or equity issuance to first be used to reduce any loan balance outstanding.

Finally, we investigate the potential drivers of our results. Specifically, we examine whether our results reflect lenders' experience in contract design or borrowers' managerial ability in negotiating appropriate covenants in light of their firms' cash flow characteristics. We capture lender experience based on a lender's participation in previous loan deals and borrowers' managerial ability (MA) as the MA-score developed in Demerjian et al. (2012). Overall, we find that lenders' experience more strongly explains our baseline results.

Our findings contribute to a growing body of research on the importance of transitory and permanent cash flow shocks in corporate financial policies. Theoretical work in this area discusses how the two types of shocks would affect capital structure (Gorbenko and Strebulaev, 2010), cash holding and liquidity management (Décamps et al., 2016; Bolton et al., 2020; Gryglewicz et al., 2021), and compensation and investment (DeMarzo et al., 2012;

Gryglewicz et al., 2020; Hackbarth et al., 2021). These theoretical insights are complemented and further investigated by several empirical papers, including Lee and Rui (2007) studying the effects of transitory and permanent cash flow shocks on share repurchase and dividend payout policies, Chang et al. (2014) on allocation of internal cash flow, and Byun et al. (2019a,b) on corporate investment and leverage. However, the role of the two types of cash flow shocks in debt covenant design is largely unexplored. Debt covenants serve a crucial function to mitigate conflicts of interest between lenders and borrowers, hence an important avenue to study whether efficient debt contracting that distinguishes the two cash flow shocks is adopted by creditors and borrowers. Motivated by Gorbenko and Strebulaev (2010), our paper fills this void and shows that the composition of cash flow matters in debt contract design, and provides new empirical evidence on how temporary and permanent cash flow shocks drive the use of liquidity, solvency and cash sweeps covenants.

We also contribute to the extensive literature on creditor control rights and debt contract design. Prior studies in this field have examined firm and accounting characteristics that affect the pricing and covenant use of debt contracts (e.g. Ball et al., 2008; Chava et al., 2010; Christensen and Nikolaev, 2012; Demerjian, 2011, 2017; Dyreng et al., 2017; Frankel et al., 2008; Jensen and Meckling, 1976), covenant violations and contract regenotiation (e.g. Denis and Wang, 2014; Dichev and Skinner, 2002; Roberts and Sufi, 2009c) and the impact of debt financing on corporate investment and other decisions (e.g. Chava and Roberts, 2008; Nini et al., 2009). However, these studies do not account for the variations in the impact of temporary and permanent cash flow shocks. Our findings suggest that the level of exposure to permanent and transitory cash flow shocks conveys distinct information about borrowers' short-term liquidity and long-term profitability, affecting the type and extent of covenants used in debt contracts, and the consequences of covenant violations and credit ratings.

2 Theory and Hypothesis

2.1 Transitory and permanent cash flow shocks

Firms are constantly exposed to cash flow shocks of transitory and permanent nature. Transitory shocks are characterized by their largely unexpected timing, potentially substantial initial magnitude, and effect that is felt over a limited time (Gorbenko and Strebulaev, 2010). They affect firms' immediate cash flow and are uninformative about the future expected profitability (Gorbenko and Strebulaev, 2010; Décamps et al., 2016). In contrast, the impact of permanent shocks is persistent, thereby leading to change of both current and future profitability. One example of transitory shocks is the 2020 Hurricane Laura, which reduced crude oil production in the U.S. Federal Offshore Gulf of Mexico by an estimated 14.4 million barrels over 15 days. Despite the disruptive effect, production of oil firms in that region quickly reverted back to its pre-shock level (Barnett and Kirby, 2020). Conversely, an example of permanent shocks in the oil production sector is a technological innovation in the commercial shale oil extraction that brought about an industrial revolution since 2007. It significantly increased the oil supply and permanently intensified the competition faced by conventional fossil oil producers which has long lasting effect on these conventional fossil oil producers' cash flow (Blackmon, 2018).

Using a dynamic capital structure model, Gorbenko and Strebulaev (2010) distinguish cash flow shocks of temporary or permanent nature, and investigate how the exposure to both shocks impacts corporate financing policies. The study generates novel insights that the value of maintaining financial flexibility increases when firms face prospects of adverse transitory shocks. This finding highlights firms' consideration of financial flexibility in making capital structure decisions. It also provides implications for the optimal firm default decisions and debt contract designs. In particular, Gorbenko and Strebulaev (2010) point out that creditors should design debt contracts with in-built flexibility to give borrowers more chances to survive if borrowers experience volatile short-term performance but have sound long-term prospects.

Building on these theoretical insights on firms' default risk and efficient debt contracting, our study empirically examines whether the default implications from transitory and permanent shocks to cash flow are well understood by lenders and borrowers, and whether they have significant impact on debt contract designs.

The theoretical development of Gorbenko and Strebulaev (2010) and subsequent corporate finance studies demonstrates the importance of separating the effect of transitory cash flow shocks from permanent shocks in understanding corporate financial policies. For example, Décamps et al. (2016), Bolton et al. (2020) and Gryglewicz et al. (2021) provide novel findings on how permanent and transitory cash flow shocks impact firms' cash holdings, equity issuance and liquidity management decisions. DeMarzo et al. (2012), Gryglewicz et al. (2020), and Hackbarth et al. (2021) study the agency conflicts in corporate decision-making and examine the implications of permanent and transitory shocks on optimal compensation and investment in dynamic moral hazard models. There are also attempts to empirically test the predictions generated from the theoretical models on various corporate policies and decisions. Byun et al. (2019a,b) investigate the effects of persistent and transitory shocks on firms' leverage and investment, and report empirical evidence consistent with the theoretical expectations. Chang et al. (2014) focus on the transitory component of cash flow and find that financially constrained firms allocate more temporary cash for saving rather than investment purpose. Moreover, Lee and Rui (2007) document that share repurchases are strongly associated with temporary components of earnings (cash flow), whereas dividends are not, suggesting that share repurchases and dividends are imperfect substitutes. While the existing theoretical and empirical research in this area has mainly focused on analysing how temporary and permanent cash flow shocks influence firms' financial decisions, in this paper we aim to extend the empirical analysis to debt contracting and study the impact of cash flow shocks on the lenders' choice and use of debt covenants.

2.2 Debt covenants

In debt contracting, there exist incentive conflicts between shareholders and debtholders because corporate actions that maximize shareholder wealth may not maximize debtholder wealth (Fama et al., 1972; Smith Jr and Warner, 1979). Specifically, debtholders face asymmetric payoffs in that they are exposed to downside risk but do not enjoy the rewards of any upside from risky actions a firm may take (Gigler et al., 2009). Smith Jr and Warner (1979) highlight that the asymmetric payoff is exacerbated by manager incentives to design operations and financial structures in ways that benefit shareholders to the detriment of debtholders.

To reduce costs associated with these conflicts, debt contracts include various kinds of covenants (Smith Jr and Warner, 1979). Debt covenants explicitly and/or implicitly restrict the firm from engaging in specified actions or limit managerial behavior that diminishes the value of debtholder claims in the firm (Jensen and Meckling, 1976; Smith Jr and Warner, 1979; Leftwich, 1983). When corporate performance or actions deviate, covenants can serve as trip wires which provide lenders with the option to step in and take action as the circumstances warrant (Dichev and Skinner, 2002; Christensen and Nikolaev, 2012). Essentially, through the use of covenants, lenders enjoy broad powers by controlling corporate policies as managers attempt to avoid violating covenants, or by having the power to decide the fate of a firm in the event of covenant violation (Roberts and Sufi, 2009b; Bradley and Roberts, 2015). Consistent with this, covenants can hold the key to firms' ability to survive (Bradley and Roberts, 2015).

Debt contract design has been extensively studied in the accounting and finance literature (e.g. Ball et al., 2008; Chava et al., 2010; Christensen and Nikolaev, 2012; Demerjian, 2011, 2017; Denis and Wang, 2014; Dichev and Skinner, 2002; Dyreng et al., 2017; Frankel et al., 2008; Roberts and Sufi, 2009c; Chava and Roberts, 2008; Nini et al., 2009). Particularly relevant to our study is a stream of research inquiry into how the quality of accounting information influences the use of financial covenants in debt contracts (Christensen and Niko-

laev, 2012; Demerjian, 2011; Demerjian et al., 2020; Dou, 2020; Dyreng et al., 2017). For example, Demerjian et al. (2020) find that private debt contracts are more likely to include earnings-based covenants when borrowers have smoother income that improves creditors' ability to assess credit risk. Focusing on the contractility of accounting balance sheet information, Demerjian (2011) documents that changes in accounting standards that introduce volatility in firms' balance sheet reduce the use of balance sheet covenants in debt contracts. Moreover, Demerjian (2017) examines the impact of borrowers' information and economic uncertainty on debt contracting. It predicts and finds that greater uncertainty of borrowers' creditworthiness is associated with higher financial covenant intensity.

These prior studies provide insightful findings on the usefulness of accounting information in helping lenders evaluate borrowers' credit risk and designing debt contracts. However, none of them makes clear distinctions between the temporary and permanent nature of performance shocks that borrowing firms are exposed to, regardless whether the performance variations are caused by accounting policies or business fundamentals. As noted earlier, Gorbenko and Strebulaev (2010) demonstrate that the optimal default decision can only be made by distinguishing the consequence of cash flow shock into the permanent and transitory components. Therefore, our study provides new insight to the existing literature by highlighting the differential impacts of temporary and permanent cash flow on debt contracting.

2.3 Hypothesis development

Our hypothesis examines the association of debt covenants and borrowing firms' exposure to variations in transitory and permanent cash flow. We focus on the notion that a firm with sound long-term prospects may experience volatile transitory cash flow shocks, and when this happens inefficient debt contracts could force the firm into unnecessary renegotiation or liquidation even if the risk of economic default is low. Given that debt covenants are the primary instruments to determine creditors' control rights and can hold the key to firms' ability to survive (Bradley and Roberts, 2015), we expect debt covenants to be designed in

a manner that monitors a borrowing firm's performance but also allows financial flexibility (Gorbenko and Strebulaev, 2010).

In particular, liquidity-based covenants are those covenants determined by periodic performance measures and are typically used by lenders as trip wires to monitor borrowers' performance from time to time (Christensen and Nikolaev, 2012). Because transitory shocks affect immediate cash flow and are uninformative about firms' future expected profitability (Gorbenko and Strebulaev, 2010; Décamps et al., 2016), all else equal, efficient use of liquidity covenants should reflect the intent to prevent frequent and unnecessary covenant violations and renegotiations by borrowers who experience volatile temporary cash flow shocks (Gorbenko and Strebulaev, 2010). Conversely, greater use of liquidity-based covenants is expected when a borrower is exposed to permanent shocks to cash flow, which reflect the risk of its long-term prosperity and influence firm value. Thus, we test the proposition that the use of liquidity-based covenants decreases when a borrowing firm is subject to greater variations in transitory cash flow shocks, but increases when subject to greater variations in permanent cash flow shocks. We state this hypothesis as follows:

H1. The use of liquidity-based covenants is negatively (positively) associated with variations in transitory (permanent) cash flow shocks.

3 Research Design

In this section, we discuss our data sources, explain how we decompose annual cash flow into transitory and permanent components, and describe our debt covenants measures. Next, we present our estimation model for the baseline analyses and discuss some summary statistics for the primary sample.

3.1 Sample and data

We obtain firm financial data from S&P CapitalIQ Compustat, stock market price data from the Center for Research in Security Prices, LLC (CRSP), and debt contract data from Thomson/Refinitiv Dealscan (Dealscan). Our initial sample consists the Compustat population of U.S. publicly listed firms. Following common practice, we exclude financial firms, utility firms, not-for-profit entities, and government enterprises (SIC code 4900-4999, 6000-6999 and 8000-9999). Utility firms, not-for-profit organizations, and government enterprises are excluded because they are differently regulated, and financial firms because their financing decisions are affected by different factors (e.g., capital adequacy regulations) that are almost irrelevant for non-financial firms (Chang et al., 2014). We require firms to have at least ten years' observations and less than two consecutive missing cash flow to ensure the reliability of cash flow decomposition. For the loan observations, we limit the sample based on the loan data links to firm characteristics in the Roberts Dealscan-Compustat Linking Database provided by Chava and Roberts (2008).[3] We exclude loan observations without covenant information reported in Dealscan. After restricting observations with available financial, stock market and loan data, we reach a sample of 19,005 firm-year observations or 33,872 loan observations from fiscal year 1981 to 2017.

3.2 Decomposing transitory and permanent cash flow shocks

Transitory and permanent shocks to firms' cash flow are not directly observable. Therefore, to test our predictions, we must first identify proxies for these two shocks. To do this, we apply Hodrick and Prescott (1997) (thereby HP) filter, a commonly used method in macroeconomics to separate a time series into a trend (permanent) component and a cycle (transitory) component. Besides HP filter, there are two other standard methods used in the literature to estimate transitory and permanent cash flow components, namely Beveridge and

[3] "Dealscan-Compustat Linking Database.xlsx" dated April 13, 2018, as accessed June 8, 2021 via Wharton Research Data Services (WRDS).

Nelson (1981) filter (thereby BN) and Baxter and King (1999) filter (thereby BK). We use HP filter because Gryglewicz et al. (2021) and Byun et al. (2019b) show that HP filter provides more desirable decomposition results relative to BN and BK filters. More importantly, HP filter produces orthogonal transitory and permanent components, i.e., two components are not correlated. Because we intend to examine how the use of debt covenants changes when either transitory or permanent cash flow becomes volatile, HP filter allows us to focus on the variations of individual component without worrying about their co-movement.

HP filter imposes stringent data requirements for consecutive observations of cash flow. To obtain accurate decomposition of each individual firm's cash flow, we drop firms with fewer than ten cash flow observations and firms with two or more consecutive missing cash flow. Since it also requires consecutive observations without gaps, we fill in the gap by the average over the nearest neighboring cash flow observations if there is a single missing observation in one year (Byun et al., 2019b).

Following Denis and Sibilkov (2010) and Byun et al. (2019b), we define a firm's operating cash flow as operating income before depreciation and adopt the cash flow decomposition procedure as follows. A firm's cash flow CF at time t is written as

$$CF_t \quad = \quad s_t + g_t + \epsilon_t \tag{1}$$

where s_t is the permanent cash flow shock, g_t is the transitory cash flow shock, ϵ_t is the white noise, and $t = 1, \ldots, T$. HP filter computes the permanent cash flow shock s by minimizing the variance of cash flow CF around its permanent component s, subject to a penalty that constrains the second difference of the permanent cash flow shocks. That is, the HP filter chooses s to minimize:

$$\sum_{t=1}^{T}(CF_t - s_t)^2 + \lambda \sum_{t=3}^{T}[(s_t - s_{t-1}) - (s_{t-1} - s_{t-2})]^2 \tag{2}$$

where the penalty parameter λ controls the smoothness of the cash flow series. The larger the λ, the smoother the series. As $\lambda = 0$, the permanent cash flow shock s would just be

the cash flow series CF itself; As $\lambda = \infty$, the permanent cash flow shock s approaches a linear trend (that is, a series whose second difference is exactly 0). Following Ravn and Uhlig (2002), we use the penalty parameter $\lambda = 6.25$ since our cash flow series is annual. When we obtain the estimated permanent component $\hat{s}_t$, the transitory component $\hat{g}_t$ is given by

$$\hat{g}_t = CF_t - \hat{s}_t. \tag{3}$$

We perform the decomposition process by firm and obtain both transitory and permanent cash flow shock series for each firm. We normalize permanent and transitory cash flow shocks by dividing them using book value of assets (Chang et al., 2014; Gryglewicz et al., 2021). Then, we compute our key variables, the volatility of permanent and transitory shocks, based on the standard deviations of the shocks over the past five years.[4]

It is worth noting that we do not presuppose that in practice lenders utilize the same transitory and permanent cash flow decomposition method studied in this paper in evaluating borrowing firms' credit risk. Rather, we argue that creditors do consider the transitory or permanent nature of firm performance in designing debt contracts. Relying on credit rating agency analysts as proxies for lender behavior, we identify anecdotal evidence to illustrate that lenders/credit analysts evaluate transitory and permanent nature of cash flow shocks. For example, in August 2016, Noble Group Limited, a Hong Kong-based commodities trader experienced a liquidity crunch but Fitch Ratings did not change Noble's credit rating, explaining that the liquidity crunch experienced by the firm was only temporary (Fitch Ratings, 2016).

3.3 Identifying liquidity-based debt covenants

Our hypothesis focuses on the use of liquidity-based debt covenants. Following the existing literature (e.g., Dichev and Skinner, 2002; Chava and Roberts, 2008; Demerjian, 2011; Christensen and Nikolaev, 2012; Demerjian et al., 2020; Sikochi, 2020), we obtain debt covenants

[4]We document consistent results (untabulated) when we use either three or ten-year time windows.

from Dealscan, which contains detailed terms and conditions on private corporate loan transactions made by bank and non-bank lenders. Information and data in Dealscan are sourced from regulatory filings, journalist contributions, and contacts within the credit industry, borrowers, and lenders. The Dealscan database includes data on loan deal packages and facilities, where a package is a collection of facilities that are structured and contracted as one transaction. In general, a set of financial and general covenants apply to all facilities within a given package. However, a given facility in a package has its own contractual terms, namely facility amount, maturity, interest rate spread, repayment schedules, collateral, and loan type or purpose. Certain contract arrangements such as performance pricing provision and lender allocations of syndicated loan amounts may also apply to specific facilities. Hence, in this study, we perform our analysis at the loan facility level. This allows us to better control facility-level loan characteristics that affect the design of debt covenants (Houston et al., 2017).[5] We match each loan facility to the most recent fiscal year prior to the firm entering into a loan contract for multivariate regression analyses.

To define liquidity covenants, we aggregate debt covenants that are based on accounting measures of short-term performance: Debt-to-EBITDA, Senior Debt-to-EBITDA, Cash Interest Coverage, Debt Service Coverage, EBITDA, Fixed Service Coverage, and Interest Coverage). Covenant variables used in our baseline analyses include the number of these liquidity-based covenants per loan facility (*LiqCov*), the ratio of liquidity covenants out of total number of financial covenants (*LiqCovRatio*), and liquidity covenant slack (*LiqCovSlack*). Higher values of *LiqCov* and *LiqCovRatio* indicate more liquidity-based covenants use in debt contracts. While the number and ratio of liquidity covenants directly capture the intensity of liquidity covenants in loan contracts, liquidity covenant slack measures how tight a covenant benchmark is set at the initiation of a loan contract. Tighter covenants increase the probability of covenant violation and lender intervention (Infuehr and Laux, 2022). Since it is costly to set a tight benchmark around covenants when the bor-

[5]Untabulated results based on package level analyses similar to some prior studies (e.g., Christensen and Nikolaev, 2012) yield coefficients with similar signs and significance, and provide the same inferences.

rower is exposed to volatile transitory shocks (Gorbenko and Strebulaev, 2010), we expect liquidity covenant slack (i.e. looser covenant benchmark) to serve a similar function as liquidity covenant intensity in providing financial flexibility to the borrower and monitoring any fundamental change to credit risk.

3.4 Baseline regression model

To test our hypothesis (H1), we specify our main panel regression as the following, where we regress measures of liquidity-based debt covenants on the measures related to borrowing firms' temporary and permanent cash flow risk:

$$\begin{aligned} LiqCov_{it} &= \beta_0 + \beta_1 Transitory\ Vol_{it-1} + \beta_2 Permanent\ Vol_{it-1} \\ &\quad + \textstyle\sum_{m=1}^{m} \gamma_m FirmControls_{it-1} + \sum_{n=1}^{n} \theta_n LoanControls_{it} + \delta_t + \alpha_j + \epsilon_{it}. \end{aligned} \tag{4}$$

The dependent variable $LiqCov_{it}$ is the number of liquidity-based covenants used in the debt contract of a firm at year t. We also run separate regressions using the ratio of liquidity-based covenants ($LiqCovRatio_{it}$) and covenant slack ($LiqCovSlack_{it}$) as the dependent variables. We hypothesize a similar association between variations in cash flow and all these three measures. Specifically, we expect $\beta_1 < 0$ if the use of liquidity covenants decreases with the variations in transitory shocks and $\beta_2 > 0$ if the use of liquidity covenants increases with the variations in permanent shocks.

Our explanatory variables of interest are $Transitory\ Vol_{it-1}$ and $Permanent\ Vol_{it-1}$, where $Transitory\ Vol_{it-1}$ captures the volatility of transitory cash flow shocks and $Permanent\ Vol_{it-1}$ captures the volatility of permanent cash flow shocks over the past five years prior to t. $FirmControls_{it-1}$ and $LoanControls_{it}$ represent vectors of firm and loan characteristics that are found in prior literature to be determinants of the debt covenants (e.g., Demerjian, 2011; Christensen and Nikolaev, 2012). Firm characteristics include firm size, market-to-book ratio, capital expenditure, R&D expense, depreciation expense, tangible assets, advertising expense, indicator for loss firm-years, return on assets, Z-score, firm age, and standard devia-

tion of stock returns. They are measured at the most recent fiscal year prior to the inception of the loans. The loan characteristics are loan amount, maturity, number of participating lenders, and indicators for secured loan, dividend restriction, sweeps, capital expenditure restrictions, performance pricing, whether performance pricing is based on credit rating, and whether loan type is line of credit.

Lastly, we include year dummies (δ_t) to control for time fixed effects and industry dummies (α_j) to control for unobservable industry heterogeneity. Industry dummies are based on Fama and French 48 Industry classification. The coefficient estimates are based on standard errors adjusted for firm and year clustering to account for firms that have multiple loan facilities in the sample period.

3.5 Summary statistics

Table 1 reports the summary statistics for the key variables used in our regression analyses. To reduce the impact of extreme observations, all continuous variables are winsorized at 1% and 99% levels. We present summary statistics separately for firm characteristics (measured at the firm-year level) in panel A and loan characteristics (measured at the loan facility level) in panel B. An individual firm-year observation may be associated with multiple loan observations as firms often borrow multiple times a year and/or negotiate deals with multiple loans. All variables are as defined in Appendix A.

Panel A reports the decomposed temporary and permanent cash flow variables for firm-year observations. Consistent with prior studies, the mean and median of transitory cash flow are zero, confirming its basic feature of a zero-mean stationary process (Chang et al., 2014). Permanent cash flow, on the other hand, has a mean (median) of 0.13 (0.13), and follows a value distribution almost identical to that of total cash flow. This conforms to the cash flow properties shown in other studies where the magnitude of total cash flow is dominated by the decomposed permanent component for most observations (Chang et al., 2014; Byun et al., 2019b). As our primary focus is on the variations in the transitory and

permanent cash flow, we also present the statistics for the volatility of these variables. There is slightly greater volatility in transitory shocks with a mean (median) volatility of 0.04 (0.03) compared with the mean (median) volatility of permanent shocks of 0.03 (0.02).

At the loan level, the average loan contains 1.61 covenants classified as liquidity covenants, with a liquidity covenant ratio of 74%. The average loan has a maturity of 49.7 months (about 4 years). Nearly half of the loans are secured, and are funded by about 8 lenders. Cash-proceeds sweeps and performance pricing provision are present in 20% and 32% of the loans respectively. 54% of the loan observations in our sample are classified as lines of credit, 30% term loans, and the remainder are other type.

Pair-wise correlation matrix (untabulated), at the firm-year level, shows that the correlation between the levels of transitory and permanent cash flow components is -0.08. The correlation of total cash flow with the transitory and permanent components is respectively 0.39 and 0.87. In terms of volatility, the correlation between the transitory and permanent cash flow volatility is 0.73. Total cash flow volatility is positively correlated with these cash flow components, with a correlation of 0.82 on transitory cash flow volatility and 0.68 on permanent cash flow volatility. At the loan facility level, the number of liquidity covenants is negatively associated with volatility of total cash flow (-0.06) and transitory cash flow (-0.06), but is positively associated with volatility of permanent cash flow (0.01). Moreover, the use of liquidity covenant is significantly associated with many other firm and loan characteristics. Accordingly, we next perform multivariate tests as in equation (4) to control for these firm and loan characteristics to isolate the incremental effects of transitory and permanent cash flow shocks on debt covenant design.

4 Empirical Results

4.1 Intensity of liquidity covenants

Our hypothesis relates to whether and how cash flow shocks affect the liquidity-based covenants used in debt contracts.As our baseline analyses, We estimate equation (4) with two measures of liquidity-based covenants: the number of covenants ($LiqCov$) and ratio to total financial covenants ($LiqCovRatio$). Table 2 present the results. Columns (1) and (2) report the results for the number of liquidity covenants, while columns (3) and (4) report the results for the liquidity covenant ratio. In columns (1) and (3) we use the total cash flow volatility as explanatory variable before showing our explanatory variables of interest in columns (2) and (4).

The coefficient estimate for cash flow volatility ($CF\ Vol$) in both columns (1) and (3) is negative and significant at level of 1%, indicating that the number and ratio of liquidity covenants decreases as overall cash flow volatility increases. This result is generally consistent with the finding of Demerjian et al. (2020) that the use of earnings-based covenants increases with managerial income-smoothing measures that improve the usefulness of accounting information in monitoring borrowers.

However, when we decompose cash flow volatility into the transitory and permanent shocks, we find that the negative effect between liquidity covenants and firms' overall cash flow volatility is mainly driven by the impact of transitory cash flow, and that transitory and permanent cash flow have opposite effects on the use of liquidity covenants after controlling other firm and loan characteristics. This is reflected in the negative and significant coefficient estimate on transitory shocks in column (2) for $LiqCov$ (coef. = -1.653, t-stat = -4.77) and in column (4) for $LiqCovRatio$ (coef. = -0.660, t-stat = -4.44). By contrast, the coefficient estimate on permanent shocks is positive and significant in column (2) for $LiqCov$ (coef. = 1.218, t-stat = 3.43) and in column (4) for $LiqCovRatio$ (coef. = 0.448, t-stat = 3.62).

Overall, these results are consistent with our hypothesis that transitory cash flow shocks

are associated with lower liquidity-based covenant intensity but permanent cash flow shocks are associated with higher liquidity covenant intensity. Our findings indicate that borrowers and creditors act in a manner exhibiting awareness about the composition of cash flow shocks, and view temporary shocks as a noisy signal of economic profitability. Thus, all else equal, they choose to finance a borrower with fewer liquidity covenants if the borrower experiences noisy temporary cash flow.

4.2 Slack of liquidity covenants

While our previous results suggest that transitory shocks are associated with fewer liquidity covenants, these covenants are still employed in debt contracts to keep borrowers' performance in check. On the occasions when liquidity covenants are used, we expect a looser benchmark to be set around these covenants if the borrower is exposed to volatile transitory shocks. This is based on the premise that it is costly for both the lenders and borrowers to set a tight benchmark as it would increase the probability of covenant violation and excessive lender intervention (Gorbenko and Strebulaev, 2010; Infuehr and Laux, 2022).

We re-estimate equation (4) with liquidity covenant slack as the dependent variable. The covenant slack is measured through the slack of interest coverage ratio at the initiation of the loan which is calculated as the difference between firms' reported accounting measure for EBITDA/Interest Expense and contracted minimum covenant threshold obtained from Dealscan. We choose interest coverage ratio to perform the analysis because it is the most frequently used liquidity covenant that is purely based on periodic financial performance information (Dichev and Skinner, 2002; Demerjian and Owens, 2016). We follow the standard definition of interest coverage ratio (EBITDA/Interest Expense) provided in Demerjian and Owens (2016) to calculate borrowing firms' realized ratio, given the actual covenant definition may vary from contract to contract. Higher values of the covenant slack indicate less tightness of the benchmark.

Table 3 presents the results on slack of liquidity covenants based on a subset of the sample

where we have sufficient information to compute slack for interest coverage ratio. As shown in column (1), when the overall cash flow volatility of a borrowing firm is high, greater slack of liquidity covenant is designed in the debt contract (coef. = 102.640, t-stat = 2.22). If we decompose the overall cash flow volatility into transitory and permanent components as reported in column (2), the coefficient estimate of volatility of temporary cash flow is positive and significant in a one-tailed test (coef. = 73.981, t-stat = 1.61). This indicates that the difference between actual interest coverage and contracted minimum coverage threshold is high when temporary cash flow is volatile, meaning that the covenant tightness is low (or slack is high) at the time of the loan contract. In other words, there is some weak evidence that debt contracts contain looser liquidity covenants for borrowers exposed to high transitory cash flow volatility. This is consistent with the prediction that contracts are designed in such a manner that borrowers are not unnecessarily forced to violate covenants in the event of a transitory shock, thereby triggering unnecessary renegotiation or technical default. On the other hand, the coefficient estimate of permanent cash flow volatility is negative despite of being statistically insignificant (coef. = -25.194, t-stat = -0.55). This suggests that firms with greater exposure to volatile permanent performance shocks are not given more slack for liquidity covenants, if not tighter ones, signifying creditors' need to closely monitor borrowers' performance if long-term profitability and firm value are at risk.

Prior research suggests that debt covenants are set tight at the start of loan agreements to give greater decision rights to creditors under asymmetric information and are used as trip wires for subsequent renegotiations when technical violations occur (Denis and Wang, 2014; Garleanu and Zwiebel, 2009). Our findings provide more nuanced evidence in regards to how covenant benchmarks are chosen upon inception of debt contracts. We show that creditors can use loose liquidity covenants to avoid unnecessary renegotiation and improve contracting efficiency. Our results also complement studies that examine the impact of variability in financial measures on covenant slack and the probability of covenant violation (e.g. Dichev and Skinner, 2002; Demerjian and Owens, 2016) by demonstrating that the

degree to which covenant slack reflects the likely variation in the financial measures depends on the temporary or permanent nature of the variability.

4.3 Performance pricing provision

If the concern with the impact of transitory shocks is only about avoiding costly renegotiation, debt contracts can include performance pricing to respond to changes in credit quality. Performance pricing is an automatic mechanism written into the contract to link debt interest rate spreads to a borrower's performance, either by reducing spreads if credit quality improves or by increasing spreads if credit quality deteriorates (Asquith et al., 2005; Manso et al., 2010). Thus, it removes the need to renegotiate a loan after a covenant violation by specifying the outcome of such renegotiation ex-ante and thus avoids the situation of a technical default (Adam and Streitz, 2016). Performance pricing is appropriate for reducing debt renegotiation costs due to unanticipated changes in the borrower's credit risk and thus serving as an inexpensive screening device (Asquith et al., 2005; Manso et al., 2010). Yet, in the context of transitory shocks, we propose that borrowers and lenders are less likely to use performance pricing when a borrower is exposed to volatile transitory shocks because it would unnecessarily penalize a borrower for short-lived negative shocks or reward the borrower for short-lived positive shocks which do not reflect the fundamental performance. On the other hand, we expect that performance pricing is more likely to be included in the contract when a borrower is exposed to volatile permanent cash flow shocks. Cash flow shocks of permanent nature affect a firm's economic prospect and credit risk, which can be effectively addressed by performance pricing provision.

Table 4 presents our results related to performance pricing from re-estimating equation (4) with the dependent variable being an indicator for whether performance pricing is used in a loan contract. Columns (1) and (2) present the estimates based on OLS and LOGIT regressions, respectively. As shown in the table, the coefficient estimate of temporary cash flow volatility is negative and significant in both column (1) (coef. = -0.329, t-stat = -2.89)

and column (2) (coef. = -2.610, t-stat = -3.70). Although the coefficient for permanent cash flow volatility is insignificant, these results are generally consistent with our expectation that transitory shocks are associated with lower likelihood of using performance pricing provision. This reflects the intention of the debt contract design to not only avoid costly renegotiation, but also to prevent favorable or unfavorable temporary shocks from being automatically priced.

4.4 Implications for covenant violations

Having documented that lenders are likely to design contracts with covenants that facilitate financial flexibility for firms exposed to volatile transitory cash flow but not permanent cash flow, we investigate the consequences of covenant violations for firms experiencing greater variations in transitory or permanent shocks to cash flow. Debt covenants are frequently violated and renegotiated (Dichev and Skinner, 2002; Roberts and Sufi, 2009a; Infuehr and Laux, 2022). If debt covenants are designed to allow firms to survive a temporary liquidity crunch, then it is also likely that firms would experience less serious consequences in the event of low performance or covenant violations arising from volatility in transitory shocks. Conversely, we expect more severe consequences in the event of low performance or covenant violations that arise because of variations in permanent shocks to a firm's cash flow.

To test this, we first limit our sample to those firm-year observations where covenants are violated during the loan periods. We identify general covenant violations by comparing a firm's actual covenant ratios during a loan outstanding period with the contracted covenant benchmarks recorded at loan initiation (Chava and Roberts, 2008; Dichev and Skinner, 2002). As discussed in Dichev and Skinner (2002), this approach likely captures firms' reported and unreported covenant violations, providing a more comprehensive coverage of the phenomenon. Actual values of all covenants are calculated based on the standard definitions given in Demerjian and Owens (2016). As long as one of the loan covenants used in the loan contract is breached, a violation is identified for a given borrower in a certain year.

Within this limited sample, we then distinguish violations with serious and less serious consequences based on whether covenant violations are disclosed or not in the Securities and Exchange Commission (SEC) filings. We utilize data on disclosures of serious violations provided by Nini et al. (2009) who apply text-search programs to scan firms' 10-K and 10-Q filings and identify covenant violation terms.[6] Dichev and Skinner (2002) note that if a firm's covenant violation circumstance is sufficiently serious as to prohibit it from receiving a waiver or favorable renegotiation from the lender, the firm is required to disclose this information in the filings to the SEC. Prior research document that these reported covenant violations represent more serious cases which are concentrated in a smaller sample and incur larger interest costs (Beneish and Press, 1993; Chen and Wei, 1993). Accordingly, we match reported violation data with our comprehensive sample of covenant violations to create a dummy variable indicating the seriousness of violation consequences. The violation consequence dummy variable equals one if we identify covenant violations for a borrower and the borrower makes a disclosure of the violations in a certain year, and zero if we identify violations but the borrower does not make a disclosure.

Table 5 presents the results from regressing the violation consequence dummy variable on the cash flow shock variables. The regression analyses are performed at the firm-year level. Column (1) shows the results for overall cash flow shocks and column (2) reports the results for the components of cash flow shocks. The coefficient estimate on the overall cash flow in column (1) is positive and significant (coef. = 2.172, t-stat = 2.40), and so is the estimate in column (2) on permanent cash flow volatility (coef. = 1.209, t-stat = 1.75). By contrast, the coefficient estimate is negative and significant on transitory cash flow volatility (coef. = -1.259, t-stat = -1.80). These results indicate that while overall cash flow volatility is associated with more serious violations, the result is mainly driven by the impact of permanent cash flow shocks when firms' fundamental prospects are volatile. Consistent with the notion that covenant violations of firms exposed to cash flow volatility

[6]Nini et al. (2009) identify violation disclosures within each SEC filing, not for each loan. Therefore, our analyses are performed at firm-year level rather than at loan level.

of temporary nature are evaluated as less serious by creditors, transitory cash flow shocks are negatively associated with serious violation consequences.

4.5 Implications for credit ratings

To provide further evidence on creditors' risk assessment, we also examine changes in the borrowers' long-term credit ratings. Here we use subsequent credit rating changes as a proxy of how lenders would react to borrowers' transitory and permanent cash flow shocks. Long-term credit ratings reflect credit rating agencies' current opinions of a borrower's overall creditworthiness, with an emphasis on the borrower's capacity and willingness to meet its long-term financial obligations as agreed upon with the creditors. As temporary shocks do not reflect a firm's long-term profitability and value, we expect only permanent cash flow shocks to have significant impact on future credit rating changes. We obtain S&P long-term credit ratings from Compustat, and transform the letter ratings into numeric values coded from 1 (SD/D) to 22 (Aaa), with higher values indicating higher credit quality. We then take the changes in ratings for each year, and perform analyses on the absolute value to capture the presence of a change in ratings as volatility increases.

Table 6 presents the results of the firm-year level analyses. Columns (1) and (2) report the OLS estimation results, and columns (3) and (4) report the Ordered Probit estimation results. In all columns, the dependent variable is calculated as the absolute changes in credit ratings over the following 12-month period. We document a positive and significant coefficient on overall cash flow volatility in both column (1) using OLS (coef. = 0.920, t-stat = 2.31) and column (3) using Ordered Probit models (coef. = 1.685, t-stat = 3.43). When we decompose the cash flow, the coefficient is positive and significant on permanent cash flow volatility in both column (2) (coef. = 1.809, t-stat = 3.46) and column (4) (coef. = 2.535, t-stat = 4.13). However, as expected, the coefficient estimate is negative but not significant on transitory cash flow volatility in both column (2) (coef. = -0.405, t-stat = -0.84) and column (4) (coef. = -0.314, t-stat = -0.48). These results suggest that while credit rating

changes are more likely when a borrower is exposed to higher overall particularly permanent cash flow volatility, there is no evidence of credit rating changes for a borrower exposed to higher transitory shocks. We interpret these results as evidence that credit rating agencies do not penalize or reward firms for variations in transitory cash flow shocks. Movements in long-term credit ratings are driven by cash flow shocks of a permanent nature.

5 Additional Analyses

5.1 Interest alignment and risk appetite

Our results thus far show that debt contracts are designed to reduce costly renegotiation and avoid penalizing borrowers exposed to transitory shocks by using fewer or less tight liquidity-based covenants. These results suggest that liquidity-based covenants allow firms to survive a temporary liquidity crunch, as theoretically predicted in optimal debt contracting (Gorbenko and Strebulaev, 2010). However, agency risk may arise from a firm's liquidity position. As discussed in Gorbenko and Strebulaev (2010), borrowing firms facing poor long-term prospects are prone to gamble by using available resources to delay their default. To leverage the existing creditor interest and increase the value of their equity options, managers and shareholders may increase the firm's leverage, or make acquisitions or other risky investments, taking advantage of the temporary and favorable liquidity positions. Moreover, Davydenko (2012) demonstrates that default is triggered when the market value of the firm's assets falls below a certain solvency boundary, but finds that in practice the default timing is chosen endogenously to maximize the value of equity. Such 'late' defaults are effectively wealth transfers from debtholders to equityholders. Gorbenko and Strebulaev (2010) theoretically demonstrate that delayed defaults are more likely to occur when firms have weak future fundamentals (low permanent cash flow) but high liquidity because of temporarily positive cash flow shocks (high transitory cash flow).

Thus, we expect lenders to also consider debt contracting designs that align the interest

of lenders and borrowers to mitigate potential agency conflicts (Smith Jr and Warner, 1979). For example, lenders can employ solvency-based covenants that essentially monitor the firms' long-term solvency and restrict managerial actions that damage the creditors' interest. As suggested in Christensen and Nikolaev (2012), solvency-based covenants can be used to prevent gambling behavior by ensuring that equityholders have large enough stake in the firm. Alternatively, lenders can use cash-proceeds sweeps to limit the ability of managers to use firm resources in taking risk (Christensen and Nikolaev, 2012; Dey et al., 2016; Lou and Otto, 2020). Sweeps require that cash from excess cash flow or proceeds from assets sales, debt issuance, or equity issuance must first be used to reduce any loan balance outstanding.

We examine how lenders align their interest with those of the borrowers by re-estimating equation (4) with the number of solvency covenants and cash-proceeds sweeps used in the loan contract as the dependent variables. We define solvency covenants ($SolCov$) as the number of debt covenants based on accounting measures of the firm's financial position and shareholders' residual claims: Debt-to-equity, Debt-to-tangible networth, Leverage ratio, Loan-to-value, Net debt-to-assets, Senior leverage, Total debt-to-tangible networth, Equity-to-asset ratio, Networth-to-total asset, Networth, Tangible networth. For cash sweeps, consistent with prior literature (e.g., Dey et al., 2016; Lou and Otto, 2020), we count the number of cash sweeps specified in the debt contract which include excess cash flow sweep, asset sale sweep, debt issuance sweep, equity issuance sweep, and insurance proceeds sweep. These cash sweeps stipulate that cash proceeds generated from various business transactions are first used to pay down outstanding debt, thereby limiting borrowers' access to excess cash and reducing agency risk.

Table 7 presents the results on the use of solvency covenants. Overall, the results in column (1) show that the use of solvency covenants increases with volatility of transitory shocks and decreases with volatility of permanent shocks. This seemingly contradicts the expectation that when firms' economic fundamentals present a higher risk (more volatile permanent cash flow), more solvency covenants are used to align interests between debtholders

and equityholders. However, it is consistent with the conclusion of Christensen and Nikolaev (2012) that there is a trade-off between the use of liquidity-based and solvency-based covenants. When a borrowing firm is subject to more volatile transitory cash flow, there is less use of liquidity covenants which would otherwise trigger unnecessary lender interventions (documented in Table 2). Hence, more solvency covenants are included in the debt contract as an alternative way to reduce agency concerns (coef. = 0.637, t-stat = 2.95). When a borrower experiences higher permanent cash flow volatility, liquidity covenants serve the main mechanism to monitor the borrower's fundamental performance prospect and solvency covenants are less utilized (coef. = -0.579, t-stat = -2.26). So column (1) results about the impact of cash flow volatility on the use of solvency covenants, together with Table 2, generally reflect the trade-off decision between the two types of financial covenants which boils down to a cost-benefit analysis of which mechanism better addresses the agency problems, lending support to Christensen and Nikolaev (2012).

Since the agency issue raised in Gorbenko and Strebulaev (2010) is particularly severe when temporary cash flow improves current liquidity and when permanent cash flow is poor, we focus the attention to circumstances when borrowing firms recently experienced positive transitory cash flow but negative permanent cash flow. Instead of analysing the volatility of transitory and permanent cash flow, we estimate equation (4) with dummy variables indicating whether transitory (permanent) cash flow in the latest fiscal year before the loan inception is positive (negative). The results are reported in column (2) where only main effects are estimated. Column (3) shows the results when an interaction term between these two cash flow indicators are added. As shown in the table, the coefficient estimate on positive transitory cash flow is positive and significant in both column (2) (coef. = 0.030, t-stat = 2.43) and column (3) (coef. = 0.026, t-stat = 2.12). The coefficient estimate on negative permanent cash flow is negative in both columns and is statistically significant in column (3) (coef. = -0.096, t-stat = -1.43 in column 2; coef. = -0.166, t-stat = -2.13 in column 3). The coefficient estimate on the interaction between positive transitory and

negative permanent shocks is also positive and significant (coef. = 0.127, t-stat = 1.97). We interpret these results as evidence that debt contracts contain more solvency covenants when transitory cash flow is positive, indicating available resources that firms can use to delay default, and when permanent cash flow is negative, indicating weak firm fundamentals that create incentives for firms to gamble. Thus, there is some evidence suggesting that solvency covenants are used by creditors to restrict borrowers' risk appetite as predicted in Gorbenko and Strebulaev (2010).

Table 8 presents the results based on the use of cash sweeps in debt contracts. As borrowers can gamble by taking on additional risk or make business decisions that prioritize shareholder wealth over debtholder wealth, a debt contract can protect creditors' interest and limit a borrower's access to excess cash-proceeds by including a range of sweeps. We expect cash sweeps to also be used to limit borrowers' gambling behavior when their fundamental performance is at risk. In particular, we examine whether a debt sweep is included in the contract as reported in column (1), focusing on a creditor's competing interest against other lenders. We also analyze the use of sweeps in general, with column (2) reporting results on whether sweep is used at all in the contract and column (3) on the number of sweeps used. As the table shows, the coefficient estimate on transitory shock is negative but insignificant across all columns, suggesting that transitory cash flow volatility does not have significant impact on cash proceed sweeps. By contrast the estimate on permanent cash flow volatility is positive and significant in all columns, no matter whether the dependent variable is sweeps of debt issuance proceeds (coef. = 3.270, t-stat = 3.34), any use of sweep (coef. = 2.862, t-stat = 3.43), and the number of sweeps (coef. = 1.272, t-stat = 3.55). These results suggest that when permanent cash flow shocks are volatile, indicating uncertainty in long-term prospects, the contracts are more likely to include cash-proceeds sweeps to limit the borrower's access to excess cash flow and reduce agency risk.

It is worth noting that the relation between cash flow volatility and cash sweeps is the opposite to what is reported with solvency covenants in column (1) of Table 7. This is

consistent with Christensen and Nikolaev (2012) who report that the use of cash sweeps is inversely (positively) related to the use of solvency (liquidity) covenants. The use of cash sweeps is an ex-ante covenant design to align shareholder interest with debtholders, and are used to complement other ex-post control mechanisms (Christensen and Nikolaev, 2012).

5.2 Lender experience and managerial ability

So far, our empirical findings suggest that private debt contracts in the U.S. are in general designed efficiently with an intentional awareness of cash flow shocks that are temporary or permanent. However, it is not clear whether it is the lender or borrower characteristics that drive the contract design. The first question is whether lenders tap into their experience to design appropriate covenants to allow borrowers the financial flexibility to survive a short-term cash flow shock, monitor shocks of permanent nature and ensure interest alignment. The second question is whether managers of the borrowing firm recognize the nature of shocks to their cash flow and thus propose covenants that more efficiently control the credit risk. To shed some light on these questions, we perform separate regressions to examine the moderating role of lead lender experience and managerial ability on our main results of liquidity and solvency covenant use.

We capture lead lender experience by a lender's participation in previous loan deals. Specifically, we develop two variables, *repeat* and *repeatlead* which respectively indicate whether the lead lender had prior lending or lead lending relationship with the borrower in the past five years. Table 9 presents the results on lender experience. In panel A, we report the incremental effect of lender experience by incorporating the interaction terms of *Transitory Vol* $\times$ *LenderExp* and *Permanent Vol* $\times$ *LenderExp* in the regressions, where *LenderExp* is either measured by variable *repeat* (in columns 1, 3 and 5) or *repeatlead* (in columns 2, 4 and 6). For the number and ratio of liquidity covenants, the coefficient estimates of the interaction term *Transitory Vol* $\times$ *LenderExp* (*Permanent Vol* $\times$ *LenderExp*) are all negative (positive). For the use of solvency covenants, the estimated coefficients

of the interaction terms bear the opposite signs, showing a positive (negative) effect of *Transitory Vol* × *LenderExp* (*Permanent Vol* × *LenderExp*). Although the level of statistical significance varies depending on the specific variable measurement, these results generally reveal that the previously documented relations of cash flow volatility with the use of liquidity and solvency covenants are more pronounced for lenders who had greater lending experience with the borrowing firms. This is further confirmed by results in panel B which reports the estimated total effect of transitory/permanent cash flow volatility for the group of inexperienced ($LenderExp = 0$) and experienced lenders ($LenderExp = 1$).[7] As can be seen, the impact of transitory and permanent cash flow on debt covenants is more obvious in terms of both economic magnitude and statistical significance for experienced lenders.

For managerial ability, we adopt the updated 2018 version of managerial ability measures developed in Demerjian et al. (2012) which estimate managers' efficiency in generating firms' financial returns. Variable *MAscore* is the original managerial ability score estimated in Demerjian et al. (2012). Variable *MAscore_rank* is the decile ranks of the original score by industry and year which is also provided in the dataset. Table 10 presents the results on managerial ability, with coefficient estimates of control variables unreported. In most regressions, managerial ability score has no significant incremental effect on the relation between cash flow volatility and the use of liquidity/solvency covenants.

Overall, our findings on the use of liquidity and solvency covenants are more pronounced for greater lender experience. This evidence suggests that lead lenders' past experience with the borrower helps them better understand the borrower's exposure to transitory and permanent cash flow shocks so that they can design a more efficient loan contract to control credit and agency risk while allowing financial flexibility for the borrower. The same cannot be said for managerial ability. In general, there is very little to no evidence that managerial ability has any significant influence on how debt covenants are designed to account for the

[7] In panel A, the incremental effect is estimated by adding both the main effects of *Transitory Vol*, *Permanent Vol*, *LenderExp*, and their interaction terms to equation (4). In panel B, the total effect is estimated by adding only the interaction terms between *Transitory Vol*/*Permanent Vol* and *LenderExp* to equation (4), without separately estimating their main effects.

impact from cash flow shocks of transitory or permanent nature.

5.3 Alternative method to decompose cash flow

In our main analysis, we decompose cash flow based on HP filter. In this section, we use an alternative Beveridge and Nelson (1981) model to decompose firms' cash flow to test the robustness of our results. Under this decomposition model, permanent cash flow shock is taken as a random walk with a drift and transitory shock is treated as a stationary process with zero mean. Using two types of cash flow shocks from the BN decomposition, we repeat our main analyses.

Table 11 presents the results. Similar to our previous findings, transitory shocks are negatively associated with liquidity covenants and liquidity ratio, but positively associated with solvency covenants. Conversely, permanent shocks are positively associated with liquidity covenants and negatively associated with solvency covenants. Overall, these results support our key inference that debt contracts include fewer liquidity covenants when the borrower is exposed to transitory shocks which may trigger unnecessary lender intervention and renegotiation. They are more used to monitor performance when a borrowing firm's fundamental profitability and value is at risk. To complement the use of liquidity covenants, solvency covenants are included as an alternative mechanism to control the agency risk.

5.4 Other robustness tests

As another robustness test, we perform our analyses at loan package level rather than facility level. Facility-level control variables are summarized and taken the mean value for each loan package. Untabulated results confirm our main findings that the use of liquidity-based covenants is associated with lower temporary cash flow volatility but higher permanent cash flow volatility. The opposite results hold for solvency-based covenants in debt contracts.

In our main analyses, cash flow volatility is measured over a five-year window. In robustness tests, we change the estimation window from past five years to a shorter three-year

or longer ten-year period. We also apply alternative definitions to measure firms' cash flow, including using operating cash flow reported in the Cash Flow Statement and the cash flow definition used in Chang et al. (2014). For regressions using the number of debt covenants as the dependent variable, there may be a concern of censored data at the value of 0. Hence, we also apply a Tobit model as an alternative estimation method. Our findings and inferences remain qualitatively the same with slight changes in the statistical significance levels.

6 Conclusion

We study the effects of transitory and permanent shocks to borrowers' cash flow on the choice and use of covenants in debt contracts. Our study is motivated by the premise that a borrower's cash flow is an important factor affecting corporate financing decisions (Graham and Harvey, 2001), and that the nature of shocks driving the distribution of the cash flow can be transitory or permanent with different, often opposing, implications for firms (Gorbenko and Strebulaev, 2010; Décamps et al., 2016). We develop our main hypothesis based on the predictions in Gorbenko and Strebulaev (2010) that optimal contracting facilitates borrowers' financial flexibility if the borrowers experience temporary liquidity crunch but have sound fundamental prospects.

In support of our arguments, we document evidence that debt contracts are less likely to use liquidity-based covenants when transitory cash flow volatility is high, and more likely to use liquidity-based covenants when permanent cash flow volatility is high. We examine both the intensity and tightness of liquidity-based covenants. Our empirical results show that debt contracting is generally efficient in a sense that the design of liquidity-based covenants allows firms to survive a temporary liquidity crunch, in line with the theoretical arguments presented in Gorbenko and Strebulaev (2010).

In subsequent tests, we find that firms exposed to volatile transitory shocks are less likely to include performance pricing provision in debt contracts, which is not the case for permanent shocks. We also show that firms exposed to transitory shocks are not subject

to serious consequences if covenant violations occur. By contrast, permanent cash flow shocks are associated with a greater likelihood of serious covenant violations. Moreover, we show that transitory shocks do not trigger subsequent credit rating changes while permanent shocks are associated with greater credit rating changes.

We also examine covenant designs that mitigate agency risk that may arise from the firm's liquidity position. We find that debt contracts employ solvency-based covenants and cash-proceeds sweeps to mitigate borrowers' appetite for risk, especially when borrowers are faced with poor and uncertain long-term prospects who are prone to gamble by delaying their default. Evidence also suggests that lenders' past lending experience with the same borrower helps improve the efficiency of debt contract design.

Overall, our findings reveal that in general the design of private debt contracts efficiently reflects the variations in borrowing firms' exposure to transitory and permanent cash flow shocks. In the grand scheme of things, our results indicate that considerations for transitory and permanent cash flow shocks are important in evaluating firms' credit risk. As the use of machine learning and textual analysis in evaluating credit risk is increasing (e.g., Donovan et al., 2021), future research should consider incorporating cash flow shocks of transitory and permanent nature when performing these analyses.

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Appendix A - Variable definitions

Variable	Definition
Panel A: Cash flow	
CF	Operating income before depreciation, scaled by total assets
Transitory CF	Transitory component of cash low, scaled by total assets
Permanent CF	Permanent component of cash low, scaled by total assets
Pos_Transitory	A dummy variable equal to 1 if transitory component of cash flow is positive, 0 otherwise
Neg_Permanent	A dummy variable equal to 1 if permanent component of cash flow is negative, 0 otherwise
CF Vol	Volatility of cash flow over the past five years
Transitory Vol	Volatility of transitory component of cash flow over the past five years
Permanent Vol	Volatility of permanent component of cash flow over the past five years
Panel B: Covenants	
LiqCov	Number of liquidity covenants which include Debt-to-EBITDA, Senior Debt-to-EBITDA, Cash Interest Coverage, Debt Service Coverage, EBITDA, Fixed Service Coverage,and Interest Coverage
LiqCovRatio	Number of liquidity covenants (*LiqCov*) divided by the total number of financial covenants
LiqCovSlack	Slack of the interest coverage ratio calculated as the difference between the firm's actual ratio value when the loan was initiated and the covenant threshold recorded in Dealscan
SolCov	Number of solvency covenents which include Debt-to-equity, Debt-to-tangible networth, Leverage ratio,Loan-to-value, Net debt-to-assets, Senior leverage, Total debt-to-tangible networth, Equity-to-asset ratio, Networth-to-total asset, Networth, Tangible networth
Panel C: Firm characteristics	
Market Leverage	The sum of long-term debt and short-term debt, scaled by the sum of long-term debt, short-term debt and closing price times common shares outstanding
Dividend	Common dividends scaled by closing price times common shares outstanding
Size	Logarithm of total assets
Market-to-Book	The sum of long-term debt, short-term debt, preference stock and closing price times common shares outstanding, scaled by total assets
CapEX	Capital expenditure scaled by total assets

Continued on next page

Appendix A (Continued)

Variable	Definition
R&D	Research and development expense scaled by total assets
Depreciation	Depreciation and amortization expense scaled by total assets
Tangible	Net property, plant and equipment scaled by total assets
Advertisement	Advertising expense, scaled by total assets
Loss	A dummy variable equal to 1 if net income is negative, 0 otherwise
ROA	Income before extraordinary items scaled by total assets
Z-Score	Altman's credit risk score computed as 1.2×(CurrentAssets - Current Liabilities)/Total Assets + 1.4×Retained Earnings/Total Assets + 3.3× Pretax Income /Total Assets + 0.6×Market Capitalization/Total Liabilities + 0.999×Revenue/Total Assets
Age	Logarithm of the number of years the firm has been covered by CRSP
RetStD	Logarithm of the standard deviation of daily returns over the fiscal year

Panel D: Debt characteristics

DealSize	Logarithm of facility amount plus one
Maturity	Maturity of the loan (in months)
Secured	A dummy variable equal to1 if the loan is secured, 0 otherwise
NumOfLenders	Number of lenders for the loan
DivRestrict	A dummy variable equal to 1 if dividend restriction covenant exist in the loan contract, 0 otherwise
Sweep	A dummy variable equal to 1 if sweep covenants exist in the loan contract, 0 otherwise
CapexRestrict	A dummy variable equal to 1 if capital expenditure restriction covenants exist in the loan contract, 0 otherwise
PP_Rating	A dummy variable equal to 1 if performance pricing is based on credit ratings, 0 otherwise
PP_Indictor	A dummy variable equal to 1 if performance pricing exists in the loan contract, 0 otherwise
Creditline	A dummy variable equal to 1 if the loan type is line of credit or revolving loan, 0 otherwise

Table 1: Summary Statistics

Pane A Firm Characteristics

Variable	Obs.	Mean	St.Dev	Min	P5	P25	Median	P75	P95	Max
CF	19,005	0.13	0.09	-0.21	-0.01	0.09	0.13	0.18	0.28	0.38
Transitory CF	19,005	0.00	0.04	-0.19	-0.08	-0.02	0.00	0.01	0.06	0.13
Permanent CF	19,005	0.13	0.08	-0.14	0.01	0.09	0.13	0.18	0.27	0.40
CF Vol	19,005	0.05	0.05	0.00	0.01	0.02	0.03	0.05	0.14	0.29
Transitory Vol	19,005	0.04	0.05	0.00	0.01	0.01	0.03	0.05	0.13	0.30
Permanent Vol	19,005	0.03	0.04	0.00	0.01	0.01	0.02	0.04	0.10	0.30
Market Leverage	19,005	0.27	0.22	0.00	0.00	0.10	0.22	0.40	0.73	0.91
Dividend	19,005	0.01	0.02	0.00	0.00	0.00	0.00	0.02	0.05	0.11
Size	19,005	7.01	2.03	2.60	3.59	5.60	6.99	8.36	10.44	12.06
Market-to-Book	19,005	1.43	0.96	0.37	0.54	0.84	1.14	1.69	3.36	5.77
CapEX	19,005	0.06	0.06	0.00	0.01	0.02	0.04	0.08	0.20	0.34
R&D	19,005	0.02	0.04	0.00	0.00	0.00	0.00	0.02	0.12	0.21
Depreciation	19,005	0.05	0.03	0.01	0.01	0.03	0.04	0.06	0.11	0.19
Tangible	19,005	0.33	0.24	0.01	0.04	0.14	0.26	0.47	0.81	0.90
Advertisement	19,005	0.01	0.03	0.00	0.00	0.00	0.00	0.01	0.07	0.18
Loss	19,005	0.22	0.41	0.00	0.00	0.00	0.00	0.00	1.00	1.00
ROA	19,005	0.03	0.10	-0.47	-0.15	0.01	0.04	0.08	0.15	0.22
Z-Score	19,005	3.45	2.86	-2.12	0.27	1.78	2.88	4.39	8.79	16.20
Age	19,005	20.85	18.53	1.00	3.00	7.00	15.00	28.00	66.00	83.00
RetStD	19,005	0.03	0.02	0.01	0.01	0.02	0.02	0.04	0.06	0.10

Pane B Loan Characteristics

Variable	Obs.	Mean	St.Dev	Min	P5	P25	Median	P75	P95	Max
LiqCov	15,239	1.61	0.94	0.00	0.00	1.00	2.00	2.00	3.00	5.00
SolCov	15,239	0.56	0.70	0.00	0.00	0.00	0.00	1.00	2.00	3.00
LiqCovRatio	15,058	0.74	0.34	0.00	0.00	0.50	1.00	1.00	1.00	1.00
DealSize	33,872	18.59	1.82	0.00	15.42	17.40	18.79	19.83	21.39	24.62
Maturity	33,872	49.71	28.88	0.00	12.00	31.00	59.00	60.00	94.00	420.00
Secured	33,872	0.46	0.50	0.00	0.00	0.00	0.00	1.00	1.00	1.00
NumOfLenders	33,872	7.55	8.36	1.00	1.00	2.00	5.00	10.00	23.00	290.00
DivRestrict	33,872	0.34	0.47	0.00	0.00	0.00	0.00	1.00	1.00	1.00
Sweep	33,872	0.20	0.40	0.00	0.00	0.00	0.00	0.00	1.00	1.00
CapexRestrict	33,872	0.10	0.30	0.00	0.00	0.00	0.00	0.00	1.00	1.00
PP_Rating	33,872	0.10	0.30	0.00	0.00	0.00	0.00	0.00	1.00	1.00
PP_Indictor	33,872	0.32	0.47	0.00	0.00	0.00	0.00	1.00	1.00	1.00
Creditline	33,872	0.54	0.50	0.00	0.00	0.00	1.00	1.00	1.00	1.00

Note: This table reports the summary statistics of key firm-level and loan-level variables. All variables are as defined in Appendix A.

Table 2: Use of liquidity covenants with temporary and permanent cash flow volatility

	Liquidity Covenant				Liquidity Ratio			
	(1)		(2)		(3)		(4)	
CF Vol	-0.644**	(-2.51)			-0.355**	(-2.53)		
Transitory Vol			-1.653***	(-4.77)			-0.660***	(-4.44)
Permanent Vol			1.218***	(3.43)			0.448***	(3.62)
Market Leverage	0.126	(1.53)	0.261***	(3.00)	0.120***	(5.10)	0.117***	(4.77)
Dividend	-0.847	(-1.03)	-0.405	(-0.53)	0.034	(0.13)	0.012	(0.04)
Size	-0.110***	(-7.50)	-0.076***	(-4.28)	-0.011*	(-1.79)	-0.010*	(-1.75)
Market-to-Book	-0.040*	(-1.87)	0.056***	(3.45)	0.042***	(6.32)	0.038***	(5.80)
CapEX	0.575**	(2.18)	-0.100	(-0.38)	-0.024	(-0.25)	-0.013	(-0.13)
R&D	-1.083**	(-2.62)	-2.354***	(-6.60)	-0.420***	(-3.53)	-0.418***	(-3.65)
Depreciation	-0.350	(-0.61)	1.170**	(2.38)	0.597***	(4.03)	0.588***	(3.98)
Tangible	0.048	(0.63)	-0.329***	(-3.89)	-0.138***	(-3.45)	-0.137***	(-3.37)
Advertisement	-1.052*	(-1.86)	-0.389	(-0.71)	0.255	(1.50)	0.248	(1.46)
Loss	-0.126***	(-2.84)	-0.078*	(-1.77)	0.008	(0.63)	0.007	(0.54)
ROA	0.619***	(3.01)	0.525***	(2.79)	0.093*	(1.86)	0.089*	(1.80)
Z-Score	-0.005	(-0.83)	-0.017***	(-2.98)	-0.007***	(-2.81)	-0.007**	(-2.71)
Age	-0.001	(-1.64)	-0.003***	(-2.99)	-0.002***	(-3.03)	-0.001***	(-2.90)
RetStD	-3.620**	(-2.55)	-4.138***	(-3.47)	-0.769**	(-2.42)	-0.711**	(-2.14)
DealSize	-0.021**	(-2.15)	0.024	(1.62)	0.016***	(3.80)	0.015***	(3.71)
Maturity	0.002***	(2.92)	0.005***	(8.18)	0.001***	(7.02)	0.001***	(7.07)
Secured	-0.023	(-0.67)	0.017	(0.50)	0.038***	(3.45)	0.037***	(3.38)
NumOfLenders	0.003*	(1.83)	0.006***	(4.13)	0.001*	(1.78)	0.001*	(1.79)
DivRestrict	0.155***	(6.21)	0.176***	(6.72)	0.041***	(3.50)	0.040***	(3.51)
Sweep	0.136***	(2.83)	0.354***	(6.56)	0.081***	(6.29)	0.080***	(6.25)
CapexRestrict	0.113**	(2.42)	0.172***	(4.39)	0.036***	(4.03)	0.036***	(4.06)
PP_Rating	-0.397***	(-11.55)	-0.468***	(-12.66)	-0.119***	(-7.67)	-0.120***	(-7.86)
PP_Indictor	0.210***	(5.62)	0.325***	(7.86)	0.079***	(7.27)	0.079***	(7.34)
Creditline	-0.035	(-1.68)	-0.073***	(-3.38)	-0.016**	(-2.33)	-0.016**	(-2.27)
Const.	3.339***	(19.17)	1.224***	(4.50)	0.349***	(4.46)	0.347***	(4.41)
Industry Fixed Effect	Yes		Yes		Yes		Yes	
Year Fixed Effect	Yes		Yes		Yes		Yes	
N	15,114		15,238		15,058		15,058	
Adj. R-sq	0.294		0.320		0.328		0.329	
Coefficient test:			Transitory Vol vs Permanent Vol					
F-stat (p-value)			21.77 (0.000)				22.84 (0.000)	

Note: This table reports the association between the use of liquidity covenants and firms' transitory and permanent cash flow volatility. In columns (1) and (2), the dependent variable is the number of liquidity covenants used in the loan contract. In columns (3) and (4), the dependent variable is the ratio between the number of liquidity covenants and the total number of liquidity and solvency covenants. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix A. T-stats are reported in parentheses. Standard errors are clustered by firm and year. ***, **, and * denotes two-tailed statistical significance for 1%, 5%, and 10% respectively.

Table 3: Slack of liquidity covenants with temporary and permanent cash flow volatility

	Slack of Liquidity Covenant			
	(1)		(2)	
CF Vol	102.640**	(2.22)		
Transitory Vol			73.981	(1.61)
Permanent Vol			-25.194	(-0.55)
Market Leverage	-5.164	(-0.58)	-5.979	(-0.67)
Dividend	6.913	(0.17)	10.381	(0.25)
Size	1.806*	(1.84)	1.498	(1.61)
Market-to-Book	-9.056***	(-4.27)	-8.086***	(-4.04)
CapEX	21.938	(1.30)	21.982	(1.25)
R&D	88.377	(1.26)	90.767	(1.31)
Depreciation	-11.615	(-0.36)	-1.875	(-0.06)
Tangible	7.473	(1.11)	6.654	(0.96)
Advertisement	-8.567	(-0.21)	-8.336	(-0.21)
Loss	4.724	(1.70)	4.965*	(1.72)
ROA	-14.379	(-0.53)	-14.826	(-0.54)
Z-Score	14.669***	(8.26)	14.497***	(8.10)
Age	-0.081	(-1.56)	-0.083	(-1.57)
RetStD	53.612	(0.60)	78.925	(0.86)
DealSize	-2.064**	(-2.41)	-1.979**	(-2.35)
Maturity	0.063*	(1.89)	0.057	(1.66)
Secured	-3.015	(-1.23)	-2.738	(-1.12)
NumOfLenders	-0.153**	(-2.34)	-0.152**	(-2.30)
DivRestrict	-1.980	(-0.87)	-1.744	(-0.77)
Sweep	1.536	(0.92)	1.571	(0.95)
CapexRestrict	2.116	(0.72)	2.198	(0.75)
PP_Rating	-5.969**	(-2.20)	-5.644**	(-2.09)
PP_Indictor	2.014	(0.74)	1.801	(0.67)
Creditline	0.241	(0.15)	0.161	(0.10)
Const.	5.563	(0.27)	6.850	(0.34)
Industry Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
N	5,861		5,861	
Adj. R-sq	0.335		0.332	
Coefficient test:			Transitory Vol vs Permanent Vol	
F-stat (p-value)			1.50 (0.233)	

Note: This table reports the association between the liquidity covenant slack and firms' transitory and permanent cash flow volatility. In both columns (1) and (2), the dependent variable is the slack of the interest coverage ratio calculated as the difference between the firm's actual ratio value when the loan was initiated and the covenant threshold recorded in Dealscan. Interest coverage ratio is chosen because it is the most frequently used liquidity covenant that is purely based on periodic financial performance information. The actual interest coverage ratio is calculated as EBITDA/InterestExpense. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix A. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 4: Use of performance pricing with temporary and permanent cash flow volatility

	Performance Pricing			
	OLS		LOGIT	
	(1)		(2)	
Transitory Vol	-0.329***	(-2.89)	-2.610***	(-3.70)
Permanent Vol	-0.025	(-0.23)	-0.216	(-0.31)
Market Leverage	-0.120***	(-5.97)	-0.913***	(-7.21)
Dividend	-0.499***	(-2.76)	-3.327***	(-2.89)
Size	-0.033***	(-9.49)	-0.276***	(-14.34)
Market-to-Book	-0.006	(-1.00)	-0.057*	(-1.83)
CapEX	-0.195***	(-3.30)	-1.219***	(-2.79)
R&D	-0.361***	(-3.00)	-1.933***	(-2.94)
Depreciation	-0.025	(-0.21)	0.175	(0.22)
Tangible	0.022	(0.77)	0.172	(1.18)
Advertisement	0.074	(0.65)	0.605	(0.90)
Loss	-0.035***	(-4.00)	-0.202***	(-3.03)
ROA	0.085**	(2.23)	0.789**	(2.46)
Z-Score	0.001	(0.41)	0.003	(0.27)
Age	0.000	(0.82)	0.001	(1.27)
RetStD	-2.068***	(-5.90)	-15.525***	(-7.45)
DealSize	0.034***	(7.03)	0.289***	(12.26)
Maturity	-0.000	(-0.05)	-0.001**	(-2.09)
Secured	-0.016**	(-2.27)	-0.108**	(-2.20)
NumOfLenders	0.009***	(7.51)	0.066***	(16.67)
DivRestrict	0.309***	(10.85)	1.594***	(33.11)
Sweep	0.119***	(7.20)	0.694***	(11.80)
CapexRestrict	0.029**	(2.14)	0.223***	(3.20)
Creditline	0.123***	(9.66)	0.870***	(27.29)
Const.	-0.206**	(-2.58)	-6.536***	(-10.05)
Industry Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
N	33,872		32,489	
Adj./Pseudo R-sq	0.323		0.295	
Coefficient test:	Transitory Vol vs Permanent Vol			
F-stat (p-value)	2.16 (0.150)		3.52 (0.061)	

Note: This table reports the association between the use of performance pricing and firms' transitory and permanent cash flow volatility. In both columns (1) and (2), the dependent variable is a dummy variable that takes the value of 1 if performance pricing is used in the loan contract, 0 otherwise. Column (1) reports the OLS estimation results and column (2) reports the LOGIT estimation results. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix A. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 5: Violation consequence with transitory and permanent cash flow volatility

	Disclosure of Serious Violation			
	(1)		(2)	
CF Vol	2.172**	(2.40)		
Transitory Vol			-1.259*	(-1.80)
Permanent Vol			1.209*	(1.75)
Market Leverage	1.419***	(6.06)	1.313***	(5.77)
Dividend	0.787	(1.10)	0.784	(1.10)
Size	-0.393***	(-10.86)	-0.415***	(-11.64)
Market-to-Book	-0.063	(-0.75)	-0.015	(-0.22)
CapEX	1.554**	(2.04)	1.678**	(2.24)
R&D	-1.667	(-1.22)	-1.426	(-1.05)
Depreciation	-1.983	(-1.41)	-2.165	(-1.52)
Tangible	0.017	(0.06)	-0.015	(-0.05)
Advertisement	-0.776	(-0.62)	-0.271	(-0.22)
Loss	0.756***	(7.04)	0.785***	(7.24)
ROA	-0.937	(-1.46)	-1.041	(-1.56)
Z-Score	-0.032	(-0.98)	-0.044	(-1.34)
Age	-0.002	(-0.60)	-0.003	(-0.76)
RetStD	-0.740	(-0.24)	0.190	(0.06)
Const.	0.700	(1.21)	0.894	(1.56)
Industry Fixed Effect	Yes		Yes	
Year Fixed Effect	Yes		Yes	
N	4,043		4,043	
Pseudo R-sq	0.156		0.155	
Coefficient test:			Transitory Vol vs Permanent Vol	
F-stat (p-value)			3.16 (0.075)	

Note: This table reports the association between the disclosure of serious covenant violations and firms' transitory and permanent cash flow volatility, conditional on the existence of a covenant violation. A covenant violation is identified based on comparing firms' actual covenant ratios during the loan period with the covenant benchmarks recorded in Dealscan at the initiation of the loan. As long as one of the loan covenants used in the loan contract were breached, a violation is identified. Conditional on a covenant violation exists, the sampled observations are classified as those with serious or not serious violation consequences. Violation with serious consequences is identified if it is disclosed in a SEC filing as recorded in the Nini et al. (2009) dataset. In all columns, the dependent variable is a dummy variable equal to 1 if a disclosure of covenant violations was made by a firm in its SEC filings (deemed as violations with serious consequences), 0 otherwise. The LOGIT estimation results are reported. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix A. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 6: Changes in credit ratings with transitory and permanent cash flow volatility

	Absolute Changes in Subsequent Credit Ratings							
	OLS				Ordered Probit			
	(1)		(2)		(3)		(4)	
CF Vol	0.920**	(2.31)			1.685***	(3.43)		
Transitory Vol			-0.405	(-0.84)			-0.314	(-0.48)
Permanent Vol			1.809***	(3.46)			2.535***	(4.13)
Market Leverage	0.227*	(1.94)	0.213*	(1.85)	0.275**	(2.51)	0.248**	(2.27)
Dividend	1.891**	(2.62)	1.882**	(2.61)	2.561***	(3.33)	2.555***	(3.32)
Size	0.028***	(2.82)	0.027**	(2.69)	0.013	(1.12)	0.011	(0.90)
Market-to-Book	-0.003	(-0.13)	-0.010	(-0.48)	-0.014	(-0.50)	-0.022	(-0.78)
CapEX	-0.266	(-0.81)	-0.272	(-0.77)	-0.574	(-1.56)	-0.594	(-1.59)
R&D	0.568*	(1.78)	0.671*	(2.01)	0.855	(1.33)	1.011	(1.57)
Depreciation	-0.759	(-1.25)	-0.686	(-1.11)	-0.908	(-1.35)	-0.766	(-1.14)
Tangible	0.111	(1.37)	0.134	(1.61)	0.176	(1.57)	0.209*	(1.85)
Advertisement	0.484	(1.51)	0.500	(1.58)	0.922	(1.56)	0.933	(1.58)
Loss	0.061	(1.20)	0.063	(1.23)	0.127***	(2.65)	0.130***	(2.72)
ROA	-0.938**	(-2.74)	-0.972***	(-2.84)	-0.643**	(-2.15)	-0.706**	(-2.35)
Z-Score	0.007	(0.86)	0.008	(0.99)	-0.001	(-0.11)	-0.001	(-0.06)
Age	0.000	(0.81)	0.001	(1.23)	-0.000	(-0.45)	-0.000	(-0.05)
RetStD	11.649***	(6.41)	11.788***	(6.80)	13.126***	(7.06)	13.409***	(7.21)
Const.	-0.243**	(-2.18)	-0.245**	(-2.22)				
Industry Fixed Effect	Yes		Yes		Yes		Yes	
Year Fixed Effect	Yes		Yes		Yes		Yes	
N	8,742		8,742		8,742		8,742	
Adj./Pseudo R-sq	0.065		0.066		0.038		0.039	
Coefficient test:			Transitory Vol vs Permanent Vol					
F-stat (p-value)			5.89 (0.021)				6.16 (0.013)	

Note: This table reports the association between changes in subsequent credit ratings provided by credit rating agencies and firms' transitory and permanent cash flow volatility. In all columns, the dependent variable is calculated as the absolute changes in credit ratings over the following 12-month period. Columns (1) and (2) report the OLS estimation results. Columns (3) and (4) report the Ordered Probit estimation results. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix Variable Definition. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 7: Use of solvency covenants with transitory and permanent cash flow

	Solvency Covenant					
	(1)		(2)		(3)	
Transitory Vol	0.637***	(2.95)				
Permanent Vol	-0.579**	(-2.26)				
Pos_Transitory			0.030**	(2.43)	0.026**	(2.12)
Neg_Permanent			-0.096	(-1.43)	-0.166**	(-2.13)
Pos_Transitory×Neg_Permanent					0.127*	(1.97)
CF			-0.451**	(-2.38)	-0.475**	(-2.46)
Market Leverage	-0.119**	(-2.71)	-0.130***	(-3.12)	-0.132***	(-3.17)
Dividend	-0.178	(-0.32)	-0.159	(-0.28)	-0.157	(-0.27)
Size	-0.016	(-1.42)	-0.019	(-1.64)	-0.019	(-1.65)
Market-to-Book	-0.093***	(-6.88)	-0.082***	(-5.76)	-0.082***	(-5.71)
CapEX	0.190	(1.06)	0.210	(1.22)	0.216	(1.25)
R&D	0.084	(0.39)	0.021	(0.08)	0.033	(0.13)
Depreciation	-1.383***	(-3.93)	-1.004**	(-2.64)	-0.977**	(-2.57)
Tangible	0.319***	(4.16)	0.318***	(4.21)	0.317***	(4.19)
Advertisement	-0.426	(-1.28)	-0.371	(-1.12)	-0.371	(-1.12)
Loss	0.120	(1.25)	-0.091***	(-3.81)	-0.093***	(-3.92)
ROA	-0.060**	(-2.49)				
Z-Score	0.011**	(2.58)	0.014***	(3.24)	0.014***	(3.20)
Age	0.002**	(2.36)	0.002**	(2.41)	0.002**	(2.40)
RetStD	0.141**	(0.22)	0.136	(0.20)	0.148	(0.22)
DealSize	-0.002**	(-3.81)	-0.030***	(-3.60)	-0.030***	(-3.59)
Maturity	-0.002**	(-4.90)	-0.002***	(-5.01)	-0.002***	(-5.02)
Secured	-0.097***	(-4.26)	-0.099***	(-4.45)	-0.100***	(-4.48)
NumOfLenders	-0.002*	(-1.90)	-0.002*	(-1.91)	-0.002*	(-1.92)
DivRestrict	-0.013	(-0.45)	-0.015	(-0.53)	-0.014	(-0.50)
Sweep	-0.141***	(-6.84)	-0.140***	(-6.77)	-0.140***	(-6.74)
CapexRestrict	-0.077***	(-4.65)	-0.076***	(-4.68)	-0.076***	(-4.68)
PP_Rating	0.092***	(3.61)	0.093***	(3.57)	0.092***	(3.57)
PP_Indictor	-0.064***	(-3.29)	-0.065***	(-3.30)	-0.065***	(-3.30)
Creditline	0.027**	(2.15)	0.026**	(2.09)	0.026**	(2.10)
Const.	1.620***	(10.26)	1.616***	(10.28)	1.615***	(10.28)
Industry Fixed Effect	Yes		Yes		Yes	
Year Fixed Effect	Yes		Yes		Yes	
N	15,238		15,238		15,238	
Adj. R-sq	0.359		0.359		0.359	
Coefficient test:	Transitory Vol vs Permanent Vol					
F-stat (p-value)	8.43 (0.007)					

Note: This table reports the association between the use of solvency covenants and firms' transitory/permanent cash flow volatility and their levels. In columns (1), (2) and (3), the dependent variable is the number of solvency covenants used in the loan contract. In columns (2) and (3), control variable ROA is not included in the regression to avoid multicollinearity with variable CF due to their definition similarity. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix A. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 8: Use of cash sweeps with temporary and permanent cash flow volatility

	Debt Sweep		Sweep (Dummy)		Sweep (Count)	
	(1)		(2)		(3)	
Transitory Vol	-1.211	(-1.11)	-0.834	(-0.93)	-0.501	(-1.40)
Permanent Vol	3.270***	(3.34)	2.862***	(3.43)	1.272***	(3.55)
Market Leverage	0.935***	(4.75)	0.986***	(5.97)	0.366***	(4.84)
Dividend	-1.213	(-0.73)	-0.092	(-0.07)	-0.508	(-0.82)
Size	-0.228***	(-7.65)	-0.217***	(-8.07)	-0.041***	(-4.55)
Market-to-Book	0.037	(0.76)	0.082**	(2.09)	0.043**	(2.61)
CapEX	-1.230	(-1.61)	-1.581**	(-2.43)	-0.682***	(-3.29)
R&D	-2.324**	(-2.25)	-2.882***	(-3.24)	-1.165***	(-3.18)
Depreciation	2.282*	(1.91)	1.048	(1.02)	1.108**	(2.46)
Tangible	-0.561**	(-2.35)	-0.118	(-0.59)	-0.172*	(-1.92)
Advertisement	-2.032*	(-1.75)	-2.845***	(-2.96)	-0.740	(-1.53)
Loss	-0.107	(-1.12)	0.027	(0.33)	-0.029	(-0.86)
ROA	0.408	(0.85)	0.753*	(1.91)	0.431**	(2.18)
Z-Score	-0.019	(-1.01)	-0.041***	(-2.62)	-0.017**	(-2.58)
Age	0.003	(1.44)	-0.000	(-0.08)	0.000	(0.57)
RetStD	-8.244***	(-2.69)	-7.962***	(-3.21)	-3.525***	(-3.34)
DealSize	0.386***	(13.36)	0.305***	(11.82)	0.081***	(6.92)
Maturity	0.002	(1.58)	0.002**	(1.97)	0.002***	(4.11)
Secured	1.349***	(17.67)	1.552***	(23.90)	0.466***	(10.86)
NumOfLenders	0.015***	(3.13)	0.027***	(6.52)	0.007***	(3.73)
DivRestrict	2.253***	(23.99)	2.311***	(31.30)	0.926***	(15.73)
CapexRestrict	1.253***	(15.14)	1.359***	(17.49)	1.190***	(23.26)
PP_Rating	-0.035	(-0.31)	-0.319***	(-3.14)	-0.351***	(-6.44)
PP_Indictor	0.765***	(11.45)	0.857***	(13.82)	0.330***	(7.14)
Creditline	-1.103***	(-26.45)	-1.051***	(-26.67)	-0.352***	(-12.64)
Const.	-9.427***	(-12.99)	-8.188***	(-12.81)	-1.245***	(-5.03)
Industry Fixed Effect	Yes		Yes		Yes	
Year Fixed Effect	Yes		Yes		Yes	
N	31,303		31,303		33,872	
Adj./Pseudo R-sq	0.385		0.425		0.420	
Coefficient test:			Transitory Vol vs Permanent Vol			
F-stat (p-value)	5.68 (0.017)		5.53 (0.019)		7.69 (0.009)	

Note: This table reports the association between the use of cash sweeps and firms' transitory and permanent cash flow volatility. Column (1) reports the LOGIT estimation results when the dependent variable is a dummy variable that takes the value of 1 if debt sweep is used in the loan contract, 0 otherwise. Column (2) reports the LOGIT estimation results when the dependent variable is a dummy variable that takes the value of 1 if any sweep is used in the loan contract, 0 otherwise. Column (3) reports the OLS estimation results when the dependent variable is the number of sweeps used in the loan contract. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix A. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 9: Moderating effect of lender experience

Panel A. Incremental effect

	Liquidity Covenant		Liquidity Ratio		Solvency Covenant	
	(1) repeat	(2) repeatlead	(3) repeat	(4) repeatlead	(5) repeat	(6) repeatlead
Transitory Vol	-1.583***	-1.538***	-0.572***	-0.570***	0.394**	0.385**
	(-4.25)	(-3.27)	(-4.56)	(-4.70)	(2.16)	(2.08)
Permanent Vol	0.905*	0.917	0.253*	0.286*	-0.235	-0.236
	(1.87)	(1.68)	(1.93)	(1.96)	(-0.97)	(-0.84)
LenderExp	-0.054	0.000	-0.034**	-0.019*	0.049**	0.046**
	(-1.67)	(0.02)	(-2.66)	(-1.78)	(2.31)	(2.65)
Transitory Vol×LenderExp	-0.821	-0.631	-0.560*	-0.341	0.959*	0.571
	(-1.05)	(-0.81)	(-1.97)	(-1.23)	(1.85)	(1.41)
Permanent Vol×LenderExp	2.474**	1.295	1.131***	0.470	-1.284**	-0.654
	(2.46)	(1.30)	(3.49)	(1.48)	(-2.43)	(-1.34)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
N	14,748	14,748	14,585	14,585	14,748	14,748
Adj. R-sq	0.324	0.323	0.329	0.328	0.357	0.357

Panel B. Total effect

	Liquidity Covenant		Liquidity Ratio		Solvency Covenant	
	(1) repeat	(2) repeatlead	(3) repeat	(4) repeatlead	(5) repeat	(6) repeatlead
Transitory Vol (LenderExp = 0)	-1.528***	-1.539***	-0.537***	-0.531***	0.344*	0.291
	(-3.93)	(-3.15)	(-4.19)	(-4.34)	(1.81)	(1.53)
Permanent Vol (LenderExp = 0)	0.950*	0.916*	0.281**	0.307**	-0.276	-0.288
	(2.02)	(1.70)	(2.21)	(2.18)	(-1.16)	(-1.07)
Transitory Vol (LenderExp = 1)	-2.739***	-2.167***	-1.344***	-1.007***	1.656***	1.186***
	(-3.49)	(-3.52)	(-4.13)	(-3.55)	(3.33)	(3.07)
Permanent Vol (LenderExp = 1)	3.006***	2.215***	1.143***	0.661***	-1.182**	-0.664*
	(3.81)	(3.09)	(4.15)	(2.80)	(-2.63)	(-1.93)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
N	14,748	14,748	14,585	14,585	14,748	14,748
Adj. R-sq	0.324	0.323	0.328	0.328	0.356	0.356
Coefficient test (p-value):			LenderExp = 0 vs 1			
Transitory Vol	0.137	0.440	0.008	0.089	0.012	0.032
Permanent Vol	0.031	0.176	0.005	0.224	0.088	0.420

Note: This table reports how lender experience moderates the impact of firms' transitory and permanent cash flow volatility on debt covenants. *Repeat* (*RepeatLead*) indicates lead lender had prior lending (lead lending) relationship with the borrower in the past five years. Panel A reports the incremental effect of lender experience, while panel B reports the estimated total effect of transitory and permanent cash flow volatility on debt covenants for inexperienced (LenderExp = 0) and experienced (LenderExp = 1) lenders. The dependent variables are listed at the top of the columns. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix Variable Definition. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 10: Moderating effect of managerial ability

	Liquidity Covenant		Liquidity Ratio		Solvency Covenant	
	(1)	(2)	(3)	(4)	(5)	(6)
Transitory Vol	-1.584***	-1.791**	-0.600***	-0.281	0.488**	-0.060
	(-4.47)	(-2.53)	(-4.08)	(-1.19)	(2.33)	(-0.18)
Permanent Vol	1.392***	2.347**	0.460***	0.341	-0.565**	-0.157
	(3.93)	(2.70)	(3.85)	(1.49)	(-2.28)	(-0.34)
MAscore	-0.207		-0.107		0.138	
	(-1.44)		(-1.65)		(1.38)	
Transitory Vol×MAscore	0.118		-1.135		2.043*	
	(0.07)		(-1.66)		(1.75)	
Permanent Vol×MAscore	-2.632		0.900		-1.831	
	(-1.55)		(1.53)		(-1.61)	
MAscore_rank		-0.084		-0.032		0.052
		(-1.54)		(-1.44)		(1.17)
Transitory Vol×MAscore_rank		0.363		-0.577*		0.991**
		(0.40)		(-1.88)		(2.09)
Permanent Vol×MAscore_rank		-1.822		0.206		-0.726
		(-1.48)		(0.63)		(-1.27)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
N	15,062	15,062	14,887	14,887	15,062	15,062
Adj. R-sq	0.321	0.321	0.332	0.332	0.360	0.360

Note: This table reports how managerial ability moderates the impact of firms' transitory and permanent cash flow volatility on debt covenants design. Managerial ability is alternatively measured by the original managerial ability score (MAscore) and the decile ranks of the score (MAscore_rank) developed in Demerjian et al. (2012). In columns (1) and (2), the dependent variable is the number of liquidity covenants used in the loan contract. In columns (3) and (4), the dependent variable is the ratio between the number of liquidity covenants and the total number of liquidity and solvency covenants. In columns (5) and (6), the dependent variable is the number of solvency covenants used in the loan contract. Estimated coefficients for other control variables are not reported. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix Variable Definition. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.

Table 11: BN decomposition

	Liquidity Covenant		Liquidity Ratio		Solvency Covenant	
	(1)		(2)		(3)	
Transitory Vol	-0.487**	(-2.08)	-0.242**	(-2.68)	0.295**	(2.07)
Permanent Vol	0.439*	(1.83)	0.209**	(2.39)	-0.368**	(-2.41)
Market Leverage	0.290***	(3.29)	0.126***	(5.11)	-0.128***	(-2.94)
Dividend	-0.508	(-0.64)	0.009	(0.03)	-0.199	(-0.35)
Size	-0.067***	(-3.81)	-0.006	(-1.02)	-0.021*	(-1.79)
Market-to-Book	0.048***	(3.02)	0.037***	(4.88)	-0.091***	(-5.99)
CapEX	-0.020	(-0.07)	0.002	(0.02)	0.203	(1.03)
R&D	-2.572***	(-7.29)	-0.468***	(-3.80)	0.165	(0.67)
Depreciation	1.264**	(2.54)	0.583***	(3.81)	-1.423***	(-3.92)
Tangible	-0.329***	(-3.82)	-0.134***	(-3.18)	0.319***	(4.04)
Advertisement	-0.192	(-0.34)	0.327*	(1.84)	-0.557	(-1.56)
Loss	-0.093*	(-1.93)	0.003	(0.28)	-0.055**	(-2.34)
ROA	0.571**	(2.69)	0.111**	(2.23)	0.102	(1.09)
Z-Score	-0.015**	(-2.60)	-0.007**	(-2.58)	0.010**	(2.33)
Age	-0.002**	(-2.64)	-0.001***	(-2.77)	0.002**	(2.28)
RetStD	-4.515***	(-3.86)	-0.845**	(-2.50)	0.104	(0.15)
DealSize	0.021	(1.43)	0.014***	(3.33)	-0.032***	(-3.67)
Maturity	0.005***	(8.00)	0.001***	(7.43)	-0.002***	(-5.09)
Secured	0.011	(0.33)	0.037***	(3.23)	-0.100***	(-4.41)
NumOfLenders	0.006***	(4.00)	0.001**	(2.10)	-0.003*	(-2.00)
DivRestrict	0.177***	(6.18)	0.040***	(3.20)	-0.011	(-0.38)
Sweep	0.352***	(6.65)	0.080***	(6.23)	-0.142***	(-6.91)
CapexRestrict	0.174***	(4.49)	0.037***	(4.24)	-0.078***	(-4.66)
PP_Rating	-0.471***	(-12.65)	-0.125***	(-8.36)	0.096***	(3.67)
PP_Indictor	0.325***	(7.85)	0.077***	(7.00)	-0.059***	(-2.93)
Creditline	-0.076***	(-3.41)	-0.016**	(-2.30)	0.029**	(2.20)
Const.	1.182***	(4.27)	0.329***	(4.09)	1.659***	(10.40)
Industry Fixed Effect	Yes		Yes		Yes	
Year Fixed Effect	Yes		Yes		Yes	
N	14,450		14,279		14,450	
Adj. R-sq	0.312		0.325		0.357	

Note: This table reports our baseline results using temporary and permanent cash flows decomposed based on BN method. In column (1), the dependent variable is the number of liquidity covenants used in the loan contract. In column (2), the dependent variable is the ratio between the number of liquidity covenants and the total number of liquidity and solvency covenants. In column (3), the dependent variable is the number of solvency covenants used in the loan contract. Industry fixed effects are based on Fama and French 48 Industry classification. All variables are as defined in Appendix Variable Definition. T-stats are reported in parentheses. *,** and *** respectively indicates 10%, 5% and 1% significance level.