More Debt More Leverage?

Antje Berndt, Bruce Grundy and Yue Wang*

November 2022

Abstract

If the primary purpose of raising debt levels was to finance growth opportunities, then higher debt levels would signal greater post-payout returns on assets but contain no information about firm leverage. Using annual data in real terms for more than 5,400 public US non-financial firms from 1973 to 2021, we reject this hypothesis by showing that the return channel accounts for less than half of the variation in debt levels, with the leverage channel accounting for the remainder. The link between greater debt growth and higher leverage is particularly pronounced during accommodative monetary policy regimes.

JEL Classifications: C5; E4; E6; G1; H6

Keywords: Corporate debt levels, leverage, asset returns, payout yields, investment yields

*Berndt is a Professor of Finance at Australian National University, Email: antje.berndt@anu.edu.au. Grundy is a Professor of Finance at Australian National University, Email: bruce.grundy@anu.edu.au. Wang is a doctoral student in finance at the College of Business and Economics, Australian National University, Email: yue.wang1@anu.edu.au. We are extremely grateful to Jean Helwege and Phong Ngo for feedback and suggestions, and thank ANU brownbag participants for helpful comments.

In response to recent market-wide credit squeezes, emergency monetary policy measures were put in place. These measures aimed to ensure market liquidity and ease access to credit. Hotchkiss, Nini, and Smith (2022) document, for example, that in response to the March 23, 2020 announcement of market interventions by the Federal Reserve,[1] debt issuance by investment-grade firms rose sharply relative to prior-year levels. The goal of this paper is to predict how firms use higher debt levels, especially those supported by accommodative monetary policies.

The reasons for and uses of corporate debt growth are an issue of ongoing debate. Prior work tends to focus on one particular reason for debt-financing.[2] In contrast, we provide a unified framework which categorizes all potential uses of debt growth and quantifies the contribution of each use to the variation in debt levels. Our point of demarcation is the firm's inter-temporal budget constraint that defines the gross return on firm assets as the sum of the end-of-period market value of assets and net payouts divided by the beginning-of-period market value of assets. Net payouts are computed as the difference between fund outflows and fund inflows. We log-linearize the budget constraint around these fund flows to show that greater debt levels reflect either an increase in returns relative to net payout yields or an increase in leverage.

If the primary purpose of higher debt levels was to finance growth opportunities that increase post-payout returns, changes in debt levels would contain little to no information about firm leverage. Using annual data in real terms for over 5,400 public US non-financial firms from 1973 to 2021, we show that less than half of the variation in debt levels reflects changes in post-payout returns on assets, and that more than half of the variation reflects changes in leverage. Thus, the hypothesis of debt growth not containing leverage-related information is rejected. In fact, the data support the notion that the primary purpose of debt growth tends to be an adjustment to the firm's capital structure, and that the transmission of movements in debt levels to movements in returns is more limited.

[1] On March 23, 2020, the Federal Reserve established the Secondary Market Corporate Credit Facility to provide liquidity to the market for outstanding investment-grade corporate bonds.

[2] DeAngelo, DeAngelo, and Whited (2011), Bargeron, Denis, and Lehn (2018), Bolton, Chen, and Wang (2011) and Bolton, Wang, and Yang (2020), for example, study debt-financed investment, whereas Ma (2019), Begenau and Salomao (2019) and Farre-Mensa, Michaely, and Schmalz (2021) analyze debt-financed payouts. Korteweg, Schwert, and Strebulaev (2022) link the speed of leverage revisions to firms' financing choices.

We express post-payout returns on assets as the difference between assets returns and net payout yields, and further separate asset returns into investment yields and returns on post-investment assets in place. We document that the (limited) transmission of debt growth to returns is through higher returns on assets in place rather than greater investment yields. Over multi-year horizons, however, absorption shifts from returns on assets in place to investment yields. We further document that there are limitations to the extent to which monetary easing is transmitted to debt-financed business investment. This is consistent with Crouzet (2021) who argues that the overall pass-through of monetary policy shocks to investment has declined since the 1990s.[3]

The market value of debt is a key ingredient to the firm's budget constraint. It is not directly observable and must be carefully constructed. Thus, we employ the Nelson and Siegel (1987) approach to construct firm- and time-specific discount factors that translate book values of debt into market values of debt. As a robustness check, we follow Hall (1988) and Larrain and Yogo (2008) who assume that firms issue long-term debt at par with an initial maturity structure that mimics the one observed globally for all corporate debt outstanding. In this alternative approach, bond prices at each maturity are computed using Moody's seasoned Baa corporate bond yield.

We stratify the sample by monetary policy regime, leverage and industry. We find that debt growth is more reflective of leverage growth and less reflective of asset returns for low-leverage firms than for high-leverage firms. Debt levels are more indicative of investment for mining companies than for other industries. Perhaps surprisingly, we find only small differences in the variance decomposition of debt growth between dovish and hawkish periods. For both regimes, an increase in debt levels is more reflective of higher leverage ratios than greater investment yields. Over multi-year horizons, debt growth is even more indicative of increases in leverage, especially for dovish regimes. Thus, our findings run counter to the notion that accommodative monetary policy incentivizes business investment, and instead point to a link between easier monetary policy and higher leverage.

[3] Todorov (2020) and Siani (2021) show that funds raised (by proxy) through the 2016 European Central Bank's Corporate Sector Purchase Programme were mainly used to make one-off payouts instead of real investment. This view is refuted to some degree by Giambona, Matta, Peydró, and Wang (2020), De Santis and Zaghini (2021) and Darmouni and Papoutsi (2022).

The dynamics implied by the log-linearized budget constraint allow us to decompose the variation in debt levels into variation in expected and unexpected leverage growth, asset returns and payout yields. We employ pooled OLS regressions to estimate a panel VAR model, which in turn is used to construct these expectations and innovations. We find that only a small portion of the annual changes in debt levels can be predicted by expectations formed at the beginning of the period, and that variation in debt levels tends to reflect subsequent adjustments to leverage, returns or payout expectations.

We assess the extent to which the uses of debt growth during the COVID era deviated from those predicted based on pre-COVID data. We find that actual investment in 2020–2021 fell short of predictions, which suggests that debt growth supported by emergency relief measures may increase firm leverage or post-investment returns on assets as opposed to investment. Our finding of limited transmission of economic stimulus to business investment is consistent with recent work on European quantitative easing programs (Todorov, 2020; Siani, 2021; Pegoraro and Montagna, 2022).

The paper proceeds as follows. Section I reviews prior related work. Section II log-linearizes the firm's inter-temporal budget constraint, and derives debt growth dynamics. Section III provides a simple illustrative example of a firm's balance sheet and within-period fund flows that highlights the interactions between the various components of debt growth dynamics. Section IV describes the data, sample construction and VAR estimation. Section V presents the variance decomposition for debt growth, and Section VI further decomposes asset returns into investment and returns on post-investment assets in place. Section VII reports on robustness checks and extends our framework to compare predicted and actual uses of debt growth during the COVID era. Section VIII concludes.

I. Prior Work

While a substantial body of research has focused on the choice between debt and equity financing,[4] a smaller set of articles investigates how firms use the debt that they raise. Potential uses include the financing of investment, the financing of payouts to stakeholders and liquidity provision. With regard to debt-financed investment, DeAngelo, DeAngelo, and Whited (2011) find that firms may decide to deviate from leverage targets and issue debt to fund investment. Bargeron, Denis, and Lehn (2018) provide evidence that firms largely issue debt, not equity, to finance a sudden increase in investment opportunities. Bolton, Chen, and Wang (2011) propose a model of dynamic investment, financing, and risk management for financially constrained firms and value the importance of liquidity management. Bolton, Wang, and Yang (2020) argue that firms seek to preserve their financial flexibility by prudently managing leverage and investment.

As for debt-financed payouts, Ma (2019) documents that large, unconstrained firms acting as cross-market arbitrageurs by simultaneously raising debt and paying out equity when expected excess returns on debt are low relative to expected excess returns on equity. Begenau and Salomao (2019) show that firms of different size conduct their financing and payout activities differently over the business cycle, and that investment returns explain cross-sectional differences in the cyclical financing behavior. Farre-Mensa, Michaely, and Schmalz (2021) show that firms rely on capital markets, and debt financing in particular, to fund their payouts. Specifically, firms with low leverage or cash, firms with high investment opportunities, and firms with tax minimization motives are more likely to debt-finance payouts. They also highlight that firms use debt-financed payouts to jointly manage their leverage and cash.

An example of debt issuance aimed at liquidity provision is Ford Motors borrowing nearly 24 billion US dollars as "a cushion to protect for a recession or other unexpected events" (Vlasic, 2009). Furthermore, Korteweg, Schwert, and Strebulaev (2022) show that firms may adjust their leverage targets to meet working capital needs.

[4] See Julio, Kim, and Weisbach (2008), Huang and Ritter (2009), DeAngelo (2022), Korteweg, Schwert, and Strebulaev (2022), and the references therein.

The reasons for debt issuance may differ over the business cycle. Incentivized by March 23, 2020 Fed intervention, for example, companies raised capital mainly to help fund expenses as they "waited out the pandemic" (Hotchkiss, Nini, and Smith, 2022; Acharya and Steffen, 2020; O'Hara and Zhou, 2021; Darmouni and Siani, 2022). Hotchkiss, Nini, and Smith (2022) document that in response to the intervention, investment-grade corporate bond issuance more than doubled relative to a typical year. Ottonello and Winberry (2020) argue that firms with low default risk tend to be more responsive to monetary shock than firms with high default risk. Lakdawala and Moreland (2021) show that high-leverage firms, especially those dependent on long-term debt, become more responsive to monetary policy news in post-crisis periods compared to pre-crisis periods.

Our paper also relates to the literature that relies on the inter-temporal budget constraints for variance decomposition exercises. The log-linearization of a firm's asset value process follows a procedure similar to the log-linearization of the household budget constraint in Campbell (1993), the country external budget constraint in Gourinchas and Rey (2007), the government's budget constraint in Berndt, Lustig, and Yeltekin (2012), and the firm budget constraint in Larrain and Yogo (2008) and Cho, Grotteria, Kremens, and Kung (2021). The Campbell (1993) linearization of the household budget constraint treats labor income as the return on human capital and, hence, part of the return on the household's overall portfolio. The constraint is then re-expressed as a function of household wealth (inclusive of human capital) and consumption, both of which are taken to be positive. In contrast, Berndt, Lustig, and Yeltekin (2012) treat government income from taxation as a part of the surplus flow rather than as a return on a government asset. Larrain and Yogo (2008) exploit the log-linearized present-value model of Campbell and Shiller (1988) and Vuolteenaho (2002) and express firms' net payout yield as the difference between expectations about future changes in asset value and net payouts in the long run at aggregate levels. Cho, Grotteria, Kremens, and Kung (2021) use a similar framework but focus on asset prices and markups at the firm level. We contribute to this strand of the literature by employing the firm's budget constraint to derive debt growth dynamics. The decomposition of debt growth into changes in leverage ratios, asset returns and excess payout yields allows us to investigate how firms absorb net debt issuance.

II. Debt Growth Dynamics

We analyze changes in corporate debt levels through the lens of the firm's inter-temporal budget constraint. Time progresses in periods, where period t runs from time t to time $t+1$. All valuations are stated in real terms. For a generic firm, we use A_t to denote the market value of assets at time t, and C_{t+1} to denote the net payouts in period t. Net payouts C_{t+1} consist of dividends, interest expenses, net equity repurchases and net debt redemptions, and occur at time $t+1$. The firm's inter-temporal budget constraint is given by

$$A_{t+1} + C_{t+1} = A_t R_{t+1}, \tag{1}$$

where R_{t+1} is the gross return on firm assets in period t. Dividing both sides of (1) by A_t and rearranging terms allows us to express asset growth as the difference between returns on assets and net payout yields, $Y_{t+1} = C_{t+1}/A_t$,[5]

$$\frac{A_{t+1}}{A_t} = R_{t+1} - Y_{t+1}. \tag{2}$$

Let D_{t+1} denote the firm's book value of debt at time $t+1$, after interest expense for period t has been paid and inclusive of net debt issuance in period t. We define leverage ratios $\text{Lev}_t = D_t/A_t$ as the book value of debt, D_t, divided by the market value of assets, and rewrite (2) as

$$\frac{D_{t+1}}{D_t} = \frac{\text{Lev}_{t+1}}{\text{Lev}_t}\left(R_{t+1} - Y_{t+1}\right). \tag{3}$$

Using lower-case variables to denote the logarithm of the corresponding upper-case variables and Δ to denote a one-period change, so that $\Delta d_{t+1} = \log D_{t+1} - \log D_t$ is the continuously compounded

[5] Larrain and Yogo (2008) use end-of-period assets to define the payout yield as C_{t+1}/A_{t+1}. In contrast, we use beginning-of-period assets.

growth in D and so on, (3) is equivalent to

$$\Delta d_{t+1} \quad = \quad \Delta \text{lev}_{t+1} + \log\left(R_{t+1} - Y_{t+1}\right). \tag{4}$$

We refer to $\log\left(R_{t+1} - Y_{t+1}\right)$ as the "post-payout return on assets." Equation (4) states that higher debt growth signals an higher leverage growth or higher post-payout return on assets.

To facilitate the linearization of (4), we rewrite $\log\left(R_{t+1} - Y_{t+1}\right)$ as $r_{t+1} + \log(1 - Y_{t+1}/R_{t+1})$ and express debt growth as

$$\Delta d_{t+1} \quad = \quad \Delta \text{lev}_{t+1} + r_{t+1} + \log\left(1 - \frac{Y_{t+1}}{R_{t+1}}\right). \tag{5}$$

If net payout yields were always positive, one could linearize $\log(1 - Y_{t+1}/R_{t+1})$ in (5) around the average of $\log(Y_{t+1}/R_{t+1})$ to obtain the approximate relationship

$$\Delta d_{t+1} \quad = \quad \Delta \text{lev}_{t+1} + r_{t+1} + (\kappa_0 - \kappa y^e_{t+1}), \tag{6}$$

where $y^e_{t+1} = y_{t+1} - r_{t+1}$ is computed as the difference between the log payout yield y_{t+1} and the continuously compounded return on assets r_{t+1}. Going forward we refer to r_{t+1} as the "return on assets" and to y^e_{t+1} as the "excess payout yield."[6] Appendix A provides details on the derivation of (6) and the computation of the scalars κ_0 and κ. It shows that $\kappa = \exp(\overline{y^e})/[1 - \exp(\overline{y^e})]$, where $\overline{x}$ is used to denote the time-series average of x_t. The term $\kappa_0 - \kappa y^e_{t+1}$ proxies for $\log(1 - Y_{t+1}/R_{t+1})$. In line with (3), relation (6) states that all else equal, increased growth in a firm's book value of debt is a reflection of increased growth in leverage or higher post-payout returns on assets. Higher post-payout returns on assets, in turn, signal higher asset returns or lower excess payout yields.

In practice, however, net payout yields Y_{t+1} may be positive, negative or zero. Thus, we cannot proceed directly from (5) to (6). Instead, we express net payouts as the difference between two strictly positive terms, form yields of these two positive terms by dividing them by A_t, and then

[6] Note that $y^e_{t+1} \approx Y_{t+1} - R_{t+1}$, meaning y^e_{t+1} is approximately equal to the difference between net payout yields and gross returns on assets.

expand each term around its average. Specifically, we decompose C_{t+1} into fund outflows, C^o_{t+1}, minus fund inflows, C^i_{t+1}. Fund outflows C^o_{t+1} are paid out at time $t+1$ and are the sum of period-t cash dividends, equity repurchases, interest expenses and debt redemptions. Fund inflows C^i_{t+1} are received at $t+1$ and equal the sum of equity and debt issued in period t. As a result, payout yields are given as

$$Y_{t+1} \quad = \quad Y^o_{t+1} - Y^i_{t+1},$$

where $Y^o_{t+1} = C^o_{t+1}/A_t$ and $Y^i_{t+1} = C^i_{t+1}/A_t$ are the corresponding yields.

We log-linearize $1 - Y_{t+1}/R_{t+1} = 1 - Y^o_{t+1}/R_{t+1} + Y^i_{t+1}/R_{t+1}$ in (5) around the panel average of the logarithm of Y^o_{t+1}/R_{t+1} and the panel average of the logarithm of Y^i_{t+1}/R_{t+1}, respectively. Let ny_t denote the *weighted log payout yield*,

$$\mathrm{ny}_t \quad = \quad \mu_o y^o_t - \mu_i y^i_t,$$

where the weights μ_o and μ_i are derived together with the log-linearization of (5),

$$\Delta d_{t+1} \quad = \quad \Delta \mathrm{lev}_{t+1} + r_{t+1} + (\kappa_0 - \kappa\, \mathrm{ny}^e_{t+1}), \qquad (7)$$

as detailed in Appendix A. In this appendix, we also show that μ_o and μ_i are positive, that $\mu_o - \mu_i = 1$, and how to compute the scalars κ_0 and κ. Equation (7) generalizes (6). It expresses the growth rate of book debt, up to a constant, as the sum of leverage growth and asset returns, minus a fraction of weighted excess payout yields, $\mathrm{ny}^e_{t+1} = \mathrm{ny}_{t+1} - r_{t+1}$. Similarly to (6), (7) states that changes in debt growth reflect changes in leverage or changes in post-payout asset returns, with the latter signaling changes in asset returns or changes in excess payout yields.

Appendix B uses comparative statics to provide intuition for how the three channels on the right-hand side of (7) may operate separately in response to debt growth. In addition, the next section offers an illustrative example of a firm's balance sheet and within-period fund flows to further emphasize that changes in debt growth may reflect changes in just one of the components on the right-hand side of (7), or combined changes in leverage ratios, asset returns and payout policies.

III. An Illustrative Example

Consider a firm with the balance sheet and within-period fund flows shown in Panel A of Table 1. Note that the firm's book value of debt grows from $D_t = \$500$ to $D_{t+1} = \$550$, at a growth rate of $\Delta d_{t+1} = 9.5\%$. In Panel B of the table we demonstrate that this growth rate may arise under multiple scenarios, including those where *(i)* leverage grows by 9.5% while asset returns and excess payout yields are zero ($\Delta \text{lev}_{t+1} = \Delta d_{t+1}, r_{t+1} = \text{ny}^e_{t+1} = 0$), *(ii)* asset returns equal 9.5% while leverage remains unchanged and fund inflows offset fund outflows ($r_{t+1} = \Delta d_{t+1}, \Delta \text{lev}_{t+1} = \text{ny}^e_{t+1} = 0$), *(iii)* excess payout yields account for all 9.5% while leverage remains constant and asset returns are zero ($\kappa_0 - \kappa \, \text{ny}^e_{t+1} = \Delta d_{t+1}, \Delta \text{lev}_{t+1} = r_{t+1} = 0$), and *(iv)* leverage growth, asset returns and excess payout yields in combination account for the 9.5% growth in book debt.

We use N_t and S_t to denote the number of shares outstanding and the ex-dividend price per share at time t, respectively, and B_t for the time-t market value of unit bond notional, averaged across all bonds outstanding. The market value of assets is then computed as $A_t = N_t S_t + D_t B_t$.[7] For this illustrative example, we set S_t to two dollars, and fix B_t and B_{t+1} at one dollar.[8]

Consistent with case *(i)*, the first column in Panel B describes a scenario where more debt is issued than redeemed to finance the payouts to stakeholders, and where a decrease in share prices offsets the increase in book debt. In this case, debt growth is a one-to-one reflection of changes in leverage ratios while asset returns and payout yields are zero. The second and third column show examples consistent with cases *(ii)* and *(iii)*, respectively. In scenario *(ii)*, payouts are again

[7] In this section, we abstract from non-bond debt. In later sections, however, we distinguish between the book value of bonds, $D_{b,t}$, and the book value of non-bond debt, $D_t - D_{b,t}$. In this generalized setting, the market value of assets is computed as $A_t = N_t S_t + D_t B_t + (D_t - D_{b,t})$. Further details are provided in Appendix A.

[8] Debt of different maturity may be priced differently. The assumption $B_t = B_{t+1} = 1$ is consistent with a scenario where the firm issues one-period coupon-bearing debt at par each period, and does not issue any other debt. More generally, it reflects scenarios where the average bond price remains flat at par.

Table 1: Illustrative example

Panel A: Balance sheet and fund flows

	Item	Balance at t	Transactions in period t	Balance at $t+1$
Assets	Inventory	100 units at \$10	Sell 80 units at \$20, replace at \$11	$20 \times \$10 + 80 \times \$11$
	Capital	\$300	20% of capital depreciated, sell half of remainder for \$200, net invest Inv_{t+1}	\$300×(1-0.2)/2 + $(\text{Inv}_{t+1} + \$200)$
	Cash	\$0	+ Net debt issuance + Net sales of shares − Dividend payments − Net capital expenditure + Other net cash inflows	$+ \Delta D_{t+1}$ $+ \Delta N_{t+1} S_{t+1}$ $- \text{Div}_{t+1} \times 500$ $- \text{Inv}_{t+1}$ + \$695
		\$1,300		\$2,120
Equity	Shares	500 shares at \$1.6/share	Pay dividend Div_{t+1} to existing N_t shares, issue ΔN_{t+1} shares at S_{t+1}	$\$800 + \Delta N_{t+1} S_{t+1}$
	Retained earnings	\$0	+ Accounting profit − Dividend payments	+ \$795 $-\text{Div}_{t+1} \times 500$
Debt	Bonds	\$500	Pay interest at 5%, repay \$100 notional, issue \$150 notional at par	$\$500 + \Delta D_{t+1}$
		\$800+\$500		\$1,570+\$550

Panel B: Debt growth as a function of leverage growth, asset returns and excess payout yields

		(i)	*(ii)*	*(iii)*	*(iv)$_a$*	*(iv)$_b$*	*(iv)$_c$*	*(iv)$_d$*
Inputs	Div_{t+1}	0.05	0.05	0.00	0.05	0.00	0.00	0.10
	ΔN_{t+1}	0	0	65	0	0	0	0
	S_{t+1}	1.90	2.20	1.95	2.00	1.95	2.20	2.00
Outputs	A_{t+1}	1,500	1,650	1,650	1,550	1,525	1,650	1,550
	Lev_{t+1}	0.367	0.333	0.333	0.355	0.361	0.333	0.355
	C_{t+1}	0	0	-150	0	-25	-25	25
	Y_{t+1}	0.000	0.000	-0.100	0.000	-0.017	-0.017	0.017
	R_{t+1}	1.000	1.100	1.000	1.033	1.000	1.083	1.050
	Δlev_{t+1}	0.095	–	–	0.063	0.079	–	0.063
	r_{t+1}	–	0.095	–	0.033	–	0.080	0.049
	$\kappa_0 - \kappa \, \text{ny}^e_{t+1}$	–	–	0.095	–	0.017	0.015	-0.016
	Δd_{t+1}	0.095	0.095	0.095	0.095	0.095	0.095	0.095

In Panel A, other net cash inflows are computed as sales of inventory net of replacement costs minus interest expense, and is equal to $80(\$20 - \$11) - 0.05 \times \$500 = \$695$. Accounting profits are equal to sales of inventory, minus cost of goods sold, minus depreciation of capital, plus profit on sales of capital, minus interest expense, that is, $80 \times \$20 - 80 \times \$10 - \$60 + \$80 - 0.05 \times \$500 = \$795$. In this panel, we set $\text{Div}_{t+1} = \$0.05$, $\Delta N_{t+1} = 0$ and $\text{Inv}_{t+1} = -\$200$. In Panel B, we assume that at time t the firm has a book value of equity of \$1.6 per share, and that the book-to-market ratio is 0.8 which implies a market price per share of $S_t = \$2$. The market value of \$1 notional of debt, averaged across all debt outstanding, is assumed to remain constant at $B_t = B_{t+1} = \$1$. The time-$t$ market value of assets and leverage ratio are $A_t = \$1,500$ and $\text{Lev}_t = 0.333$, respectively. Net equity issuance ΔN_{t+1} is valued at the end-of-period price per share S_{t+1}. All valuations and fund flows are stated in real terms.

financed by net debt issuance and the net payout is zero, but the positive return on the firm's assets is exactly such that the increase in the market value of firm assets results in a leverage level of \$550/\$1,650; i.e., a level that is unchanged from its time-t value of \$500/\$1,500.

In scenario *(iii)*, both new equity and net debt are issued. The negative net payout of \$150 exactly offsets the assumed \$150 increase in the market value of the firm's assets such that the return on the firm is zero. Given that $A_{t+1} = A_t + \$150 = \$1,650$ and $D_{t+1} = D_t + \$50 = \$550$, leverage remains unchanged from t to $t+1$. Thus $\kappa_0 - \kappa\,\mathrm{ny}^e_{t+1}$ must be approximately equal to the 9.5% increase in the value of debt from \$500 to \$550.[9]

Next, consider the scenario where net debt issuance is used to pay dividends and interest to firm stakeholders. If no new equity is issued ($\Delta N_{t+1} = 0$), then the net payout yield is zero.[10] If ex-dividend share prices remain unchanged ($S_{t+1} = S_t$), the increase in book debt reflects an increase in leverage and a positive return on assets.[11] The approximation in (7) holds for zero excess payout yields, as shown in column *(iv)*$_a$. If, on the other hand, a decrease in stock prices offsets the increase in asset values due to net debt issuance, then asset returns are zero and the growth in book debt reflects an increase in leverage as well as payout yields being lower than asset returns (column *(iv)*$_b$). In the case where the increase in the market value of assets matches the increase in book debt, leverage remains unchanged and debt growth reflects positive returns on assets and negative excess yields (column *(iv)*$_c$). When payouts to stakeholders exceed the additional debt raised, debt growth reflects higher leverage, positive asset returns and payout yields that exceed asset returns (column *(iv)*$_d$).

In summary, Table 1 illustrates the potential information content of changes in debt levels. It raises the question that which of scenarios *(i)*–*(iv)* best describes the information content of debt growth patterns of US non-financial corporates. An empirical answer to this question is provided in Section V, using the data described in the next section.

[9]Since the debt is valued at par, N_{t+1} and S_{t+1} must satisfy $N_{t+1}S_{t+1} = \$1,650 - \$550 = \$1,100$. Furthermore, $C_{t+1} = N_t\,\mathrm{Div}_{t+1} + \mathrm{Int}_{t+1} - \Delta D_{t+1} - \Delta N_{t+1}S_{t+1} = -\$150$ implies that net equity issuance raises $\Delta N_{t+1}S_{t+1} = \$125$. These gives $S_{t+1} = \$1.90$ and $\Delta N_{t+1} \approx 65$.

[10]This is because $C_{t+1} = N_t\,\mathrm{Div}_{t+1} + \mathrm{Int}_{t+1} - \Delta D_{t+1} - \Delta N_{t+1}S_{t+1} = 25 + 25 - 50 - 0 = \$0$.

[11]Specifically, leverage increases from $\$500/\$1,500$ to $\$550/\$1,550$, so that $\Delta\mathrm{lev}_{t+1} = 0.063$. The return on assets is $\log(\$1,550/\$1,500) = 0.033$. Since $\Delta\mathrm{lev}_{t+1} + r_{t+1} = 0.95 = \Delta d_{t+1}$, (7) implies $\kappa_0 - \kappa\,\mathrm{ny}^e_{t+1} = 0$.

IV. Data Sources and Variable Construction

We collect financial reporting and market data for public US non-financial firms. Our sample is based on all US-domiciled and US-headquartered firms in the merged Compustat-CRSP files, exclusive of financial firms (SIC 6) and government-related entities (SIC 9). We collect annual end-of-year data from 1973 to 2021. The year 1973 is chosen as the beginning of the sample period as it is the first year for which bond prices are available.

For firm-year pairs to be included in the study, we require data for book asset value, common equity, book debt value, long-term debt, interest expenses and all the variables (and their components) in debt growth dynamics (7). Following van Binsbergen, Graham, and Yang (2010), we delete observations that are involved in substantial M&A activities, defined as acquisitions amounting to over 15% of total assets. We also remove the few firm-year pairs that have a market leverage ratio greater than one. The final sample consists of more than 5,400 firms as identified by permco, and more than 40,000 firm-year observations.

A. *Market value of assets*

The market value of assets, A_t, is calculated as the market value of equity plus the market value of debt. The market value of equity is computed as the market value of common stock, by multiplying the stock price (CRSP *prc*) with the number of common shares outstanding (CRSP *shrout*), and is aggregated to the firm level by summing over different classes of common shares, if any. The market value of debt is computed as the market value of bonds plus the market value of non-bond debt.

We measure the price of unit notional of bonds using bond-level pricing data. Specifically, we collect bond price data from the Lehman Brothers Fixed Income Database, TRACE, the Mergent NAIC Database and DataStream (Jostova, Nikolova, Philipov, and Stahel, 2013; Nozawa, 2017). The Lehman data provide month-end bid prices for the period January 1973 to March 1998. The WRDS Bond Returns facility provides end-of-month TRACE prices for the period July 2002 to September 2021. NAIC contains transaction data reported by insurance companies for the period

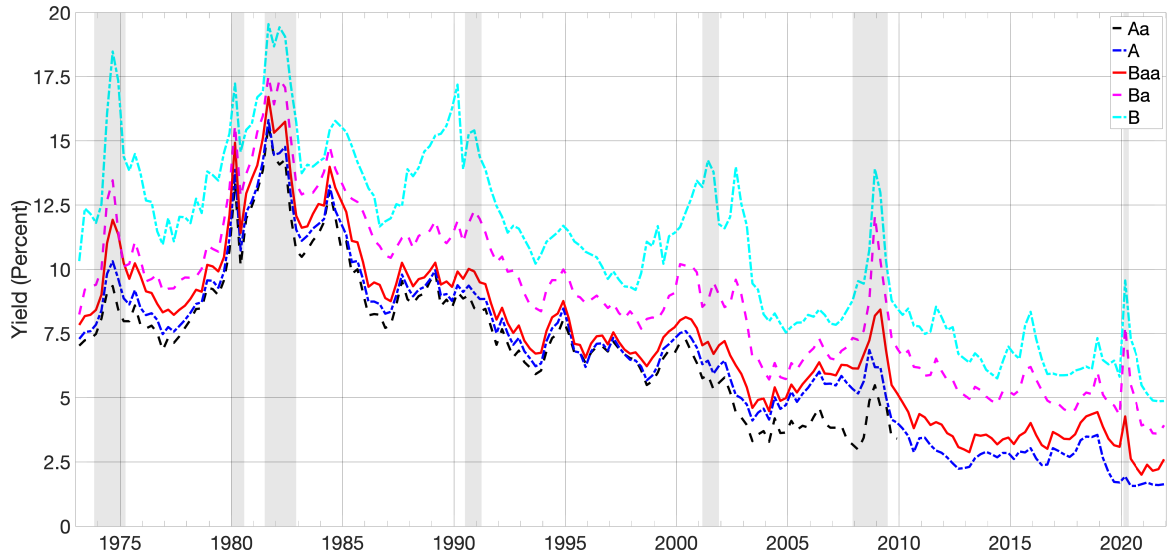

Figure 1: Nelson-Siegel fitted bond yields

The figure shows the quarterly time series of Nelson-Siegel fitted five-year senior-unsecured bond yields by Moody's letter rating. The sample period is 1973–2021. The shaded areas identify NBER recessions.

January 1994 to December 2021. DataStream has month-end bond price quotes (datatype *mpd*) from January 1990 onwards. If for a given firm and month price data are available from more than one source, we prioritize Lehman and TRACE data (which do not overlap) first over NAIC and then over DataStream. Bonds are identified by nine-digit cusip and are linked to their publicly listed parent company.

Using these bond price data, every quarter we fit a Nelson and Siegel (1987) yield curve for each Moody's letter rating cohort.[12] The resulting yield curves are shown in Figure 1. The fitted yield curves are then used to price firms' outstanding bonds. To do so, we first compute rating- and year-specific coupon rates as the median ratio of annual interest expenses to book value of bonds. Firms' book values of bonds are interpreted as the notional of semi-annual coupon bonds maturing in five years. We estimate a multinomial logistic regression model that predicts ratings using the logarithm of the previous year's book leverage, market value of equity and net income (Table C.1), and use this fitted model to impute ratings for the firms in our sample that do not have a Moody's rating. The market value of non-bond debt is set equal to its book value.

In Section VII, we show that our findings are robust to an alternative measure of the market

[12]To facilitate robust calibration, we combine the Aaa and Aa cohorts and exclude rating categories Caa or lower.

value of debt based on Hall (1988) and Larrain and Yogo (2008).

B. Balance-sheet variables and fund flows

The net payouts C is computed as the sum of cash dividends, equity repurchases net of equity issuance, interest expenses, and debt redemptions net of debt issuance. Cash dividends (Compustat *dv*) represent the total amount of cash dividends paid for common capital, preferred capital and other share capital. Equity repurchases (Compustat *prstkc*) are defined as any use of funds that decreases common or preferred stock and equity issuance. Following Larrain and Yogo (2008), we also use CRSP delisting data to account for any equity repurchases related to M&A and liquidations. Equity issuance (Compustat *sstk*) includes all funds received from the issuance of common and preferred stock. Interest expenses are estimated using total interest and related expenses (Compustat *xint*).

Net debt issuance is the difference between debt issuance and debt redemption. As in Farre-Mensa, Michaely, and Schmalz (2021), it is computed as long-term debt issuance minus long-term debt reduction plus the change in current debt (Compustat $dltis - dltr + dlcch$).[13] To facilitate the log-linearization in Section II, we separate the change in current debt into a positive part and a negative part, and assign $dltis + \max(dlcch, 0)$ to C^i and $dltr + \max(-dlcch, 0)$ to C^o. To ensure that all cash flows related to financing activities are accounted for, we similarly add positive and negative parts of other financing activities (Compustat *fiao*) to C^i and C^o.

In Section VI we decompose asset returns into investment yields, Inv_{t+1}/A_t, and the returns on the stock of assets after investment. Inv_t is net capital expenditure in period t, computed as the difference between capital expenditure (Compustat *capx*) and sale of property (Compustat *sppe*) .

Table A.1 summarizes the definitions and source codes for the accounting variables used, and Table 2 reports summary statistics. All nominal quantities are deflated by the consumer price index from the Bureau of Labor Statistics. Our sample is representative of a wide cross-section of firms in terms of their size, leverage and payout policies. It encompasses firms from a broad

[13] For sample inclusion, we require at least one of these three variables to be available.

Table 2: Summary statistics

	Mean	Std Dev	5th pctl	25th pctl	Median	75th pctl	95th pctl
Panel A. *Variables measured in millions of 1982-1984 US dollars*							
A	4,163	15,213	16	111	549	2,515	18,568
D	1,817	7,712	5	41	218	1,069	7,975
C	122	753	-92	-1	7	64	634
N Div	59	254	0	0	2	25	251
ER	65	487	0	0	0	5	246
EI	22	104	0	0	1	8	105
Int	55	244	0	1	7	36	239
DR	187	1,032	0	1	12	91	729
DI	225	1,232	0	1	13	117	879
Inv	168	619	0	3	19	100	742
Panel B. *Variables measured in percent*							
Δd	4.65	29.16	-30.24	-7.29	1.77	13.21	49.62
Lev	45.98	22.11	10.44	28.54	46.02	62.67	82.68
Δlev	1.34	33.54	-46.11	-12.71	-0.07	14.03	54.37
r	5.82	32.99	-43.40	-7.99	5.59	19.38	56.39
i	5.27	6.39	0.27	1.67	3.75	7.03	15.91
$\widehat{r}$	0.56	32.87	-48.54	-13.75	0.35	14.48	51.08
Y	7.70	17.95	0.50	2.23	4.18	6.99	19.12
f	5.87	3.04	1.32	3.59	5.70	7.86	11.73
r^{SP}	2.04	3.58	-3.46	0.13	2.25	4.19	7.48

This table reports the distribution of firm characteristics and VAR input variables in real terms. The market value of assets A, book value of debt D, net payouts C, cash dividends NDiv, equity repurchases ER, equity issuance EI, interest expenses Int, debt redemptions DR, debt issuance DI, and net capital expenditure Inv, are reported in millions of 1982-1984 US dollars. The leverage ratio Lev, debt growth Δd, leverage growth Δlev, asset returns r, investment yields i, returns on assets in place $\widehat{r}$, payout yields Y, five-year forward rates one year ahead f, and equal-weighted S&P returns r^{SP}, are reported in percent. The sample comprises 42,269 firm-year observations for 5,449 public non-financial US firms from 1973 to 2021.

spectrum of industries, as shown in Table C.2. The industries represented in our sample align with header Standard Industrial Classification (SIC) codes and include agriculture, forestry and fishing; mining; construction; manufacturing; transportation, communications, electric, gas and sanitary service; wholesale and retail trade, and services.

Figure 2 shows the annual time series of the four key elements of debt growth dynamics in (6), for the average firm in our sample. We observe that debt growth tends to be smaller or even negative during recessions, and that it recovers during subsequent expansions. Leverage is often at its lowest in the immediate aftermath of a recession. Asset returns have the typical pro-cyclical

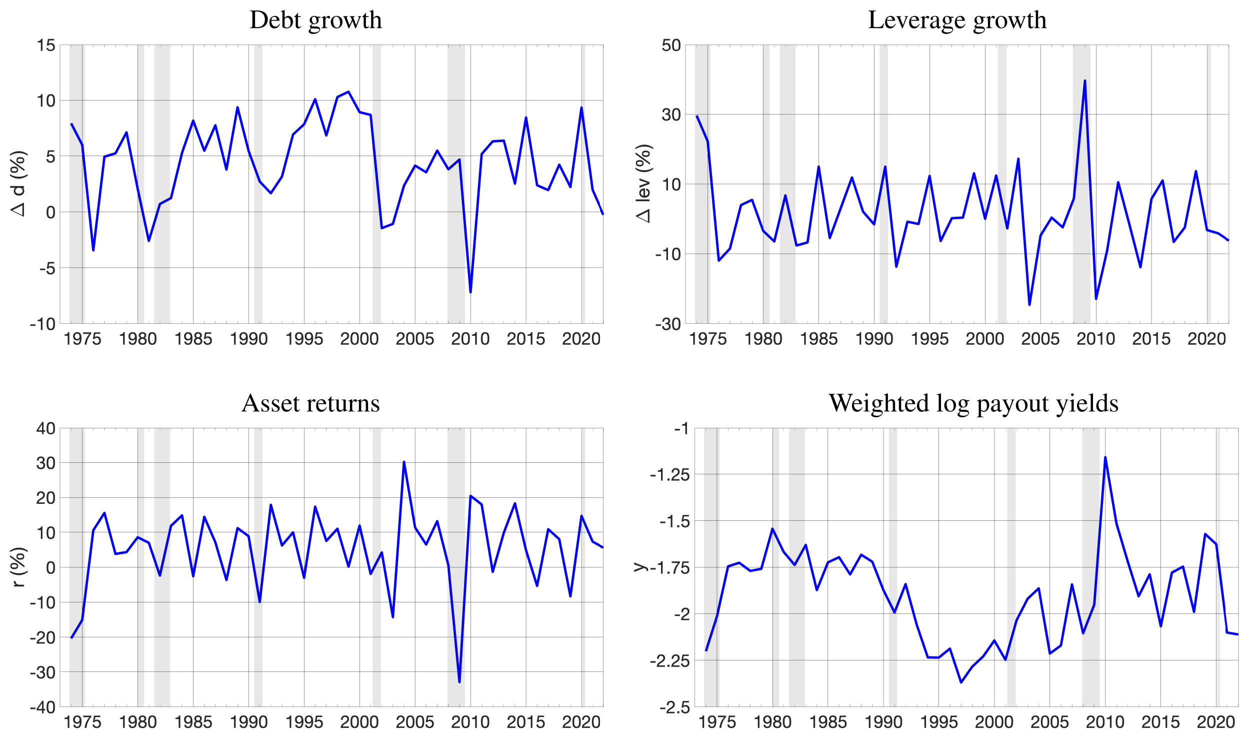

Figure 2: Debt growth, leverage ratios, asset returns and payout yields
The top left figure shows the time series of annual real debt growth, Δd_{t+1}, for the average firm in our sample. The top right figure depicts the time series of average leverage ratios, Lev_{t+1}, the bottom left figure shows the time series of average annual real returns on assets, r_{t+1}, and the bottom right figure displays the weighted log real payout yields, ny_{t+1}. The sample period is 1973–2021. The shaded areas identify NBER recessions.

pattern, while weighted log payout yields appear somewhat slower moving.

C. Conditional expectations and news variables

To distinguish between expected and surprise movements in the components of debt growth in (7), we set up an unrestricted VAR. In our estimation, the state vector for firm i, $\mathbf{z}_{it}$, contains all variables in (7) or their components. To sharpen the prediction of asset returns, we also include one-year-ahead five-year forward rates f_t (Cochrane and Piazzesi, 2005), and equally-weighted annual S&P returns r_t^{SP}.[14] Thus,

$$\mathbf{z_{it}} = \begin{pmatrix} \Delta d_{it} & \Delta \text{lev}_{it} & r_{it} & \text{ny}_{it}^{e} & f_t & r_t^{\text{SP}} \end{pmatrix}. \tag{8}$$

[14] The forward rates are computed from one-year and six-year Treasury yields which are obtained from Federal Reserve Board's website at https://www.federalreserve.gov/data/nominal-yield-curve.htm, and are based on Gurkaynak, Sack, and Wright (2007). S&P returns are obtained from CRSP.

All state variables are demeaned by their respective panel averages.

We impose a first-order structure on the VAR, so that

$$\mathbf{z_{i,t+1}} = \mathbf{M}\,\mathbf{z_{it}} + \boldsymbol{\varepsilon}_{\mathbf{i,t+1}}, \tag{9}$$

where $\mathbf{M}$ is the coefficient matrix and $\boldsymbol{\varepsilon}_{\mathbf{i,t+1}}$ are VAR residuals. Similar to Nozawa (2017), $\mathbf{M}$ is constant across firms and over time.[15]

To estimate (9), we run pooled OLS regressions. The results are reported in Table 3. While we assume $\boldsymbol{\varepsilon}_{\mathbf{i,t+1}}$ to be independent over time, we allow for cross-sectional correlations by clustering standard errors by year. Debt growth is persistent, and is higher when past leverage growth is lower or when past return is lower. Leverage growth is predicted by past debt growth and past changes in leverage. Asset returns are predicted by past debt growth and past excess payout yields, yet as is common the return R^2 is fairly low. Excess payout yields are explained relatively well with an R^2 of 20%.

The first-order structure of (9) implies $\mathbb{E}_t\left(\mathbf{z_{i,t+1}}\right) = \mathbf{M}\,\mathbf{z_{it}}$. Thus,

$$\mathbb{E}_t\left(\Delta d_{i,t+1}\right) = \mathbb{E}_t\left(\mathbf{e_1 z_{i,t+1}}\right) = \mathbf{e_1 M\,z_{it}}, \qquad \mathbb{E}_t\left(\text{lev}_{i,t+1}\right) = \mathbb{E}_t\left(\mathbf{e_2 z_{i,t+1}}\right) = \mathbf{e_2 M\,z_{it}},$$

$$\mathbb{E}_t\left(r_{i,t+1}\right) = \mathbb{E}_t\left(\mathbf{e_3 z_{i,t+1}}\right) = \mathbf{e_3 M\,z_{it}}, \qquad \mathbb{E}_t\left(\text{ny}^e_{i,t+1}\right) = \mathbb{E}_t\left(\mathbf{e_4 z_{i,t+1}}\right) = \mathbf{e_4 M\,z_{it}},$$

where $\mathbf{e_j}$ represents a row vector whose j^{th} entry is one and zero elsewhere. News to each VAR variables are computed as $\mathbf{e_j}\,\boldsymbol{\varepsilon}_{\mathbf{i,t+1}}$.

V. Variance Decomposition of Debt Growth

Equation (7) expresses the growth rate of book debt as leverage growth plus asset returns minus scaled excess payout yields. We compute the fraction of variation in debt growth that reflects vari-

[15] If (7) were to hold exactly as an equality, constructing all conditional expectations (and thus innovations) from the same VAR model would not be possible due to an over-identified system. In our applications, however, (7) is a first-order approximation which allows us to compute all required expectations and innovations.

Table 3: VAR estimation results

	Δd_{it}	Δlev_{it}	r_{it}	ny^e_{it}	f_t	r^{SP}_t
$\Delta d_{i,t-1}$	0.24	0.15	-0.10	1.07	0.00	0.00
	(4.8)	(2.9)	(-2.0)	(3.0)	(1.6)	(-0.7)
$\Delta \text{lev}_{i,t-1}$	-0.30	-0.22	0.11	-0.39	0.00	0.01
	(-5.4)	(-3.5)	(1.9)	(-0.9)	(-1.2)	(0.8)
$r_{i,t-1}$	-0.17	-0.08	0.08	-1.09	0.00	0.00
	(-3.3)	(-1.6)	(1.7)	(-2.9)	(-2.8)	(0.4)
$\text{ny}^e_{i,t-1}$	-0.01	-0.02	0.01	0.48	0.00	0.00
	(-9.9)	(-6.2)	(3.6)	(38.0)	(0.7)	(0.5)
f_{t-1}	0.20	0.27	-0.03	0.51	0.93	-0.01
	(1.2)	(0.6)	(-0.1)	(0.5)	(13.4)	(-0.1)
r^{SP}_{t-1}	-0.21	-0.23	0.06	0.31	0.00	0.01
	(-1.3)	(-0.5)	(0.1)	(0.4)	(0.0)	(0.1)
R^2	0.04	0.05	0.01	0.20	0.84	0.00

This table reports the VAR estimation results for (9). The VAR includes the six variables in (8), uses one lag, and is fitted to annual data using pooled OLS with standard errors clustered by year. T-statistics are reported in parentheses. The sample period is 1973–2021.

ation in a particular right-hand side variable x as the coefficient estimate $\beta^x = \text{Cov}(\Delta d, x)/\text{Var}(\Delta d)$ in the regression of x on Δd. The resulting approximate adding-up constraint is

$$1 = \beta^{lev} + \beta^r - \kappa \beta^y. \tag{10}$$

The variance decomposition results are presented in Panel A of Table 4 and show that 54% of the variation in debt growth reflect variation in leverage growth, 32% reflect variation in asset returns and 11% reflect variation in excess payout yields. These findings suggest that changes in corporate debt levels mainly reflect changes in firms' capital structure, and only to a lesser extent changes in asset returns or payout policies. The finding that variation in excess payout yields accounts for a relatively small fraction of variation in debt growth is consistent with Greenwood and Hanson (2013), who assume debt issuance to be a function of deviations from leverage targets and expected bond risk premia.

Table 4: Variance decomposition of debt growth

		Δlev	r	$-\kappa\,\text{ny}^e$	$-\Delta d^f$	Sum
Panel A.		0.54	0.32	0.11		0.97
		(36.5)	(20.1)	(37.0)		
Panel B.	*Two years*	0.59	0.27	0.17	-0.05	0.98
		(34.1)	(11.5)	(24.0)	(-4.0)	
	Five years	0.63	0.24	0.22	-0.08	1.01
		(18.6)	(6.9)	(16.6)	(-3.0)	

Panel A reports the variance decomposition of real debt growth Δd_{t+1} in (7). Estimated betas are mapped into fractions of debt growth variation according to (10). Panel B reports the variance decomposition of Δd_{t+1} in (13), for $T=2$ years and $T=5$ years, with beta estimates mapped into fractions of debt growth variation as in (14). Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

A. *Longer horizons*

To allow for offsetting movements in debt levels in later periods, and for delayed leverage-return tradeoffs, we also analyze the multi-period version of (7). For a horizon of T years, let $C_{t,t+T}$ denote the compounded net payouts between t and $t+T$,

$$C_{t,t+T} \quad = \quad \sum_{k=1}^{T} \frac{A_{t+T}}{A_{t+k}} C_{t+k}, \tag{11}$$

and $R_{t,t+T}$ the gross return on firm assets over the same period,

$$R_{t,t+T} \quad = \quad \frac{A_{t+T}+C_{t,t+T}}{A_t}. \tag{12}$$

Appendix A shows that $R_{t,t+T}$ is approximately equal to $\prod_{k=1}^{T} R_{t+k}$.

Similar to the derivation in Section II, the log-linearization of (12) yields the approximate relationship

$$\Delta d_{t+1} \quad = \quad \Delta_T \text{lev}_{t+T} + r_{t,t+T} + (\kappa_{0,T} - \kappa_T \, \text{ny}^e_{t,t+T}) - \sum_{i=2}^{T} \Delta d_{t+T}, \tag{13}$$

where $\Delta_T \text{lev}_{t+T} = \text{lev}_{t+T} - \text{lev}_t$, and $\kappa_{0,T} - \kappa_T \, \text{ny}^e_{t,t+T}$ is the log-linear approximation of $1 - (C_{t,t+T}/A_t)/R_{t,t+T}$. Equation (13) says that an increase in debt levels this period reflects higher current or future leverage, higher current or future asset returns, lower current or future excess payout yields, or lower debt growth in future years. The associated variance decomposition is

$$1 \quad = \quad \beta_T^{lev} + \beta_T^{r} - \kappa \beta_T^{y} - \beta_T^{d,f}, \tag{14}$$

with subscripts "T" indicating the number of periods and $\beta_T^{d,f}$ identifying the coefficient from regressing debt growth between $t+1$ and $t+T$ on debt growth in period t.

The long-term variance decomposition results for debt growth are shown in Panel B of Table 4. We observe no offsetting movements in debt growth in future years—if anything, an increase in current debt levels is associated with further debt growth in future years. The fraction of the movements in current-year debt growth that reflects movements in leverage ratios increases slightly with the horizon, consistent with a long-term absorption of movements in debt levels into movements in leverage ratios. Interestingly, over longer horizons rising debt levels are somewhat less revealing of higher asset returns, and more revealing of lower excess payout yields.

B. Sample stratification

We stratify the data by leverage, industry and monetary policy regime, and re-run the variance decomposition in (7) separately for each subsample. The results are reported in Table 5. In Panel A, we rank firms by median leverage to assign them to either the low-, medium- or high-leverage group, where each group consists of the same number of firms. We find that changes in debt levels are more indicative of changes in leverage and less indicative of asset return variation for low-leverage firms than for high-leverage firms. To be precise, for high-leverage firms the leverage channel accounts for only 35% of the debt growth variation, whereas for low-leverage firms it accounts for almost twice that amount.[16] This finding is intuitive in that an increase in leverage is likely to be more consequential for firms that are already highly levered. It is also qualitatively consistent with the finding in Kumar and Vergara-Alert (2020) that firms with higher leverage are

[16] To confirm that these findings are statistically significant, we run regressions that include an interaction term between debt growth and the group indicator. That is, for a particular right-hand side variable x in (7), we regress x on Δd and the interaction terms between Δd and the group indicator for all but the baseline group. This set of variance decomposition results is shown in Table C.3.

Table 5: Variance decomposition of debt growth for subsamples

		Δlev	r	$-\kappa \text{ny}^e$	Sum
Panel A.	*Low leverage*	0.68	0.24	0.05	0.97
		(30.0)	(10.9)	(25.2)	
	Medium leverage	0.53	0.31	0.10	0.94
		(27.0)	(13.3)	(23.0)	
	High leverage	0.35	0.44	0.13	0.92
		(21.6)	(23.1)	(19.9)	
Panel B.	*Agriculture, forestry and fishing*	0.56	0.29	0.09	0.94
		(4.3)	(2.1)	(2.8)	
	Mining	0.53	0.32	0.10	0.95
		(19.3)	(9.1)	(15.1)	
	Construction	0.34	0.46	0.16	0.96
		(7.6)	(9.4)	(8.0)	
	Manufacturing	0.57	0.30	0.10	0.97
		(23.9)	(12.8)	(24.3)	
	Transportation, communications,	0.40	0.41	0.11	0.92
	electric, gas and sanitary service	(16.4)	(12.9)	(14.6)	
	Wholesale and retail trade	0.53	0.32	0.13	0.98
		(15.4)	(8.6)	(12.1)	
	Services	0.58	0.30	0.12	1.00
		(22.5)	(10.8)	(16.4)	
Panel C.	*Low for long*	0.56	0.31	0.11	0.98
		(10.7)	(4.9)	(19.5)	
	Other	0.54	0.32	0.11	0.97
		(35.1)	(20.1)	(33.0)	
	Dovish	0.55	0.31	0.11	0.97
		(21.3)	(10.5)	(22.5)	
	Hawkish	0.54	0.32	0.11	0.97
		(30.8)	(17.8)	(29.9)	

This table reports the results for (7), after stratifying the data by leverage, industry or time periods. Leverage subsamples are formed using firms' median leverage ratio. Firms whose median leverage falls below the 33^{th} percentile, between the 33^{th} and 66^{th} percentiles, or above the 66^{th} percentile of median leverages will be assign to low leverage, medium leverage or high leverage sub-sample, respectively. The industry sub-samples are formed using header SIC codes. For a firm with multiple SIC codes, we use the code that appears the most frequently for that firm in our sample. If the codes have the same frequency, we pick the latest one. Low for long periods are identified as times when the fed funds rate has been at its ten-year low for at least two years. Dovish and hawkish periods are defined as in Bianchi, Lettau, and Ludvigson (2022). Estimated betas are mapped into fractions of debt growth variation according to (10). Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

more likely to cut dividends in response to a negative shock to their debt capacity.

Panel B classifies firms by industry and shows that the fraction of debt growth variation that reflects leverage variation is smaller, and the fraction that reflects return variation is larger, for construction firms than for other firms.

Panel C speaks to whether the purpose of debt issuance is different across different monetary policy regimes. In the first specification, we follow Berndt, Dergunov, and Helwege (2022) and define "low-for-long" periods as times when the Federal Funds rate has been at its ten-year low for at least two years. These times are identified as June 1993 to January 1994, August 2003 to June 2004 and September 2010 to December 2015. We find only small differences in the variance decomposition across low-for-long periods and other periods. In the second specification, we distinguish between periods of dovish and hawkish monetary policy. Specifically, we use the classification in Bianchi, Lettau, and Ludvigson (2022) that identifies October 1978 to September 2001 and April 2006 to June 2008 as hawkish periods, and other times as dovish regimes. Again, there is limited evidence to support the notion that the purpose of debt growth changes with the monetary policy regime. Our findings suggest that easy monetary policy, even if it lasts for a long time, has limited impact on how net debt issuance is used. An increase in the growth rate of debt during a prolonged period of accommodative monetary policy is estimated to predominantly reflect an increase in leverage ratios—and thus a likely increase in firms' default risk—and only to a lesser extent an increase in returns.

C. Expected and surprise movements

We now distinguish between expected and surprise movements in the components of debt growth in (7). Taking expectations conditional on time-t information, $\mathbb{E}_t(\cdot)$, on both sides of (7) implies

$$\mathbb{E}_t(\Delta d_{t+1}) \quad = \quad \mathbb{E}_t(\Delta \text{lev}_{t+1}) + \mathbb{E}_t(r_{t+1}) + [\kappa_0 - \kappa \mathbb{E}_t(\text{ny}^e_{t+1})]. \tag{15}$$

If, at the beginning of period t, the firm were to set leverage, return and payout targets according to $\mathbb{E}_t(\Delta \text{lev}_{t+1})$, $\mathbb{E}_t(r_{t+1})$ and $\mathbb{E}_t(\text{ny}^e_{t+1})$, then (15) gives the associated target level of debt.

The difference between (7) and (15) shows how corporate debt levels adjust to news about

Table 6: Variance decomposition of debt growth into expected and surprise growth

	Δlev	r	$-\kappa\,\text{ny}^e$	Sum
$\mathbb{E}_{t+1}(\cdot)$	0.05	-0.02	0.02	0.05
	(16.8)	(-19.4)	(22.2)	
$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.49	0.34	0.09	0.92
	(37.2)	(22.6)	(30.4)	
Sum	0.54	0.32	0.11	0.97

This table reports the variance decomposition results for (16). The line marked "Sum" reports the corresponding decomposition results in Table 4. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

leverage targets, asset returns or excess payout yields. Leverage targets may be updated in response to news about debt funding costs, such as monetary policy shocks, or to meet revised liquidity needs. Unanticipated changes in asset returns may stem from surprise revaluations, perhaps in response to news about a change in firm management or surprise earnings announcements. Unforeseen excess payout yields may arise from surprise changes in company payout policies. In summary,

$$\begin{aligned}\Delta d_{t+1} &= \mathbb{E}_t(\Delta d_{t+1}) + (\mathbb{E}_{t+1}-\mathbb{E}_t)\Delta d_{t+1} \\ &= \mathbb{E}_t(\Delta \text{lev}_{t+1}) + \mathbb{E}_t(r_{t+1}) + [\kappa_0 - \kappa\,\mathbb{E}_t(\text{ny}^e_{t+1})] \\ &\quad + (\mathbb{E}_{t+1}-\mathbb{E}_t)\Delta \text{lev}_{t+1} + (\mathbb{E}_{t+1}-\mathbb{E}_t)r_{t+1} - \kappa(\mathbb{E}_{t+1}-\mathbb{E}_t)\text{ny}^e_{t+1}. \end{aligned} \tag{16}$$

The results of the variance decomposition of real debt growth into expected and surprise growth are reported in Table 6. We find that expected changes in debt levels account only for a relatively small portion of realized changes in debt levels, suggesting that corporate debt levels are frequently revised in response to new information being revealed. That said, debt growth reflects lower expected returns on assets, which is consistent with Greenwood and Hanson (2013) who take debt issuance to be higher when expected returns on credit assets are lower.

VI. Debt Growth and Investment

Using Inv_{t+1} to denote the net capital expenditure in period t, we re-arrange (1) to obtain

$$R_{t+1} = \frac{A_{t+1}+C_{t+1}}{A_t} = \left(1+\frac{\text{Inv}_{t+1}}{A_t}\right)\left[1+\frac{A_{t+1}+C_{t+1}-(A_t+\text{Inv}_{t+1})}{A_t+\text{Inv}_{t+1}}\right]. \tag{17}$$

We refer to Inv_{t+1}/A_t as the investment yield, to $\widehat{A}_{t+1} = A_t + \text{Inv}_{t+1}$ as the post-investment market value of assets in place, and to

$$\widehat{R}_{t+1} = \frac{A_{t+1}+C_{t+1}-\widehat{A}_t}{\widehat{A}_t} \tag{18}$$

as the return on post-investment assets in place. Combining (7) with (17) and (18), we obtain

$$\Delta d_{t+1} = \Delta\text{lev}_{t+1} + i_{t+1} + \widehat{r}_{t+1} + (\kappa_0 - \kappa \text{ny}^e_{t+1}), \tag{19}$$

where $i_{t+1} = \log(1+\text{Inv}_{t+1}/A_t)$ approximates the investment yield. Equation (19) states that variation in debt growth reflects variation in leverage growth, investment yields, returns on assets in place, or excess payout yields.

In the illustrative example in Table 1, new investment in capital was assumed to be zero. We now lift this assumption and report on the decomposition of debt growth in (19) when there is new investment. Table 7 describes three different scenarios: one without new investment (column one), one with a moderate amount of new investment (column two), and one with substantial new investment that offsets sales of capital (column three). While the return on assets remains the same in each scenario ($r_{t+1} = 1.7\%$), net investment—which is the difference between new investment and capital sold—increases from -13.3% of assets in the no-new-investment case to zero in the substantial-new-investment case. At the same time, the return on post-investment assets in place decreases from 16.0% to 1.7%. All else the same, greater net investment translates into an increase in investment yields that is offset by an equal-sized decrease in returns on post-investment assets in place.

Table 7: Debt growth with investment

Capital expenditure	0	100	200
Inv_{t+1}	-200	-100	0
R_{t+1}	1.017	1.017	1.017
Inv_{t+1}/A_t	-0.133	-0.067	0.000
$\widehat{A}_{t+1}$	1,300	1,400	1,500
$\widehat{R}_{t+1}$	1.173	1.089	1.017
Δlev_{t+1}	0.071	0.071	0.071
i_{t+1}	-0.143	-0.069	0.000
$\widehat{r}_{t+1}$	0.160	0.086	0.017
$\kappa_0 - \kappa\,\text{ny}^e_{t+1}$	0.008	0.008	0.008
Δd_{t+1}	0.095	0.095	0.095

We consider the firm in Table 1. At time t, this firm has a book value of equity of \$1.6 per share. We assume a time-t book-to-market ratio of 0.8, which is equivalent to setting the time-t market price per share to two dollars, $S_t = \$2$. The market price per share is assumed to be $S_{t+1} = \$1.975$ and the market value of \$1 notional of debt, average across all debt outstanding, is assumed to remain constant at $B_t = B_{t+1} = \$1$. Dividends are set to 2.5% per share. There is no net issuance of equity. The time-t market value of assets and the leverage ratio are $A_t = \$1,500$ and $\text{Lev}_t = 0.333$, respectively. Net capital expenditure Inv_{t+1} is computed as the difference between capital expenditure and sales of capital, we the latter set to \$200 in Table 1. The following model outputs remain constant across all scenarios: $A_{t+1} = \$1,538$, $\text{Lev}_{t+1} = 0.358$, $C_{t+1} = -\$13$ and $Y_{t+1} = -0.008$. All valuations and fund flows are in real terms.

Figure 3 shows the time series of real investment yields and real returns on post-investment assets in place for the average firm in out sample. In line with Crouzet (2021), we observe that investment yields have been declining since the 1990s.

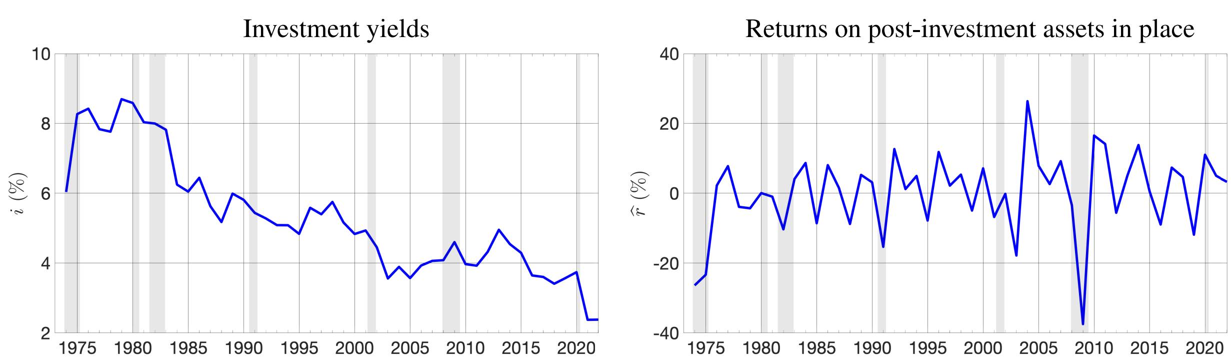

Figure 3: Investment yield and return on post-investment assets in place
The left figure shows the time series of real annual investment yield, i_{t+1}, for the average firm in our sample. The right figure depicts the time series of average annual real returns on post-investment assets in place, $\hat{r}_{t+1}$. The sample period is 1973–2021. The shaded areas identify NBER recessions.

Table 8: Variance decomposition of debt growth with investment

		Δlev	i	$\widehat{r}$	$-\kappa\,\text{ny}^e$	$-\Delta d^f$	Sum
Panel A.		0.54	0.06	0.26	0.11		0.97
		(36.5)	(15.6)	(14.7)	(37.0)		
Panel B.	*Two years*	0.59	0.11	0.17	0.17	-0.05	0.99
		(34.1)	(17.6)	(6.6)	(24.0)	(-4.0)	
	Five years	0.63	0.18	0.07	0.22	-0.08	1.02
		(18.6)	(13.6)	(2.2)	(16.6)	(-3.0)	

Panel A reports the variance decomposition of real debt growth Δd_{t+1} in (19). Estimated betas are mapped into fractions of debt growth variation according to (20). Panel B reports the variance decomposition of Δd_{t+1} in (23), for $T = 2$ years and $T = 5$ years, with beta estimates mapped into fractions of debt growth variation as in (24). Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

Regressing right-hand side variables of (19) on Δd yields the variance decomposition

$$1 \quad = \quad \beta^{lev} + \beta^{i} + \beta^{\widehat{r}} - \kappa\beta^{y}. \tag{20}$$

The beta estimates are reported in Panel A of Table 8. We find that movements in debt levels are more indicative of movements in returns on assets in place than movements in investment yields.

For a longer horizon of T years, let $\text{Inv}_{t,t+T}$ denote the compounded investment between t and $t+T$,

$$\text{Inv}_{t,t+T} \quad = \quad \sum_{k=1}^{T} \frac{A_{t+T}}{A_{t+k}} \text{Inv}_{t+k}, \tag{21}$$

and $\widehat{R}_{t,t+T}$ the T-period return on post-investment assets in place,

$$\widehat{R}_{t,t+T} \quad = \quad R_{t,t+T} \left(1 + \frac{\text{Inv}_{t,t+T}}{A_t}\right)^{-1}. \tag{22}$$

The multi-period debt growth dynamics are then given by

$$\Delta d_{t+1} \quad = \quad \Delta_T \text{lev}_{t+T} + i_{t,t+1} + \widehat{r}_{t,t+T} + (\kappa_{0,T} - \kappa_T\, \text{ny}^e_{t,t+T}) - \sum_{i=2}^{T} \Delta d_{t+T}, \tag{23}$$

where $i_{t,t+T} = \log(1 + \text{Inv}_{t,t+T}/A_t)$ approximates the T-period investment yield. The associated variance decomposition is

$$1 = \beta_T^{lev} + \beta_T^{i} + \beta_T^{\widehat{r}} - \kappa \beta_T^{y} - \beta_T^{d,f}. \tag{24}$$

Panel B of Table 8 reports on (24) for two-year and five-year horizons. Over longer horizons, movement in debt growth reflects movement in asset returns mainly through the investment channel, with limited transmission to returns on post-investment assets in place. When combined with the contemporaneous results in Panel A, we find a delayed increase in investment in response to an increase in debt levels, and a reversal of initial gains in valuations of assets in place.

The subsample results for the one-year horizon are reported in Table 9. Panel A indicates that changes in debt levels are more reflective of investment for high-leverage firms than low-leverage firms. Panel B shows that the fraction of debt growth variation that reflects variation in investment is the highest at 16% for mining companies, and is 10% or lower for other industries. On the other hand, the returns on assets in place channel—also referred to as the valuation channel—is much larger for construction firms than other firms. Panel C finds only minor differences across monetary policy regimes in the contemporaneous investment channel.[17]

Tables C.4 and C.5 show the subsample results for longer horizons, and reveal some noteworthy cross-sectional differences. For high-leverage and low-leverage firms, the long-term valuation channel is negligible while for medium-leverage firms it is negative and significant. Over five years, the investment channel accounts for about one-third for agriculture, forestry and fishing firms, mining companies and the transportation sector, and for much less in other sectors. While the long-run valuation channel is negligible for the average firms in our sample, it is sizable for the agriculture and construction sectors and negative for mining companies. Agriculture firms stand out in that current-year debt growth tends to be completely reversed over the subsequent four years.

Panel C in these tables shows that, over longer horizons, debt growth during dovish periods is more indicative of increases in leverage and less indicative of investment than debt growth during hawkish periods. This finding runs counter to the view that accommodative monetary policy

[17] The set of results that verify the statistical significance of differences among subsamples are shown in Table C.3.

Table 9: Variance decomposition of debt growth with investment for subsamples

		Δlev	i	$\widehat{r}$	$-\kappa \text{ny}^e$	Sum
Panel A.	*Low leverage*	0.68	0.02	0.22	0.05	0.97
		(30.0)	(9.1)	(9.8)	(25.2)	
	Medium leverage	0.53	0.08	0.24	0.10	0.95
		(27.0)	(14.8)	(9.3)	(23.0)	
	High leverage	0.35	0.11	0.34	0.13	0.93
		(21.6)	(11.1)	(14.3)	(19.9)	
Panel B.	*Agriculture, forestry and fishing*	0.56	0.09	0.21	0.09	0.95
		(4.3)	(2.6)	(1.4)	(2.8)	
	Mining	0.53	0.16	0.17	0.10	0.96
		(19.3)	(9.3)	(4.2)	(15.1)	
	Construction	0.34	0.04	0.41	0.16	0.95
		(7.6)	(3.9)	(8.3)	(8.0)	
	Manufacturing	0.57	0.03	0.27	0.10	0.97
		(23.9)	(8.8)	(11.8)	(24.3)	
	Transportation, communications,	0.40	0.10	0.31	0.11	0.92
	electric, gas and sanitary service	(16.4)	(7.1)	(8.2)	(14.6)	
	Wholesale and retail trade	0.53	0.06	0.26	0.13	0.98
		(15.4)	(8.9)	(6.8)	(12.1)	
	Services	0.58	0.04	0.26	0.12	1.00
		(22.5)	(8.1)	(8.9)	(16.4)	
Panel C.	*Low for long*	0.56	0.05	0.26	0.11	0.98
		(10.7)	(7.1)	(3.9)	(19.5)	
	Other	0.54	0.06	0.26	0.11	0.97
		(35.1)	(14.7)	(14.6)	(33.0)	
	Dovish	0.55	0.05	0.26	0.11	0.97
		(21.3)	(9.0)	(8.1)	(22.5)	
	Hawkish	0.54	0.07	0.26	0.11	0.98
		(30.8)	(12.8)	(12.7)	(29.9)	

This table reports the results for (19), after stratifying the data by leverage, industry or time periods. Subsamples are defined as in Table 5. Estimated betas are mapped into fractions of debt growth variation according to (20). Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

incentivizes business investment, and instead points to a link between easier monetary policy and higher firm leverage.

We further decompose the components of debt growth in (19) into their expected and surprise components:

$$\Delta d_{t+1} = \mathbb{E}_t(\Delta\text{lev}_{t+1}) + \mathbb{E}_t(i_{t+1}) + \mathbb{E}_t(\widehat{r}_{t+1}) + [\kappa_0 - \kappa\,\mathbb{E}_t(\text{ny}^e_{t+1})]$$
$$+ (\mathbb{E}_{t+1} - \mathbb{E}_t)\Delta\text{lev}_{t+1} + (\mathbb{E}_{t+1} - \mathbb{E}_t)i_{t+1} + (\mathbb{E}_{t+1} - \mathbb{E}_t)\widehat{r}_{t+1} - \kappa(\mathbb{E}_{t+1} - \mathbb{E}_t)\text{ny}^e_{t+1}. \quad (25)$$

We estimate the joint dynamics of debt growth, leverage growth, investment yields, returns on post-investment assets in place and excess payout yields through an extended VAR. Table C.6 reports the VAR estimation results when the state vector is augmented to

$$\mathbf{z_{it}} = \begin{pmatrix} \Delta d_{it} & \Delta\text{lev}_{it} & i_{it} & \widehat{r}_{it} & \text{ny}^e_{it} & f_t & r^{\text{SP}}_t \end{pmatrix}. \quad (26)$$

We find that the investment yield is higher when the past investment yield is higher. Higher past investment yields also predict greater future debt growth and lower future returns on assets in place.

The associated variance decomposition results are reported in Table 10. As before, only about 4% of the changes in debt levels reflect expected changes. The contribution of expected investment to debt growth variation, in particular, is negligible. Changes in debt levels are more indicative of unanticipated investment for high-leverage firms than low-leverage firms (Table C.7), and for mining companies than other firms (Table C.8). The (limited) monetary policy transmission to investment that we observe is mainly through the news channel (Table C.9).

Table 10: Variance decomposition with investment into expected and surprise growth

	Δlev	i	$\widehat{r}$	$-\kappa\,\text{ny}^e$	Sum
$\mathbb{E}_{t+1}(\cdot)$	0.05	0.01	-0.03	0.02	0.05
	(16.6)	(10.9)	(-19.6)	(22.1)	
$(\mathbb{E}_{t+1} - \mathbb{E}_t)(\cdot)$	0.50	0.05	0.29	0.09	0.93
	(37.2)	(13.8)	(17.6)	(30.4)	
Sum	0.54	0.06	0.26	0.11	0.97

This table reports the variance decomposition results for (25). The line marked "Sum" reports the corresponding decomposition results in Table 8. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

VII. Robustness and Extensions

Next we show that our results are robust to an alternative approach to measuring the market value of debt, and to using quarterly instead of annual data. Afterwards, we extend our framework to assess whether the uses of debt growth during the COVID era deviated from those predicted based on historical data.

A. Alternative market value of debt measure

As a robustness check, we also construct an alternative measure for the price of long-term debt using the approach suggested by Hall (1988) and employed by Larrain and Yogo (2008). It assumes that firms issue 20-year par bonds with semi-annual coupon payments at the end of each year. Firms that existed in Compustat in 1958 are assumed to have an initial debt maturity structure as in Hall, Cumminq, Laderman, and Mundy (1988), while the initial maturity structure of firms that entered Compustat after 1958 is assumed to mimic the one observed globally for all corporate debt outstanding at the time of entry. Firms' subsequent maturity structures are updated according to Equations (30) and (31) in Larrain and Yogo (2008). Figure D.1 depicts the time series of the average implied bond maturity for the firms in our sample. Bond prices are computed using Moody's seasoned Baa corporate bond yield which is obtained from the Federal Reserve Economic Data (FRED) website. As expected, Figure 4 shows that Moody's seasoned Baa corporate bond yields is some higher than, but otherwise closely tracks, the Nelson-Siegel Baa five-year yields fitted in Section IV.

The results for the variance decomposition of debt growth based on this alternative bond price measure are reported in Tables D.1 and D.2. They confirm that our main findings are qualitatively robust to using an alternative approach to calculating the market value of debt.

B. Quarterly results

Tables E.1–E.4 report results for the variance decomposition of debt growth based on quarterly data. Firms are required to have quarterly accounting periods ended in March, June, September,

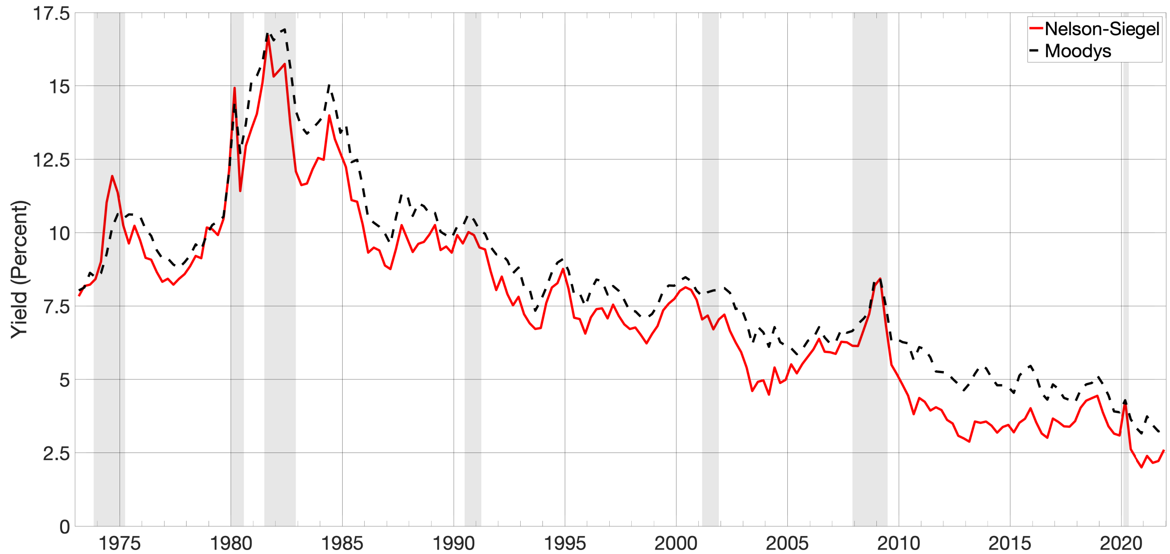

Figure 4: Baa bond yields

The figure shows the quarterly time series of Nelson-Siegel fitted five-year senior-unsecured bond yields. The sample period is 1973–2021. The shaded areas identify NBER recessions.

and December. Following a data cleaning process similar to the one for annual data, we construct a quarterly sample consisting of 9,110 firms and 196,457 firm-quarter observations. Overall, we find that at quarterly frequencies the leverage channel absorbs even more of the changes in debt growth than at annual frequencies, which is consistent with the notion that there is a time lag between debt issuance and investment. Cross-sectional differences, however, are somewhat less pronounced for the quarterly data compared to the annual data.

C. Uses of debt growth during the COVID era

In March 2020 the Federal Reserve established the Secondary Market Corporate Credit Facility (SMCCF) to stabilize and support prices of corporate bonds. Specifically, the SMCCF purchased in the secondary market bonds issued by firms with current or recent (as of March 22, 2020) investment-grade status, as well as exchange-traded funds (ETFs) that had an investment objective to provide broad exposure to the US corporate bond market.[18] The program operated from May 2020 for ETFs and June 2020 for individual bonds until it ceased in December 2020. Hotchkiss, Nini, and Smith (2022) show that in response to the SMCCF announcement, debt issuance by

[18]For details, see https://www.federalreserve.gov/monetarypolicy/smccf.htm.

investment-grade firms rose sharply relative to prior-year levels.

In this section, we re-estimate the regressions of the components of debt growth in (19) on debt growth, using aggregate data for rated firms from 1973 to 2019. We then apply the parameter estimates to the observed 2020 change in debt levels to predict the 2020 changes in leverage, investment yields, returns on assets in place and excess payout yields. This allows us to assess whether—and if so how—the uses of debt growth in 2020 differed from those predicted based on historical data.

Our results are summarized in Table 11. Across all rated firms, debt levels rose by 5% in 2020. The 1973–2019 model estimates translate a 5% debt growth into a predicted investment yield of 7%. Relative to this prediction, actual investment yields fell short as investments averaged to only 3% of the market value of assets. More specifically, investment yields fell short of expectations for both investment-grade firms and high-yield firms and, within each rating category, across sectors.[19] Investment yields remained at low levels in 2021. Overall, our finding of limited transmission of economic stimulus to business investment is in line with recent work on European quantitative easing programs[20] that finds limited or no evidence that debt funding supported by emergency relief measures incentivizes investment.

Table F.1 compares actual and predicted real investment yields for the two-year period 2020–2021. While there is some evidence of a delayed increase in investment, two-year investment yields still fell well short of their predicted levels. Table F.2 shows similar results for firms sorted by leverage instead of rating.

[19] In line with prior evidence (Hotchkiss, Nini, and Smith, 2022; Acharya and Steffen, 2020; O'Hara and Zhou, 2021; Haddad, Moreira, and Muir, 2021; Nozawa and Qiu, 2021; Becker and Benmelech, 2021), debt growth in 2020 was more pronounced for safer firms than riskier firms—for investment-grade firms debt levels rose 6%, compared to 4% for high-yield firms. Panel C of Table 11 shows results for investment-grade firms stratified by sector. Similar findings for industry cohorts of high-yield firms are available on request.

[20] See, for example, Todorov (2020), Siani (2021), Pegoraro and Montagna (2022). Arguments in support of subsidized debt financing resulting in increased investment expenditure are presented in De Santis and Zaghini (2021) and Giambona, Matta, Peydró, and Wang (2020).

Table 11: Actual and predicted changes for 2020

		Δd_{2020}		Actual 2020	Predicted 2020	Lower bound	Upper bound	Actual 2021
Panel A.	*All rated firms*	0.05	Δlev	0.01	0.01	-0.08	0.11	-0.08
			i	0.03	0.06	0.04	0.07	0.03
			$\widehat{r}$	0.03	0.00	-0.10	0.10	0.07
			κny^e	-0.09	-0.07	-0.08	-0.06	-0.06
Panel B.	*Investment grade*	0.06	Δlev	0.03	0.03	-0.05	0.12	-0.08
			i	0.03	0.05	0.03	0.07	0.03
			$\widehat{r}$	0.02	0.01	-0.08	0.10	0.07
			κny^e	-0.09	-0.07	-0.08	-0.06	-0.06
	High yield	0.02	Δlev	-0.01	0.00	-0.11	0.12	-0.09
			i	0.03	0.06	0.04	0.08	0.03
			$\widehat{r}$	0.03	-0.01	-0.13	0.11	0.08
			κny^e	-0.08	-0.07	-0.08	-0.06	-0.07
Panel C. IG firms	*Mining*	0.03	Δlev	0.05	0.01	-0.17	0.18	-0.16
			i	0.07	0.10	0.08	0.12	0.08
			$\widehat{r}$	-0.06	-0.06	-0.25	0.13	0.18
			κny^e	-0.06	-0.04	-0.07	-0.01	-0.02
	Construction	0.07	Δlev	-0.03	0.01	-0.12	0.15	-0.13
			i	0.01	0.02	0.01	0.03	0.01
			$\widehat{r}$	0.14	0.09	-0.04	0.22	0.14
			κny^e	-0.10	-0.06	-0.11	-0.02	-0.10
	Manufacturing	0.04	Δlev	0.01	0.02	-0.08	0.12	-0.10
			i	0.02	0.04	0.02	0.06	0.02
			$\widehat{r}$	0.03	0.01	-0.09	0.12	0.07
			κny^e	-0.08	-0.08	-0.08	-0.07	-0.07
	Transportation, communications, electric, gas and sanitary service	0.05	Δlev	0.06	0.01	-0.07	0.08	-0.05
			i	0.04	0.07	0.05	0.09	0.04
			$\widehat{r}$	-0.05	0.00	-0.08	0.09	-0.01
			κny^e	-0.10	-0.07	-0.09	-0.06	-0.08
	Wholesale and retail trade	0.02	Δlev	-0.05	-0.00	-0.11	0.10	-0.10
			i	0.02	0.04	0.02	0.06	0.01
			$\widehat{r}$	0.10	0.02	-0.09	0.13	0.18
			κny^e	-0.07	-0.07	-0.09	-0.05	-0.07
	Services	0.06	Δlev	-0.04	0.02	-0.11	0.15	-0.03
			i	0.02	0.05	0.02	0.08	0.02
			$\widehat{r}$	0.10	0.02	-0.12	0.17	0.07
			κny^e	-0.09	-0.05	-0.07	-0.04	-0.04

The table reports predictions based on regressions of the components of real debt growth in (19) on real debt growth. The underlying data are aggregates for rated firms over the period 1973–2019. The regression estimates are combined with the observed 2020 real debt growth to generate 2020 predictions for Δlev, i, $\widehat{r}$ and κny^e. Upper (lower) bounds are formed by adding (subtracting) one standard error to (from) the prediction. The last column reports observed 2021 changes. Panel C stratifies investment-grade firms by industry. There were no investment-grade agriculture, forestry and fishing firms in 2020.

VIII. Concluding Remarks

We exploit the inter-temporal budget constraint of the firm to decompose the growth in book debt into returns on assets in excess of net payout yields and changes in leverage. We use this decomposition to predict the uses of debt growth and to quantify the fraction of debt growth variation that reflects variation in each of its use. Based on data in real terms for a large cross-section of public US non-financial firms from 1973 to 2021, we show that more than half of debt growth variation signals changes in firms' capital structure and less than half signals post-payout return variation. Debt growth is more reflective of leverage growth and less reflective of returns on assets for low-leverage firms than for high-leverage firms. We separate asset returns into investment yields and post-investment returns on assets in place and show that higher levels of book debt are more reflective of returns on assets in place than they are of investment yields, at least over shorter horizons.

At the one-year horizon, we find only small differences in the variance decomposition of debt growth between prolonged periods of easy monetary policy and periods of neutral or tight monetary policy. For both regimes, an increase in net debt issuance is more reflective of an increase in leverage ratios—and thus a likely increase in firms' default risk—than an increase in investment yields. Over multi-year horizons, debt growth is even more indicative of increases in leverage, and particularly so for dovish regimes. Our findings run counter to the view that accommodative monetary policy incentivizes business investment, and instead establish a link between easier monetary policy and higher leverage.

We apply our framework to assess the extent to which the uses of debt growth during the COVID era deviated from those predicted based on pre-COVID data. We find that actual investment in 2020–2021 fell short of predictions, consistent with the notion that debt growth supported by emergency relief measures tends to increase firms' leverage or post-investment returns on assets rather than incentivize investment.

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A. Definitions and Derivations

A.1. Variable definitions and data sources

Table A.1: Variable definitions and data sources

	Variable	Definition/Source
Balance-sheet variable at t		
D_t	Book value of debt	Compustat $at - ceq$
$D_{b,t}$	Book value of bonds	Compustat $dltt$
B_t	Average price per bond notional	Lehman, NAIC, TRACE, DataStream
N_t	Number of common shares outstanding	CRSP *shrout*, sum over share classes
S_t	Price per common share	CRSP *prc*, wgtd average over share classes
A_t	Market value of assets	$A_t = N_t S_t + D_{b,t} B_t + (D_t - D_{b,t})$
Lev_t	Leverage ratio	$\text{Lev}_t = D_t / A_t$
Fund flows in period t		
Div_{t+1}	Cash dividend payment per share	Compustat $dv/shrout$
ER_{t+1}	Equity repurchases	Compustat $prstkc$
EI_{t+1}	Equity issuance	Compustat $sstk$
Int_{t+1}	Interest expenses	Compustat $xint$
DI_{t+1}	Debt issuance	Compustat $dltis + \max(dlcch, 0)$
DR_{t+1}	Debt redemptions	Compustat $dltr + \max(-dlcch, 0)$
Inv_{t+1}	Net capital expenditure	Compustat $capx - sppe$
FO_{t+1}	Other financing activities	Compustat $fiao$
C_{t+1}	Net payouts	$C_{t+1} = N_t \text{Div}_{t+1} + \text{ER}_{t+1} + \text{Int}_{t+1} + \text{DR}_{t+1}$ $- \text{EI}_{t+1} - \text{DI}_{t+1} - \text{FO}_{t+1}$
Model inputs for period t		
Y_{t+1}	Net payout yield	$Y_{t+1} = C_{t+1}/A_t$
R_{t+1}	Gross return on firm assets	$R_{t+1} = (A_{t+1} + C_{t+1})/A_t$
y^e_{t+1}	Excess payout yield	$y^e_{t+1} = \log(Y_{t+1}/R_{t+1})$
i_{t+1}	Investment yield	$i_{t+1} = \log(1 + \text{Inv}_{t+1}/A_t)$
$\widehat{A}_{t+1}$	Market value of post-investment assets in place	$\widehat{A}_{t+1} = A_t + \text{Inv}_{t+1}$
$\widehat{r}_{t+1}$	Log return on post-investment assets in place	$\widehat{r}_{t+1} = \log[1 + (A_{t+1} + C_{t+1} - \widehat{A}_{t+1})/\widehat{A}_{t+1}]$
Model inputs for interval t ***to*** $t+T$		
$C_{t,t+T}$	Compounded net payouts	$C_{t,t+T} = \sum_{k=1}^{T} \frac{A_{t+T}}{A_{t+k}} C_{t+k}$
$\text{Inv}_{t,t+T}$	Compounded investment	$\text{Inv}_{t,t+T} = \sum_{k=1}^{T} \frac{A_{t+T}}{A_{t+k}} \text{Inv}_{t+k}$
$R_{t,t+T}$	Gross return on firm assets	$R_{t,t+T} = (A_{t+T} + C_{t,t+T})/A_t$
$\widehat{R}_{t,t+T}$	Log return on post-investment assets in place	$\widehat{R}_{t,t+T} = R_{t,t+T}\,(1 + \text{Inv}_{t,t+T}/A_t)^{-1}$
$i_{t,t+T}$	Investment yield	$i_{t,t+T} = \log(1 + \text{Inv}_{t,t+T}/A_t)$

A.2. Log-linearization of debt growth dynamics

Since asset owners enjoy limited liability, both R_{t+1} and A_{t+1} are non-negative. If net payouts C_{t+1} were always positive, we could proceed by log-linearizing the last term in (5), $\log(1-Y_{t+1}/R_{t+1})$, around the average value of $y^e_{t+1} \equiv \log(Y_{t+1}/R_{t+1})$, denoted by $\overline{y^e}$:

$$
\begin{aligned}
\log\left(1-\frac{Y_{t+1}}{R_{t+1}}\right) &\equiv \log\left(1-\exp(y^e_{t+1})\right) \\
&\approx \log\left(1-\exp(\overline{y^e})\right) - \frac{\exp(\overline{y^e})}{1-\exp(\overline{y^e})}\left(y^e_{t+1}-\overline{y^e}\right) \\
&= \kappa_0 - \kappa y^e_{t+1},
\end{aligned}
$$

where $\kappa = \exp(\overline{y^e})/(1-\exp(\overline{y^e}))$ and $\kappa_0 = \log\left(1-\exp(\overline{y^e})\right)+\kappa\overline{y^e}$.

Since net payouts C_{t+1} may be positive, negative or zero, it follows that Y_{t+1} can be negative or zero as well in which case $\log(Y_{t+1}/R_{t+1})$ is undefined. In order to facilitate the log-linearization, we rewrite C_{t+1} as the difference between fund outflows, C^o_{t+1}, and fund inflows, C^i_{t+1}. We expand $\log\left[1-\exp(y^o_{t+1}-r_{t+1})+\exp(y^i_{t+1}-r_{t+1})\right]$ around the panel average of $y^{o,e} \equiv y^o_{t+1}-r_{t+1}$, labeled $\overline{y^{o,e}}$, and the panel average of $y^{i,e} \equiv y^i_{t+1}-r_{t+1}$, labeled $\overline{y^{i,e}}$. Specifically,

$$
\begin{aligned}
\log\left(1-\frac{Y^o_{t+1}-Y^i_{t+1}}{R_{t+1}}\right) &= \log\left[1-\exp(y^o_{t+1}-r_{t+1})+\exp(y^i_{t+1}-r_{t+1})\right] \\
&\approx \log\left[1-\exp(\overline{y^{o,e}})+\exp(\overline{y^{i,e}})\right] \\
&\quad -\frac{\exp(\overline{y^{o,e}})}{1-\exp(\overline{y^{o,e}})+\exp(\overline{y^{i,e}})}\left(y^{o,e}-\overline{y^{o,e}}\right) \\
&\quad +\frac{\exp\left(\overline{y^{i,e}}\right)}{1-\exp\left(\overline{y^{o,e}}\right)+\exp\left(\overline{y^{i,e}}\right)}\left(y^{i,e}-\overline{y^{i,e}}\right) \\
&= \kappa_0 - \kappa\left(\mu_o y^{o,e}-\mu_i y^{i,e}\right) \\
&= \kappa_0 - \kappa\,\mathrm{ny}^e_{t+1},
\end{aligned}
$$

where $\kappa = [\exp(\overline{y^{o,e}})-\exp(\overline{y^{i,e}})]/[1-\exp(\overline{y^{o,e}})+\exp(\overline{y^{i,e}})]$, $\kappa_0 = \log\left[1-\exp(\overline{y^{o,e}})+\exp(\overline{y^{i,e}})\right]+$

$\kappa(\mu_0 \overline{y^{o,e}} - \mu_i \overline{y^{i,e}})$, and

$$\mu_o = \frac{\exp(\overline{y^{o,e}})}{\exp(\overline{y^{o,e}}) - \exp(\overline{y^{i,e}})} \quad \text{and} \quad \mu_i = \frac{\exp(\overline{y^{i,e}})}{\exp(\overline{y^{o,e}}) - \exp(\overline{y^{i,e}})}.$$

In our empirical implementation, we compute the weights μ_i and μ_o and the scalars κ_0 and κ separately by industry-leverage pair, where industries and leverage levels are defined as described in Table 5. The κ's that are used to scale the variance decomposition estimates are obtained by taking weighted averages across the industry and leverage specific κ estimates.

A.3. Longer horizons

Equation (12) implies

$$R_{t+1} = \frac{A_{t+1}}{A_t}\left(1 + \frac{C_{t+1}}{A_{t+1}}\right), \; R_{t+2} = \frac{A_{t+2}}{A_{t+1}}\left(1 + \frac{C_{t+2}}{A_{t+2}}\right), \; R_{t+3} = \frac{A_{t+3}}{A_{t+2}}\left(1 + \frac{C_{t+3}}{A_{t+3}}\right) \cdots$$

Thus,

$$\begin{aligned}
R_{t,t+1}R_{t+1,t+2} &\approx \frac{A_{t+2}}{A_t}\left(1 + \frac{C_{t+1}}{A_{t+1}} + \frac{C_{t+2}}{A_{t+2}}\right) = \frac{A_{t+2} + \frac{A_{t+2}}{A_{t+1}}C_{t+1} + C_{t+2}}{A_t} \\
&= R_{t,t+2} \\
R_{t,t+1}R_{t+1,t+2}R_{t+2,t+3} &\approx \frac{A_{t+3}}{A_t}\left(1 + \frac{C_{t+1}}{A_{t+1}} + \frac{C_{t+2}}{A_{t+2}} + \frac{C_{t+3}}{A_{t+3}}\right) \\
&= \frac{A_{t+3} + \frac{A_{t+3}}{A_{t+1}}C_{t+1} + \frac{A_{t+3}}{A_{t+2}}C_{t+2} + C_{t+3}}{A_t} \\
&= R_{t,t+3},
\end{aligned}$$

and so on.

B. Comparative Statics

All else equal, there are three possible channels by which the growth rate of the book value of debt can be higher, namely

(i) higher leverage as measured by book value of debt relative to market value of assets,

(ii) a higher realized return on the firm's assets, or

(iii) a reduced net payout yield in excess of the return on assets.

In this appendix, we provide insight about how the three channels would work separately in response to debt growth, directly obtained from comparative statics. In what follows, we fix D_t and A_t.

Channel (i) Suppose that both the return on assets and the net payout yield in excess of the return on assets are fixed, then the logarithm of the net payout yield, $\log(C_{t+1}/A_t)$, must be fixed. It follows that C_{t+1} must be fixed. A fixed return on assets r_{t+1} implies a fixed gross return on assets R_{t+1}. Since $R_{t+1} = (A_{t+1} + C_{t+1})/A_t$ and each of R_{t+1}, C_{t+1} and A_t is fixed, it follows immediately that A_{t+1} must be fixed. If the book value of debt, D_{t+1}, is to grow when A_{t+1} is fixed, then leverage must be increasing and channel (i) is demonstrated. This can come about through a debt for equity swap with any monies raised by selling additional debt used to repurchase equity.

Channel (ii) Suppose that the net payout yield in excess of the return on assets is fixed. Thus, $\log(C_{t+1}/A_t) - \log[(A_{t+1} + C_{t+1})/A_t] = \log[(A_{t+1} + C_{t+1})/C_{t+1}]$ is fixed. This implies that $(A_{t+1} + C_{t+1})/C_{t+1} = \exp(\gamma)$ for some constant γ, i.e., that $C_{t+1} = \exp(-\gamma)/(1 - \exp(-\gamma))A_{t+1}$. If the leverage ratio is also fixed at level ϕ, we have $D_{t+1} = \phi A_{t+1}$. For the book value of debt D_{t+1} to grow while leverage remains fixed, the percentage growth in A_{t+1} must exactly match the percentage growth in D_{t+1}. It follows that the net payout C_{t+1} must also grow by the same percentage amount. Now consider the gross return on assets, $R_{t+1} = (A_{t+1} + C_{t+1})/A_t = [1/(1 -$

$\exp(-\gamma))] (A_{t+1}/A_t) = [1/(1-\exp(-\gamma))] (D_{t+1}/D_t)$. Thus, growth in the book value of debt implies a higher return on assets. Channel (ii) is established. In the special case of zero excess payout yields, $\gamma = 0$ and the gross return on assets equals the percentage growth in book debt.

Channel (iii) Suppose that leverage is fixed at ϕ, so that $D_{t+1} = \phi A_{t+1}$. If the book value of debt, D_{t+1}, is to grow while leverage remains fixed, then the percentage growth in A_{t+1} must exactly match the percentage growth in the book value of debt. If the gross return on assets is to be fixed at $R_{t+1} = R$, then any percentage increase in A_{t+1} above R the must be offset by a diminution in the net payout C_{t+1}. Thus, the net payout yield in excess of the return on assets is reduced. Similarly, any shortfall in the percentage increase in A_{t+1} relative to R must be offset by a rise in the net payout C_{t+1}, meaning the excess payout yield is increased. For the special case where $R_{t+1} = 1$, any increase in A_{t+1} is perfectly offset by an equal-sized reduction in C_{t+1}, leading to lower excess payout yields. Channel (3) is established.

C. Additional Tables

Table C.1: Multinomial logistic regression results

Rating categories	Book leverage	Market value of equity	Net income
A	1.73	0.15	-0.47
	(17.8)	(3.8)	(-10.5)
Baa	2.83	0.43	-0.81
	(28.3)	(10.8)	(-18.2)
Ba	3.31	0.43	-1.18
	(28.0)	(10.1)	(-24.7)
B and lower	4.37	0.54	-1.42
	(32.4)	(12.4)	(-29.2)

This table reports the multinomial logistic regression results where we predict ratings for unrated firms using logarithm of previous year's book leverage ratio, market value of equity and net income. The benchmark rating cohort is Aaa-Aa. The estimation include 19,453 firm-year observations, over the period 1973–2021.

Table C.2: Distribution of firms across sectors and by median leverage

Leverage percentile range	0-20	20-40	40-60	60-80	80-100	All
Agriculture, forestry and fishing	5	6	4	0	5	20
Mining	58	114	130	107	74	483
Construction	2	13	22	27	28	92
Manufacturing	625	514	515	447	415	2,516
Transportation, communications, electric, gas and sanitary service	38	86	147	251	249	771
Wholesale and retail trade	69	107	95	96	144	511
Services	292	250	177	162	175	1,056
Total	1,089	1,090	1,090	1,090	1,090	5,449

This table reports the distribution of firms across sectors and by median leverage ratio. The data include 5,449 public US non-financial firms, over the period 1973–2021.

Table C.3: Variance decomposition of debt growth with investment and interactions

		Δlev	i	$\widehat{r}$	$-\kappa\,\text{ny}^e$
Panel A.	*Low leverage*	0.67	0.02	0.23	0.13
		(29.6)	(7.4)	(10.1)	(26.8)
	Medium leverage	-0.14	0.06	0.01	-0.04
		(-5.2)	(9.8)	(0.3)	(-7.1)
	High leverage	-0.32	0.09	0.11	-0.03
		(-12.3)	(9.0)	(4.7)	(-3.8)
Panel B.	*Agriculture, forestry and fishing*	0.56	0.09	0.21	0.09
		(4.3)	(2.5)	(1.4)	(2.8)
	Mining	-0.02	0.08	-0.05	0.02
		(-0.2)	(2.0)	(-0.3)	(0.6)
	Construction	-0.22	-0.04	0.20	0.03
		(-1.6)	(-1.1)	(1.3)	(0.8)
	Manufacturing	0.01	-0.05	0.06	0.01
		(0.1)	(-1.5)	(0.4)	(0.5)
	Transportation, communications,	-0.15	0.01	0.11	0.03
	electric, gas and sanitary service	(-1.2)	(0.3)	(0.7)	(0.8)
	Wholesale and retail trade	-0.02	-0.02	0.05	0.02
		(-0.2)	(-0.6)	(0.4)	(0.7)
	Services	0.03	-0.05	0.05	0.04
		(0.2)	(-1.3)	(0.4)	(1.2)
Panel C.	*Low for long*	0.56	0.05	0.27	0.11
		(10.4)	(7.2)	(3.9)	(19.4)
	Other	-0.02	0.02	-0.01	0.00
		(-0.3)	(2.3)	(-0.1)	(-0.7)
	Dovish	0.55	0.05	0.26	0.11
		(20.7)	(9.8)	(8.1)	(22.0)
	Hawkish	-0.02	0.01	0.00	-0.01
		(-0.5)	(2.0)	(-0.1)	(-0.9)

This table reports the estimation results from regressing leverage growth, real investment yields, real post-investment returns on assets in place or real excess payout yields on real debt growth and on interactions between real debt growth and indicators for all but the baseline leverage group, sector and low-for-long period, respectively. Note that the sum of real investment yields and real post-investment returns on assets in place equals the real return on assets. Subgroups are formed as in Table 5. The baseline groups are low-leverage firms; agriculture, forestry and fishing firms; low-for-long periods; and dovish periods. Estimated betas are mapped into fractions of debt growth variation according to (20). Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

Table C.4: Variance decomposition of debt growth over two years by subsample

		Δlev	i	$\widehat{r}$	$-\kappa \text{ny}^e$	$-\Delta d^f$	Sum
Panel A.	*Low leverage*	0.71	0.05	0.13	0.09	0.00	0.98
		(25.5)	(7.9)	(4.0)	(15.7)	(0.3)	
	Medium leverage	0.61	0.13	0.12	0.16	-0.05	0.97
		(25.2)	(16.0)	(3.9)	(19.7)	(-3.1)	
	High leverage	0.41	0.17	0.24	0.18	-0.10	0.90
		(17.7)	(11.1)	(5.7)	(16.1)	(-6.3)	
Panel B.	*Agriculture, forestry and fishing*	0.88	0.12	0.17	0.14	-0.40	0.91
		(5.8)	(2.4)	(0.8)	(2.1)	(-3.2)	
	Mining	0.60	0.24	0.02	0.16	-0.07	0.95
		(14.8)	(11.1)	(0.4)	(12.2)	(-2.7)	
	Construction	0.41	0.07	0.43	0.22	-0.14	0.99
		(7.8)	(3.4)	(6.9)	(6.8)	(-3.0)	
	Manufacturing	0.62	0.05	0.19	0.15	-0.02	0.99
		(21.8)	(9.7)	(6.0)	(19.6)	(-1.1)	
	Transportation, communications,	0.45	0.19	0.19	0.17	-0.10	0.90
	electric, gas and sanitary service	(15.3)	(9.1)	(3.4)	(11.7)	(-4.5)	
	Wholesale and retail trade	0.61	0.09	0.20	0.18	-0.08	1.00
		(13.3)	(9.4)	(3.6)	(9.8)	(-3.0)	
	Services	0.61	0.08	0.19	0.21	-0.04	1.05
		(16.0)	(7.1)	(3.9)	(9.5)	(-1.3)	
Panel C.	*Low for long*	0.61	0.09	0.20	0.11	-0.04	0.97
		(16.7)	(7.9)	(2.9)	(0.9)	(-1.8)	
	Other	0.59	0.11	0.16	0.16	-0.05	0.97
		(30.2)	(16.6)	(5.9)	(21.0)	(-3.6)	
	Dovish	0.64	0.09	0.14	0.16	-0.04	0.99
		(19.5)	(7.9)	(3.2)	(18.1)	(-2.2)	
	Hawkish	0.57	0.11	0.18	0.22	-0.05	1.03
		(28.6)	(17.1)	(5.8)	(14.9)	(-3.1)	

The table reports the variance decomposition of real debt growth Δd_{t+1} in (23) for $T = 2$ years, for the subsamples in Table 5. Beta estimates are mapped into fractions of debt growth variation as in (24). Note that $\beta^i + \beta^{\widehat{r}} = \beta^r$. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

Table C.5: Variance decomposition of debt growth over five years by subsample

		Δlev	i	$\widehat{r}$	$-\kappa\,\text{ny}^e$	$-\Delta d^f$	Sum
Panel A.	*Low leverage*	0.73	0.09	0.07	0.18	-0.03	1.04
		(14.7)	(5.3)	(1.7)	(8.4)	(-0.7)	
	Medium leverage	0.67	0.22	-0.07	0.19	-0.04	0.97
		(15.1)	(10.5)	(-1.7)	(13.5)	(-1.1)	
	High leverage	0.42	0.26	0.18	0.19	-0.12	0.93
		(13.3)	(8.4)	(3.9)	(10.4)	(-2.3)	
Panel B.	*Agriculture, forestry and fishing*	1.11	0.45	0.57	0.20	-1.30	1.03
		(3.3)	(3.4)	(1.3)	(1.3)	(-2.3)	
	Mining	0.72	0.38	-0.22	0.31	-0.20	0.99
		(11.8)	(7.5)	(-3.5)	(5.2)	(-2.7)	
	Construction	0.40	0.18	0.42	0.27	-0.23	1.04
		(4.3)	(2.9)	(3.0)	(3.4)	(-1.4)	
	Manufacturing	0.64	0.08	0.11	0.19	0.00	1.02
		(14.4)	(5.7)	(2.6)	(14.7)		
	Transportation, communications,	0.46	0.32	0.08	0.22	-0.15	0.93
	electric, gas and sanitary service	(9.6)	(8.6)	(1.3)	(9.0)	(-2.8)	
	Wholesale and retail trade	0.64	0.14	0.15	0.21	-0.11	1.03
		(9.6)	(5.4)	(2.0)	(5.7)	(-1.8)	
	Services	0.62	0.18	0.08	0.23	-0.09	1.02
		(7.0)	(6.5)	(1.2)	(4.0)	(-1.0)	
Panel C.	*Dovish*	0.69	0.17	0.03	0.25	-0.09	1.05
		(11.1)	(7.1)	(0.5)	(6.8)	(-2.7)	
	Hawkish	0.59	0.18	0.08	0.22	-0.07	1.00
		(15.4)	(10.9)	(2.4)	(14.7)	(-2.0)	

The table reports the variance decomposition of real debt growth Δd_{t+1} in (23) for $T = 5$ years, for the subsamples in Table 5. Beta estimates are mapped into fractions of debt growth variation as in (24). Note that $\beta^i + \beta^{\widehat{r}} = \beta^r$. Standard errors are clustered by year, and t-statistics are shown in parentheses. We do not report estimates for low-for-long periods due to small sample sizes. The sample period is 1973–2021.

Table C.6: Extended VAR estimation results

	Δd_{it}	Δlev_{it}	i_{it}	$\widehat{r}_{it}$	ny^e_{it}	f_t	r^{SP}_t
$\Delta d_{i,t-1}$	0.15	0.16	-0.03	-0.13	1.06	0.00	0.00
	(3.0)	(2.8)	(-1.9)	(-2.4)	(2.7)	(-0.6)	(-0.5)
$\Delta \text{lev}_{i,t-1}$	-0.23	-0.22	0.02	0.14	-0.38	0.00	0.01
	(-4.1)	(-3.4)	(1.1)	(2.3)	(-0.9)	(0.2)	(0.7)
$i_{i,t-1}$	0.21	-0.11	0.58	-0.24	-1.04	0.01	0.00
	(2.7)	(-1.1)	(15.5)	(-2.5)	(-1.7)	(2.5)	(-0.2)
$\widehat{r}_{i,t-1}$	-0.11	-0.08	0.01	0.11	-1.08	0.00	0.00
	(-2.0)	(-1.7)	(0.6)	(2.3)	(-2.7)	(0.0)	(0.2)
$\text{ny}^e_{i,t-1}$	-0.01	-0.02	0.00	0.01	0.48	0.00	0.00
	(-10.7)	(-6.4)	(0.7)	(3.4)	(38.0)	(0.2)	(0.6)
f_{t-1}	0.06	0.28	0.15	-0.27	0.49	0.92	-0.01
	(0.4)	(0.6)	(5.3)	(-0.6)	(0.5)	(13.3)	(-0.1)
r^{SP}_{t-1}	-0.20	-0.23	-0.02	0.09	0.31	0.00	0.01
	(-1.2)	(-0.5)	(-1.0)	(0.2)	(0.4)	(0.1)	(0.1)
R^2	0.05	0.05	0.34	0.02	0.20	0.84	0.00

This table reports the VAR estimation results for the augmented state vector (26). The VAR includes the seven variables, uses one lag, and is fitted to annual data using pooled OLS with standard errors clustered by year. T-statistics are reported in parentheses. The sample period is 1973–2021.

Table C.7: Variation decomposition into expected and surprise growth by leverage

		Δlev	i	$\widehat{r}$	$-\kappa \text{ny}^e$	Sum
Low leverage	$\mathbb{E}_{t+1}(\cdot)$	0.06	0.00	-0.03	0.01	0.04
		(14.7)	(3.5)	(-13.2)	(14.2)	
	$(\mathbb{E}_{t+1} - \mathbb{E}_t)(\cdot)$	0.62	0.02	0.25	0.04	0.93
		(29.1)	(9.0)	(12.1)	(18.7)	
	Sum	0.68	0.02	0.22	0.05	0.97
Medium leverage	$\mathbb{E}_{t+1}(\cdot)$	0.05	0.02	-0.03	0.02	0.06
		(11.6)	(8.6)	(-11.3)	(13.1)	
	$(\mathbb{E}_{t+1} - \mathbb{E}_t)(\cdot)$	0.48	0.06	0.26	0.08	0.88
		(27.6)	(13.8)	(11.0)	(20.1)	
	Sum	0.53	0.08	0.24	0.10	0.95
High leverage	$\mathbb{E}_{t+1}(\cdot)$	0.03	0.02	-0.03	0.02	0.04
		(10.1)	(10.1)	(-10.6)	(12.7)	
	$(\mathbb{E}_{t+1} - \mathbb{E}_t)(\cdot)$	0.32	0.09	0.37	0.11	0.89
		(20.7)	(10.0)	(16.5)	(18.1)	
	Sum	0.35	0.11	0.34	0.13	0.93

This table reports the estimation results by leverage sub-samples from regressing expectations or innovations in leverage growth, real investment yields, real returns on assets in place and real excess payout yields on real debt growth, respectively. Estimated betas are mapped into fraction of debt growth variation according to (25). Lines marked "Sum" report the corresponding decomposition results in Table 9. Leverage sub-samples are formed as in Table 5. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

Table C.8: **Variation decomposition into expected and surprise growth by industry**

		Δlev	i	$\widehat{r}$	$-\kappa$ny^e	Sum
Agriculture, forestry and fishing	$\mathbb{E}_{t+1}(\cdot)$	0.13	0.02	0.03	0.03	0.21
		(5.0)	(0.9)	(0.6)	(2.2)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.43	0.07	0.18	0.06	0.74
		(3.4)	(3.0)	(1.4)	(2.2)	
	Sum	0.56	0.09	0.21	0.09	0.95
Mining	$\mathbb{E}_{t+1}(\cdot)$	0.05	0.02	-0.03	0.02	0.06
		(6.7)	(6.4)	(-7.6)	(7.3)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.49	0.14	0.19	0.08	0.90
		(17.9)	(8.9)	(5.0)	(14.6)	
	Sum	0.53	0.16	0.17	0.10	0.96
Construction	$\mathbb{E}_{t+1}(\cdot)$	0.04	0.00	-0.02	0.02	0.04
		(4.3)	(0.7)	(-2.9)	(2.7)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.30	0.04	0.43	0.13	0.90
		(7.0)	(3.8)	(8.7)	(9.8)	
	Sum	0.34	0.04	0.41	0.16	0.95
Manufacturing	$\mathbb{E}_{t+1}(\cdot)$	0.05	0.00	-0.03	0.03	0.05
		(14.8)	(2.9)	(-14.2)	(14.3)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.52	0.03	0.30	0.08	0.93
		(23.4)	(8.9)	(13.5)	(21.3)	
	Sum	0.57	0.03	0.27	0.10	0.97
Transportation, communications, electric, gas and sanitary service	$\mathbb{E}_{t+1}(\cdot)$	0.03	0.02	-0.03	0.02	0.04
		(10.1)	(6.5)	(-7.8)	(10.2)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.37	0.08	0.34	0.09	0.88
		(15.1)	(6.5)	(9.5)	(12.6)	
	Sum	0.40	0.10	0.31	0.11	0.92
Wholesale and retail trade	$\mathbb{E}_{t+1}(\cdot)$	0.08	0.02	-0.04	0.03	0.09
		(5.8)	(4.1)	(-6.2)	(8.9)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.46	0.05	0.30	0.10	0.91
		(15.0)	(8.4)	(8.8)	(10.3)	
	Sum	0.53	0.06	0.26	0.13	0.98
Services	$\mathbb{E}_{t+1}(\cdot)$	0.06	0.01	-0.03	0.03	0.07
		(10.4)	(5.4)	(-6.9)	(9.8)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.52	0.03	0.28	0.09	0.92
		(20.9)	(6.9)	(10.4)	(14.8)	
	Sum	0.58	0.04	0.26	0.12	1.00

This table reports the estimation results by industry. We regress expectations or innovations in leverage growth, real investment yields, real returns on assets in place, and real excess payout yields on real debt growth, respectively. Estimated betas are mapped into fraction of debt growth variation according to (25). Lines marked "Sum" report the corresponding decomposition results in Table 9. Industry sub-samples are formed as in Table 5. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

Table C.9: Variation decomposition into expected and surprise growth by periods

		Δlev	i	$\widehat{r}$	$-\kappa \text{ny}^e$	Sum
Low for long	$\mathbb{E}_{t+1}(\cdot)$	0.04	0.01	-0.03	0.02	0.04
		(3.6)	(3.0)	(-2.9)	(10.1)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.53	0.04	0.29	0.09	0.95
		(11.8)	(9.6)	(4.9)	(12.6)	
	Sum	0.56	0.05	0.26	0.11	0.98
Other	$\mathbb{E}_{t+1}(\cdot)$	0.05	0.01	-0.03	0.03	0.06
		(14.5)	(10.4)	(-15.8)	(20.5)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.49	0.05	0.29	0.08	0.91
		(36.8)	(12.7)	(17.5)	(27.4)	
	Sum	0.54	0.06	0.26	0.11	0.97
Dovish	$\mathbb{E}_{t+1}(\cdot)$	0.04	0.01	-0.03	0.02	0.04
		(5.5)	(4.3)	(-4.1)	(10.8)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.52	0.04	0.29	0.09	0.94
		(21.9)	(9.1)	(9.9)	(19.7)	
	Sum	0.55	0.05	0.26	0.11	0.97
Hawkish	$\mathbb{E}_{t+1}(\cdot)$	0.05	0.01	-0.03	0.03	0.06
		(15.7)	(8.3)	(-13.5)	(24.1)	
	$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.48	0.06	0.29	0.08	0.91
		(31.6)	(11.6)	(14.9)	(24.4)	
	Sum	0.54	0.07	0.26	0.11	0.98

This table reports the estimation results by low-for-long periods from regressing expectations or innovations in leverage growth, real investment yields, real returns on assets in place and real excess payout yield on real debt growth, respectively. Estimated betas are mapped into fraction of debt growth variation according to (25). Lines marked "Sum" report the corresponding decomposition results in Table 9. The low-for-long periods are formed as described in Table 5. Dovish and hawkish periods are defined as in Bianchi, Lettau, and Ludvigson (2022). Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973–2021.

D. Results for Alternative Market Value of Debt Measure

This appendix presents results based on an alternative measure for the price of long-term debt using the approach in Hall (1988) and Larrain and Yogo (2008).

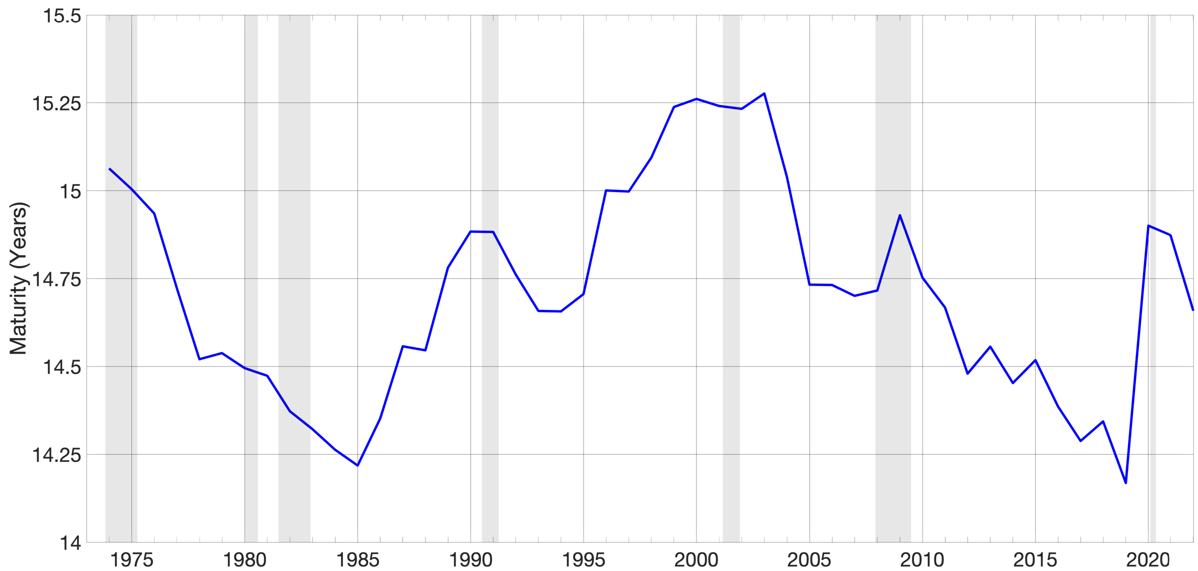

Figure D.1: Average bond maturity

This plot shows the time series of the average bond maturity implied from the assumed maturity structure, for the average public US non-financial firm in our sample. The sample period is 1973–2021. The shaded areas identify NBER recessions.

Table D.1: Variance decomposition of debt growth with investment

		Δlev	i	$\widehat{r}$	$-\kappa \text{ny}^e$	Sum
Panel A.	*Full sample*	0.55	0.06	0.25	0.11	0.97
		(37.5)	(15.4)	(14.2)	(36.1)	
Panel B.	*Low leverage*	0.68	0.02	0.21	0.05	0.96
		(29.9)	(9.9)	(9.2)	(24.7)	
	Medium leverage	0.54	0.08	0.22	0.10	0.94
		(26.7)	(14.2)	(8.5)	(22.2)	
	High leverage	0.37	0.11	0.31	0.14	0.93
		(21.5)	(11.1)	(12.8)	(20.6)	
Panel C.	*Agriculture, forestry and fishing*	0.62	0.09	0.13	0.08	0.92
		(3.9)	(2.0)	(0.7)	(2.0)	
	Mining	0.54	0.16	0.16	0.10	0.96
		(18.8)	(9.1)	(3.8)	(15.2)	
	Construction	0.34	0.03	0.42	0.16	0.95
		(7.9)	(4.4)	(8.7)	(7.5)	
	Manufacturing	0.58	0.03	0.26	0.11	0.98
		(24.9)	(8.5)	(11.7)	(24.8)	
	Transportation, communications,	0.40	0.11	0.30	0.12	0.93
	electric, gas and sanitary service	(16.5)	(7.1)	(8.2)	(17.2)	
	Wholesale and retail trade	0.55	0.06	0.24	0.13	0.98
		(15.3)	(9.3)	(6.1)	(12.0)	
	Services	0.60	0.04	0.23	0.12	0.99
		(22.1)	(7.7)	(7.7)	(15.7)	
Panel D.	*Low for long*	0.58	0.05	0.25	0.11	0.99
		(11.6)	(7.1)	(4.0)	(18.6)	
	Other	0.55	0.07	0.24	0.11	0.97
		(35.6)	(14.4)	(13.8)	(32.1)	
	Dovish	0.56	0.05	0.25	0.11	0.97
		(22.0)	(9.0)	(8.2)	(26.2)	
	Hawkish	0.55	0.07	0.24	0.11	0.97
		(31.5)	(12.8)	(12.0)	(27.1)	

Panel A reports the variance decomposition of real debt growth Δd_{t+1} in (19), using an alternative measure for the price of long-term debt. Estimated betas are mapped into fractions of debt growth variation according to (20). Panels B, C and D report similar results, after stratifying the data by leverage, industry or time periods. Subsamples are defined as in Table 5. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973 to 2021.

Table D.2: Variance decomposition of debt growth into expected and surprise growth

	Δlev	i	$\widehat{r}$	$-\kappa\,\text{ny}^e$	Sum
$\mathbb{E}_{t+1}(\cdot)$	0.05	0.01	-0.03	0.03	0.06
	(16.6)	(10.6)	(-19.6)	(22.7)	
$(\mathbb{E}_{t+1} - \mathbb{E}_t)(\cdot)$	0.50	0.05	0.28	0.09	0.92
	(38.4)	(13.7)	(17.0)	(29.2)	
Sum	0.55	0.06	0.25	0.11	0.97

This table reports the estimation results for variance decomposition results for (25), using an alternative measure for the price of long-term debt. The line marked "Sum" reports the corresponding decomposition results in Table D.1. Standard errors are clustered by year, and t-statistics are shown in parentheses. The sample period is 1973 to 2021.

E. Quarterly Results

This appendix presents results based on quarterly data.

Table E.1: Variance decomposition of debt growth with investment

		Δlev	i	$\widehat{r}$	$-\kappa$ny^e	Sum
Panel A.	*Full sample*	0.65	0.03	0.22	0.04	0.94
		(80.7)	(15.2)	(25.9)	(35.3)	
Panel B.	*Low leverage*	0.81	0.01	0.13	0.01	0.96
		(72.6)	(9.7)	(12.2)	(27.2)	
	Medium leverage	0.62	0.04	0.22	0.04	0.92
		(75.8)	(11.3)	(21.5)	(31.3)	
	High leverage	0.43	0.05	0.36	0.07	0.91
		(46.1)	(11.2)	(23.0)	(21.4)	
Panel C.	*Agriculture, forestry and fishing*	0.63	0.02	0.11	0.05	0.81
		(9.5)	(2.8)	(1.0)	(5.1)	
	Mining	0.61	0.10	0.18	0.04	0.93
		(31.7)	(8.8)	(6.9)	(15.5)	
	Construction	0.49	0.01	0.35	0.05	0.90
		(13.1)	(4.3)	(7.1)	(7.2)	
	Manufacturing	0.68	0.01	0.21	0.04	0.94
		(66.0)	(11.8)	(21.2)	(29.3)	
	Transportation, communications,	0.56	0.04	0.25	0.04	0.89
	electric, gas and sanitary service	(33.4)	(7.9)	(11.6)	(20.2)	
	Wholesale and retail trade	0.61	0.02	0.27	0.06	0.96
		(38.7)	(8.9)	(15.5)	(16.8)	
	Services	0.68	0.02	0.21	0.04	0.95
		(50.8)	(7.8)	(13.3)	(20.3)	
Panel D.	*Low for long*	0.64	0.02	0.23	0.05	0.94
		(40.6)	(7.9)	(14.4)	(21.8)	
	Other	0.66	0.03	0.22	0.04	0.95
		(73.6)	(14.3)	(23.4)	(31.9)	
	Dovish	0.62	0.02	0.25	0.05	0.94
		(55.3)	(11.8)	(19.7)	(35.3)	
	Hawkish	0.67	0.03	0.21	0.04	0.95
		(70.6)	(12.6)	(21.3)	(28.7)	

Panel A reports the variance decomposition of real debt growth Δd_{t+1} in (19), using quarterly data. Estimated betas are mapped into fractions of debt growth variation according to (20). Panels B, C and D report similar results, after stratifying the data by leverage, industry or time periods. Subsamples are defined as in Table 5. Standard errors are clustered by quarter, and t-statistics are shown in parentheses. The sample period is 1973 to 2021.

Table E.2: Variance decomposition of debt growth with investment and interactions

		Δlev	i	$\widehat{r}$	$-\kappa \text{ny}^e$
Panel A.	*Full sample*	0.65	0.03	0.22	0.04
		(80.7)	(15.2)	(25.9)	(35.3)
Panel B.	*Low leverage*	0.81	0.01	0.13	0.05
		(72.2)	(8.9)	(12.2)	(27.5)
	Medium leverage	-0.19	0.03	0.09	-0.01
		(-16.9)	(8.5)	(6.9)	(-4.3)
	High leverage	-0.38	0.04	0.23	0.00
		(-28.6)	(9.4)	(12.8)	(-0.9)
Panel C.	*Agriculture, forestry and fishing*	0.63	0.02	0.11	0.05
		(9.4)	(2.9)	(1.0)	(5.1)
	Mining	-0.02	0.08	0.06	-0.01
		(-0.3)	(5.8)	(0.5)	(-1.1)
	Construction	-0.14	-0.01	0.24	-0.02
		(-1.7)	(-1.1)	(1.9)	(-1.3)
	Manufacturing	0.06	-0.01	0.10	-0.01
		(0.9)	(-1.1)	(0.9)	(-1.2)
	Transportation, communications,	-0.07	0.02	0.13	-0.02
	electric, gas and sanitary service	(-1.0)	(2.0)	(1.2)	(-1.8)
	Wholesale and retail trade	-0.02	0.00	0.16	0.00
		(-0.2)	(-0.4)	(1.4)	(0.1)
	Services	0.06	0.00	0.10	-0.01
		(0.8)	(-0.2)	(0.9)	(-0.9)
Panel D.	*Low for long*	0.64	0.02	0.23	0.05
		(40.1)	(8.0)	(14.0)	(21.3)
	Other	0.02	0.01	-0.01	-0.01
		(1.1)	(2.9)	(-0.6)	(-4.1)
	Dovish	0.62	0.02	0.24	0.05
		(53.1)	(12.7)	(18.5)	(34.1)
	Hawkish	0.05	0.01	-0.03	-0.02
		(3.2)	(3.4)	(-1.9)	(-8.2)

This table reports the quarterly estimation results from regressing leverage growth, real investment yields, real post-investment returns on assets in place or real excess payout yields on real debt growth and on interactions between real debt growth and indicators for all but the baseline leverage group, sector and monetary policy period, respectively. Subgroups are formed as in Table 5. Estimated betas are mapped into fractions of debt growth variation according to (20). Standard errors are clustered by quarter, and t-statistics are shown in parentheses. The sample period is 1973 to 2021.

Table E.3: Four-quarter debt growth variance decomposition with investment

		Δlev	i	$\widehat{r}$	$-\kappa$ny^{e}	$-\Delta d^{f}$	Sum
Panel A.	*Full sample*	0.68	0.07	0.15	0.16	-0.06	1.00
		(48.8)	(20.5)	(11.0)	(28.4)	(-6.6)	
Panel B.	*Low leverage*	0.81	0.03	0.08	0.06	0.00	0.98
		(31.9)	(11.1)	(3.7)	(19.2)	(0.3)	
	Medium leverage	0.68	0.09	0.14	0.12	-0.09	0.94
		(47.0)	(19.1)	(8.4)	(24.7)	(-6.6)	
	High leverage	0.51	0.10	0.27	0.16	-0.10	0.94
		(32.6)	(13.8)	(13.3)	(20.9)	(-6.5)	
Panel C.	*Agriculture, forestry and fishing*	0.63	0.05	0.35	0.12	-0.16	0.99
		(4.1)	(2.4)	(2.3)	(2.8)	(-1.5)	
	Mining	0.71	0.20	0.04	0.14	-0.12	0.97
		(18.5)	(11.3)	(1.0)	(13.4)	(-4.8)	
	Construction	0.42	0.05	0.44	0.14	-0.12	0.93
		(5.8)	(3.6)	(5.7)	(5.3)	(-2.4)	
	Manufacturing	0.67	0.04	0.18	0.15	-0.02	1.02
		(36.7)	(13.4)	(10.1)	(22.7)	(-1.6)	
	Transportation, communications,	0.65	0.12	0.16	0.13	-0.17	0.89
	electric, gas and sanitary service	(19.2)	(11.9)	(4.3)	(14.6)	(-6.7)	
	Wholesale and retail trade	0.66	0.05	0.17	0.15	-0.04	0.99
		(22.0)	(9.4)	(5.3)	(11.5)	(-1.7)	
	Services	0.75	0.06	0.12	0.21	-0.07	1.07
		(24.6)	(7.4)	(4.0)	(11.8)	(-3.4)	
Panel D.	*Low for long*	0.68	0.06	0.16	0.17	-0.06	1.01
		(31.2)	(7.0)	(6.8)	(13.1)	(-2.1)	
	Other	0.68	0.07	0.15	0.20	-0.06	1.04
		(43.3)	(19.5)	(9.7)	(20.6)	(-6.3)	
	Dovish	0.67	0.06	0.18	0.14	-0.07	0.98
		(26.7)	(11.9)	(7.5)	(21.6)	(-5.4)	
	Hawkish	0.67	0.07	0.16	0.15	-0.05	1.00
		(43.5)	(16.6)	(10.0)	(21.6)	(-4.8)	

Panel A reports the variance decomposition of real debt growth Δd_{t+1} in (23) for $T = 5$ quarters, for both full sample and the subsamples in Table 5 using quarterly data. Estimated betas are mapped into fractions of debt growth variation according to (24). Standard errors are clustered by quarter, and t-statistics are shown in parentheses. The sample period is 1973 to 2021.

Table E.4: Variance decomposition of debt growth into expected and surprise growth

	Δlev	i	$\widehat{r}$	$-\kappa\,\text{ny}^e$	Sum
$\mathbb{E}_{t+1}(\cdot)$	0.01	0.00	-0.01	0.01	0.01
	(22.4)	(10.9)	(-17.5)	(23.3)	
$(\mathbb{E}_{t+1}-\mathbb{E}_t)(\cdot)$	0.64	0.03	0.23	0.04	0.94
	(80.1)	(14.2)	(26.9)	(33.2)	
Sum	0.65	0.03	0.22	0.04	0.94

This table reports the estimation results for variance decomposition results for (25), using quarterly data. The line marked "Sum" reports the corresponding decomposition results in Table E.1. Standard errors are clustered by quarter, and t-statistics are shown in parentheses. The sample period is 1973 to 2021.

F. Results for COVID Era

This appendix presents prediction results for the use of debt growth during the COVID era.

Table F.1: Actual and predicted changes for 2020-2021 by rating

		Δd_{2020}		Actual	Predicted	Lower bound	Upper bound
Panel A.	*All rated firms*	0.05	Δlev	-0.08	0.03	-0.09	0.14
			i	0.06	0.11	0.08	0.15
			$\widehat{r}$	0.09	-0.01	-0.14	0.12
			$\kappa\,\mathrm{ny}^e$	-0.06	-0.07	-0.08	-0.06
			Δd_{2021}	-0.03	0.03	0.00	0.06
Panel B.	*Investment grade*	0.06	Δlev	-0.05	0.05	-0.06	0.16
			i	0.05	0.10	0.06	0.14
			$\widehat{r}$	0.06	-0.00	-0.13	0.12
			$\kappa\,\mathrm{ny}^e$	-0.07	-0.07	-0.08	-0.06
			Δd_{2021}	-0.04	0.04	0.00	0.07
	High yield	0.03	Δlev	-0.12	-0.01	-0.14	0.12
			i	0.07	0.13	0.09	0.16
			$\widehat{r}$	0.12	-0.02	-0.17	0.13
			$\kappa\,\mathrm{ny}^e$	-0.03	-0.05	-0.08	-0.02
			Δd_{2021}	-0.03	0.02	-0.03	0.06

The table reports predictions based on regressions of the components of real debt growth in (19) on real debt growth for $T = 2$ years. The underlying data are aggregates for rated firms over the period 1973–2019. The regression estimates are combined with the observed 2020 real debt growth to generate 2020-2021 predictions for Δlev, i, $\widehat{r}$, $\kappa\,\mathrm{ny}^e$ and Δd_{2021}. Upper (lower) bounds are formed by adding (subtracting) one standard error to (from) the prediction.

Table F.2: Actual and predicted changes for 2020–2021 by leverage group

		Δd_{2020}		Actual	Predicted	Lower bound	Upper bound
				Panel I. $T = 1$ year			
Panel I.A.	*Full sample*	0.02	Δlev	-0.04	-0.01	-0.13	0.11
			i	0.02	0.05	0.04	0.07
			$\widehat{r}$	0.05	0.00	-0.12	0.13
			$\kappa\,\mathrm{ny}^e$	-0.08	-0.07	-0.08	-0.06
Panel I.B.	*Low leverage*	0.04	Δlev	-0.12	-0.02	-0.19	0.14
			i	0.02	0.04	0.02	0.05
			$\widehat{r}$	0.14	0.05	-0.11	0.21
			$\kappa\,\mathrm{ny}^e$	-0.05	-0.04	-0.05	-0.03
	High leverage	-0.01	Δlev	0.02	-0.01	-0.10	0.08
			i	0.03	0.06	0.04	0.08
			$\widehat{r}$	-0.02	-0.02	-0.11	0.07
			$\kappa\,\mathrm{ny}^e$	-0.09	-0.09	-0.10	-0.07
				Panel II. $T = 2$ years			
Panel II.A.	*Full sample*	0.02	Δlev	-0.11	-0.02	-0.16	0.11
			i	0.05	0.11	0.08	0.14
			$\widehat{r}$	0.09	0.01	-0.13	0.15
			$\kappa\,\mathrm{ny}^e$	-0.06	-0.06	-0.07	-0.05
			Δd_{2021}	-0.01	0.03	-0.01	0.07
Panel II.B.	*Low leverage*	0.06	Δlev	-0.12	0.01	-0.17	0.18
			i	0.03	0.09	0.06	0.12
			$\widehat{r}$	0.15	0.06	-0.11	0.24
			$\kappa\,\mathrm{ny}^e$	-0.05	-0.05	-0.07	-0.03
			Δd_{2021}	0.02	0.06	0.02	0.11
	High leverage	-0.01	Δlev	-0.08	-0.03	-0.14	0.08
			i	0.06	0.12	0.09	0.15
			$\widehat{r}$	0.02	-0.03	-0.15	0.09
			$\kappa\,\mathrm{ny}^e$	-0.03	-0.06	-0.07	-0.04
			Δd_{2021}	-0.05	0.01	-0.03	0.04

The table reports predictions based on regressions of the components of real debt growth in (23) on debt growth, for $T = 1$ year and $T = 2$ years. The underlying data are cross-section aggregates over the period 1973–2019. The regression estimates are combined with the observed 2020 real debt growth to generate 2020 (Panel I) and 2020–2021 (Panel II) predictions for Δlev, i, $\widehat{r}$ and $\kappa\,\mathrm{ny}^e$. Upper (lower) bounds are formed by adding (subtracting) one standard error to (from) the prediction.