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Leverage and the Macroeconomy: Implications of Low Interest Rates for Corporate Debt

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ABSTRACT

How worried should we be about current debt levels? Although corporate debt declined following the Global Financial Crisis of 2007 to 2008, debt levels began to rise again in 2011, and reached an all-time high during the Covid-19 pandemic. In this paper I argue that the aggregate data, while informative, mask substantial heterogeneity in the underlying distribution of debt and its uses. Low interest rates reduced the cash-flow burden of debt and have led firms to hoard more cash. The propensity to save out of debt has increased in recent years. As a result, net leverage – calculated as debt minus cash – has declined dramatically, especially for smaller publicly traded companies.

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Introduction

Although corporate debt declined following the Global Financial Crisis of 2007 to 2008, debt levels began to increase again in 2011, and they reached an all-time high during the Covid-19 pandemic.[1] If current interest rates remain low for the foreseeable future, corporate indebtedness may increase even more. Policy makers are rightly concerned about the potential effects of high, and possibly rising, debt burden on financial stability and the real economy at both the onset of a debt crisis and during the recovery phase.[2] What role does a greater reliance on credit by nonfinancial firms play in such real economic activity as output and employment fluctuations?[3] Will high indebtedness lead to slower recoveries and amplify tail events? In particular, what part does monetary policy play in amplifying credit cycles, especially when policy makers maintain very low interest rates? Are the adverse effects of high leverage potentially less damaging in an environment characterized by an extended period of low interest rates that reduces the cash-flow burden of debt-service payments?

To answer these questions, one needs to study not only the debt side but also the assets side of the balance sheet. What do firms do with the funds they raise in credit markets? And how do these uses change over time, especially during periods of low and, in particular, ultra-low interest rates? Are firms using the funds they raise in the debt market to finance capital expenditures and boost investments, or are they hoarding their borrowings as cash and short-term investments?

Furthermore, although the aggregate data, which show the size of corporate indebtedness and the magnitude of the credit cycle, are informative, they mask substantial heterogeneity.[4] Do smaller firms, which typically are weaker and riskier financially than bigger firms, have higher leverage than their larger

[1] Abraham, Cortina, and Schmulker (2020); Graham, Leary and Roberts (2015); Jorda et al. (2013); and Schularick (2021).
[2] Adrian et al. (2019); Albuquerque (2021); Bordo and Huabrich (2017); and Reinhart and Rogoff (2014).
[3] See Giesecke et al. (2014) for a long-term study of corporate default crises.
[4] Similarly, Covas and Den Haan (2011) show that the aggregate data masks heterogeneity in the countercyclicality of debt and equity issuance.

counterparts? More generally, is there a misallocation of debt in the economy, in which weaker firms account for a larger share of corporate debt?

In this paper I attempt to move beyond aggregate debt by looking into the underlying heterogeneity in corporate debt and analyzing not only the type of firms that take on more debt but also the financial and operational uses of that debt. Moreover, I examine how corporate behaviors change during periods of low interest rates and study the consequences of lower rates for corporate investment.

The first takeaway from the paper is that, in addition to studying corporate debt, we should examine *net indebtedness,* or *net leverage*. I define *net leverage* as the difference between total debt and cash and short-term investments. Many firms engage in both borrowing and cash hoarding, and their true indebtedness is reflected by their *net debt*. This focus on net debt is especially valuable because smaller firms tend to hoard more cash, relative to their assets, than larger firms. For example, the ratio of cash and short-term investments to total assets is much higher for smaller firms: the average firm in the first quartile of size distribution in Compustat holds 0.196 of its assets in cash and short-term investments, as compared to 0.065 for firms in the fourth quartile (the largest firms). Moreover, the tendency of smaller firms to hoard cash increases during periods of low interest rates.

The pattern of increased cash holdings by smaller firms has important consequences for the *net indebtedness* of U.S. firms. Net leverage of firms in the lowest quartile of size has been effectively zero since 2014. In fact, since 2019 such firms have a negative net debt, since their cash holdings far exceed their debt. Firms in the second size quartile exhibit the same pattern of low net leverage. And although net leverage of these firms increased between 2010 and 2018, it remained at historically low levels: well under 0.10. Larger firms, those in the third and fourth size quartiles, do not exhibit the same patterns of declining net leverage since their cash holdings to assets did not grow at the same rate of the smaller firms. Even though larger firms, because of their sheer size, are responsible for the lion's share of corporate debt, these firms are less likely to be financially constrained and be low rated. For example, several measures of financial distress use firm size as one of the most important inputs to their model.[5] That is, when looking into the allocation of debt across U.S. firms, it seems that the smaller and riskier firms in Compustat have very low *net leverage* ratios.

The second finding, strongly related to the first, is that firms are not using the debt they raise to fund investment; instead, especially in recent years, they hoard their borrowing as cash and financial investments. Although it is difficult to identify the specific uses of debt because firms do not report how they allocate the capital they raise to different uses, I develop a new methodology to empirically identify the uses of debt (see Section III). I find that over time there is a significant decline in the amount of debt used to fund investment, in particular by smaller firms. Instead, and consistent with the net leverage results, firms use debt to increase their cash holdings much more than to finance investment.

Third, I document empirically the dramatic decline in bond yields and the ratio of interest expenses that firms pay as a result of lower interest rates. And although some firms respond to the lower rates by increasing leverage somewhat, the overall effect is to reduce the amount of cash they need to service their debt. The decline in interest rates relaxes firms' financial constraints, especially for those firms interested in investing.

I find overall that although aggregate indebtedness is high, its distribution across firms is such that smaller firms effectively have much less debt. Over time credit markets seem to have a lesser effect on investment because firms use the proceeds from debt issuance largely for acquisitions and cash hoarding. And despite the high leverage, the decline in interest rates has had a major impact on firms by reducing the amount they need to service their debt.

The rest of the paper is organized as follows. In Section I, I describe the data and variables construction. In Section II, I present evidence on leverage and net leverage. I discuss the financial and operational uses of debt in Section III. The decline in bond yields and firms' interest expenses are described in Section IV,

[5] For example, Kaplan and Zingales (1997); Whited and Wu (2006).

and the implications of lower interest rates for investments are discussed in Section V. I conclude in Section VI.

I. Data Sources and Variable Definitions

A. Compustat

I use data from Compustat throughout the paper. The main dependent variables are: (1) cash, defined as cash and short-term investment [Compustat annual item *che*] divided by total assets; (2) *leverage (including leases),* defined as total debt and capital leases [Compustat annual items *dltt+dlc+dclo*] divided by total assets; (3) *net leverage,* defined as total debt and capital leases minus cash [Compustat annual items *dltt+dlc+dclo-che*] divided by total assets; (4) *leverage (excluding leases),* defined as total debt [Compustat annual items *dltt+dlc*] divided by total assets; and (5) *net leverage (excluding leases),* defined as total debt minus cash [Compustat annual items *dltt+dlc-che*] divided by total assets.

Additional dependent variables include: (1) *debt repayment,* defined as total debt reduction [Compustat annual item *dltr*] divided by lagged total assets; (2) *acquisitions repayment,* defined as acquisitions [Compustat annual item *acq*] divided by lagged total assets; (3) *investment,* defined as capital expenditure [Compustat annual item *capx*] divided by lagged total assets; (4) $\Delta cash$, defined as the total change in cash [Compustat annual item $che_t - che_{t-1}$] divided by lagged total assets; (5) *selling, general, and administrative expenses (SG&A),* defined as SG&A [Compustat annual item *xsga*] divided by lagged total assets; (6) *share repurchases,* defined as repurchases [Compustat annual item *prstkc*] divided by lagged total assets; and (7) *dividends,* defined as dividends [Compustat annual item *dv*] divided by lagged total assets.

The main explanatory variables are: (1) *log(assets),* the logarithm of the book value of the assets; (2) *Tobin's Q,* defined as the book value of assets plus the market value of equity [Compustat annual items *at+(csho*prcc f)*] minus the book value of equity and deferred taxes [Compustat annual item *ceq+txdb*], all over (book value of assets*0.9+market value of assets*0.10); (3) *profitability,* defined as earnings before interest, taxes, depreciation, and amortization (EBITDA) [Compustat annual item *oibdp*] divided by lagged total assets; (4) *tangibility,* defined as net property, plant, and equipment [Compustat annual item *ppentp*] divided by total assets; (5) *gross long-term debt issuance,* defined as gross long-term debt issuance [Compustat annual item *dltis*] divided by lagged total assets; (6) *net long-term debt issuance,* defined as gross long-term debt issuance minus long-term debt reduction issuance [Compustat annual items *dltis-dltr*] divided by lagged total assets; (7) *interest to assets,* defined as interest expenses [Compustat annual item *xint*] divided by lagged total assets; and (8) *interest expenses,* defined as interest expenses issuance [Compustat annual item *xint*] divided by total debt [Compustat annual items *dltt+dlc*].

Table IX shows the implementation of the maturing debt identification strategy.[6] Compustat reports the amount of long-term debt payable in more than one year through more than five years from firms' fiscal year-end. I collect these data on the amount of future maturing debt. Specifically, I use Compustat variables *dd3*, *dd4*, and *dd5,* which represent, respectively, the amount of long-term debt maturing three, four, and five years after the annual reporting date. To measure the maturing debt structure of a firm in a particular year, I construct lagged values of these debt maturity variables: *l2_dd3* is the two-year lag of *dd3; l3_dd4* is the three-year lag of *dd4;* and *l4_dd5* is the four-year lag of *dd5*. By construction, these variables measure the amount of long-term debt issued at least two, three, or four years before the base year and maturing in the upcoming year. I scale the lagged variables by beginning of year total assets.

B. Mergent Bond Data

I obtain information on bond issuances from the Mergent Fixed Income Securities Database (FISD), a comprehensive database of publicly offered U.S. bonds. FISD contains detailed information on

[6] I follow the same definitions as in Benmelech, Bergman, and Seru (2021).

more than 140,000 bonds. Although the Mergent data set includes bonds issued before the 1960s, more complete coverage starts around 1960.[7]

I omit bonds issued by financial firms and government agencies, and I drop convertible bonds and bonds with floating rates. I further require the offer-yield at issuance and the bond maturity to be available. Spread is calculated as the yield spread at issuance over the maturity-matched Treasury (see Gurkaynak, Sack, and Wright (2007)). I drop bonds with maturity greater than 30 years because they cannot be matched with similar-maturity Treasury securities.

C. Macro Data

I use several time-series explanatory variables in the analysis. I obtain the yield on the 10-year Treasury bonds from the St. Louis Federal Reserve's data service, FRED. I also use "Moody's Seasoned Aaa Corporate Bond Yield and Moody's Seasoned Baa Corporate Bond Yield" from FRED to calculate the variable *credit spread*. These monthly data series are used to calculate annual averages, and the units are in decimals.

II. Leverage and Net Leverage

A. The Evolution of Net Leverage over Time

I begin my analysis by illustrating the correlation between interest rates and cash holdings. Figure 1 displays the average yearly yield on the 10-year Treasury from 1970 to 2018.[8] The figure also plots the coefficients on year dummies from firm-level regression in which the dependent variable is the ratio of cash and short-term investment to assets and the explanatory variables are firm characteristics and industry and year fixed-effects. As Figure 1 demonstrates, average cash holdings relative to assets began to increase in the 1990s and increased further after 2000, hovering over 8% in the years following the Global Financial Crisis. These estimates are consistent with the predictions in Acharya et al. (2007) and the findings in Bates,

[7] See Benmelech, Kumar and Rajan (2021).
[8] Throughout the paper I use the average monthly market yield on the constant maturity 10-year Treasury from FRED (https://fred.stlouisfed.org/series/DGS10).

Kahle, and Stulz (2009), who document that the average cash-to-assets ratio for U.S. industrial firms more than doubled from 1980 to 2006. The rise in corporate saving is not unique to the United States and is found in many countries, industries, and types of firms (Chen, Karabarbounis, and Neiman (2017)). As I show later, lower interest rates and increased cash holdings have significant effects of corporate net leverage. Indeed, Chen, Karabarbounis, and Neiman (2017) and Eisfeldt and Muir (2016) predict that a decline in the cost of capital leads to increased corporate savings.

The implications of cash holdings for corporate leverage are illustrated in Figure 2. The figure depicts the evolution of median leverage over time from 1975 to 2020.[9] As Figure 2 shows, the median corporate leverage declined slightly to around 0.30 in 2020 and is at the same levels as in the late 1980s and early 1990s. Figure 2 also depicts the median net leverage defined as debt minus cash divided by total assets.[10] The increase in cash holdings over time is well reflected in the figure: net leverage declined from around 0.24 in 2000 to 0.12 in 2006, and while it shot up during the Global Financial Crisis to 0.16, it stabilized around 0.15 in 2020. As Figure 2 demonstrates, even though median leverage in 2020 is at the same level as it was in the early 1990s, the median net leverage is more than 10 percentage points lower than its early 1990s figures.

Table I reports summary statistics on cash and short-term investments and different measures of leverage and net leverage of nonfinancial U.S. firms. The mean cash and short-term investments divided by total assets in 0.121 with a standard deviation of 0.174 and a median of 0.054. I use two definitions of leverage: with and without leases. The mean (median) leverage (including leases) is 0.314 (0.287), with a standard deviation of 0.241. Net leverage (including leases) mean is 0.191, with a standard deviation of 0.330. When I exclude leasing from leverage calculation, the mean (median) leverage is 0.305 (0.281).

Table II provides more information about the behavior of cash holdings and leverage and net leverage over time. Similar to Figure 2, the table presents mean leverage, net leverage, and cash and short-

[9] Leverage is defined as long-term debt+debt in current liabilities+capitalized lease obligations (Compustat items (*dltt*+*dlc*+*dclo*)) divided by total assets (Compustat item *at*).
[10] Net Leverage is defined as long-term debt+debt in current liabilities+capitalized lease obligations minus cash (Compustat items (*dltt*+*dlc*+*dclo*-*che*)) divided by total assets (Compustat item *at*).

term investments over time. As column (1) of Table II shows, mean leverage (including leases) was 0.289 in 1970, 0.314 in 1980, and 0.330 in 1990. Corporate leverage continued to trend up, increasing from 0.334 in 2000 to 0.349 in 2015, reaching its highest level of 0.362 in 2018. Column (2) documents a similar pattern using a measure of leverage that excludes leases. However, even though leverage ratios have hovered around 0.30 since 1970 and inched up in the past decade to around 0.35, the average firm also holds much more cash today than in the 1970s. As Column (5) demonstrates, the mean ratio of cash and short-term investments to assets was 0.073 in 1970, declining to 0.071 in 1975 and to 0.066 in 1980. Cash holdings increased markedly in the 1990s, and by 2000 the average cash holdings to assets ratio was 0.130. The ratio of cash to assets increased to 0.154 in 2005, 0.163 in 2015, and 0.176 in 2018. Cash holdings further increased to 0.225 in 2019 and peaked at 0.278 in 2020, primarily reflecting the tendency of firms to draw down their lines of credit and hold cash during the early months of the Covid-19 pandemic.

While leverage of the average firm has increased between 1985 and 2018 so did cash holdings. In fact, firm cash holdings to assets ratio more than doubled during the same period. As a result, net leverage in 2018 was 0.180 as compared to 0.213 in 1985 (column (3)). On average, net leverage has been at its lowest levels since 2010, dropping to 0.123 in 2019 before bottoming out at 0.045 in 2020.

B. The Cross-Sectional Distribution of Net Leverage

After documenting the evolution of net leverage over time, I now analyze the cross-sectional differences in net leverage across firms. Table III displays means for the different measures of leverage and net leverage as well as cash and short-term investment relative to total assets along firms' size quartiles. I sort firms into firm size quartiles each year based on total assets, with firms in the first quartile being the smallest and firms in the fourth quartile being the largest.

In column (1) of Table III, I report the mean leverage (including leases) in each of the size quartiles. As Table III shows, and consistent with the evidence in the empirical literature on capital structure, mean leverage is generally higher in the quartiles with the largest firms.[11] The mean leverage ratio is 0.303 in the first quartile, compared to 0.285 in the second quartile, 0.330 in the third quartile, and 0.343 in the fourth quartile. Similar results are observed in column (2) for a measure of leverage that excludes leases. Perhaps the most notable pattern that emerges from Table III is that the ratio of cash and short-term investments to total assets is much higher for smaller firms, consistent with the findings of Bates, Kahle, and Stulz (2009). For example, the average firm in the first quartile holds 0.196 of its assets in cash and short-term investments as compared to 0.065 in the fourth quartile. The pattern of increased cash holdings by smaller firms results in much lower net leverage for these firms. For example, as column (3) of Table III shows, net leverage of firms in the first size quartile is only 0.105 as compared to 0.145 in the second quartile, 0.242 in the third quartile, and 0.279 in the fourth quartile. Similar results are obtained when using a net leverage definition that excludes leasing (column (4)).

To gain a better understanding of the evolution of the cross-sectional changes in cash holdings and net leverage over time, Figures 3a–3d plot median cash holdings of firms in different size quartiles from 1975 to 2000. Figure 3a depicts median cash and short-term investment to assets for the first size quartile. The figure illustrates the significant increase in cash holdings by smaller Compustat firms since the early 2000s. The dramatic increase in 2020 and to some extent in 2019 represents outlier cash holdings driven mostly by precautionary motives stemming from the Covid-19 pandemic. However, cash holdings increased to over 0.20 of total assets in 2015 and remained elevated long before the Covid-19 outbreak. Figure 3b portrays a similar picture for firms in the second quartile of the size distribution. Median cash holdings for firms in the second quartile increased from about 0.05 in 2000 to 0.15 in 2009 and have been hovering over 0.10 from 2010 before rising to 0.14 in 2018 and jumping to over 0.30 in 2020. Figure 3c presents a similar trend in which median cash holdings relative to assets increased threefold between 2000 and 2018, albeit from a much lower level. The median cash and short-term investments relative to assets was about 0.03 during the 1990s before increasing to around 0.05 in the early 2000s and to around 0.06 in

[11] Rajan and Zingales (1995); Roberts and Leary (2005).

2016. Likewise, firms in the fourth size quartile increased their cash holdings during the years leading to the Global Financial Crisis, but the ratio of cash and short-term investments to assets then declined below 0.03 before jumping again in 2020 (Figure 4c).

The effect of increased cash holdings by smaller Compustat firms on net leverage is reflected in Figures 4a and 4b. Net leverage of firms in the lowest quartile of size has been effectively zero since 2014 (Figure 4a). In fact, since 2019 these firms have a negative net debt, as their cash holdings far exceed their debt. Firms in the second size quartile exhibit the same pattern of low net leverage. And while their net leverage increased between 2010 and 2018, it was still at historically low levels – well under 0.10 (Figure 4b). Larger firms, those in the third and fourth size quartiles, do not exhibit the same patterns of declining net leverage as their cash holdings to assets did not grow at the same rate of the smaller firms (Figures 4c and 4d).

C. Determinants of Net Leverage

To understand the determinants of net leverage, I estimate the following regression specification:

$$Y_{i,t} = \beta X_{i,t-1} + \delta_t + \mathrm{v}_j + \varepsilon_{i,t}, \qquad (1)$$

where $Y_{i,t}$ is net leverage, leverage, or cash of firm *i* at time *t*. The vector $X_{i,t}$ controls for firm lagged characteristics that include the natural logarithm of assets, Tobin's Q, profitability (earnings divided by assets), and tangibility (net property, plant, and equipment divided by assets). $\delta_{j,t}$ represents year fixed effects, and v_j represents four-digit SIC industry fixed-effects.

I report the results of this analysis in Table IV, where in columns (1)–(3), I include only firm characteristics – log(assets), Tobin's Q, profitability, and tangibility – and in columns (4)–(6), I include the interactions between size quartile and the 10-year Treasury.[12]

[12] I winsorize these variables at the 1st and 99th percentiles.

In column (1) of Table IV, I report the results from estimating Regression (1) using net leverage as the dependent variable. As column (1) shows, larger firms have higher net leverage ratios, while firms with higher Tobin's Q (measured using the market-to-book ratio) have lower net leverage. Moreover, and as documented in the empirical capital structure literature, more profitable firms have lower net leverage, whereas firms with a higher proportion of fixed assets on their balance sheets (measured by *tangibility*) have higher leverage. To gain a better understanding of net leverage, I now turn to decompose net leverage into leverage and cash and estimate Regression (1) separately for each variable. The second column of the table repeats the analysis using leverage (instead of net leverage) as the dependent variable. Column (3) of Table IV presents the results for the cash regression. Consistent with the cross-sectional univariate statistics presented in Table III, I find that smaller firms tend to hoard more cash. Similarly, firms with higher Tobin's Q tend to hold more cash, and more profitable firms hold less cash. Finally, and to some extent mechanically, firms with a higher proportion of tangible assets on their balance sheets tend to hold less cash.

After documenting that firm size is perhaps the most important determinant of cash holdings (see also Table III), and given that the trend in increased cash holdings also coincides with declining interest rates (Figure IV), I now turn to investigate the combined effects of firm size and low interest rates on cash holdings, leverage, and net leverage. Columns (4)–(6) report the results from estimating the following regression:

$$Y_{i,t} = \beta X_{i,t-1} + \theta * Asset\ Quartile_{i,t-1} * \ 10Y_t + \delta_t + v_j + \varepsilon_{i,t}, \qquad (2)$$

where $Y_{i,t}$ is net leverage, leverage, or cash of firm *i* at time *t*. The vector $X_{i,t}$ controls for firm lagged characteristics that include the natural logarithm of assets, Tobin's Q, profitability (earnings divided by assets), and tangibility (net property, plant, and equipment divided by assets). $Asset\ Quartile_{i,t-1}$ is a vector of indicator variables that equals one if firm *i* is in each one of the four assets-based size quartiles, and zero otherwise, and $10Y_t$ is the rate on the 10-year constant maturity Treasury. $\delta_{j,t}$ represents year fixed effects, and v_j represents four-digit SIC industry fixed-effects. The main coefficients of interest in Regression (2) are those in the θ vector, which captures the sensitivity of the size quartile to the level of interest rate in affecting leverage, cash, and net leverage. The fourth quartile is the omitted category in the regressions reported in columns (4)–(6), hence all the reported quartile estimates are relative to the largest firms quartile.

As column (4) of Table IV shows, leverage of firms in the first and second size quartiles tend to be higher than that of firms in the third and fourth size quartiles during periods of high interest rates. These results imply that large firms become more leveraged during times of low rates – perhaps since they can more easily access the bond market (Benmelech and Becker (2021)). Column (5) of the table documents the opposite effect of interest rates and firm size on cash holdings. The interaction between the first two asset quartiles and the 10-year Treasury is negative and statistically significant, suggesting that smaller firms hoard more cash when interest rates are low. Indeed, these regression estimates are consistent with the evidence in Figures 3a and 3b.

In Table IV, column (6), I estimate the final specification that uses net leverage as the dependent variable. Here, I essentially estimate the overall effect of interest rates on the net leverage position of the firm. Since the results in column (4) show that smaller firms tend to decrease their leverage when the interest rate is low as well as to hoard cash (column (5)), the expected overall effect of low interest rates is to lower net leverage. This is exactly what column (6) shows: firms in the first two quartiles of assets have lower net leverage (compared to larger firms) in periods of low interest rates.

III. What Do Firms Do with the Funds from Debt Financing?

To understand the potential effects of leverage on financial and operational outcomes and shed more light on the relation between debt and cash, I next analyze what firms do with the funds they raise from debt financing. I first describe the empirical strategy for measuring the financial and operational uses of debt.

A. Empirical Strategy

The difficulty in identifying the uses of debt stems from the fact that firms do not report how they allocate the capital they raise to different uses. To gain insight into those uses, I estimate the following flow-based regression:

$$\Delta Y_{i,m,t} = \alpha + \beta_m * debt\ issuance_{i.t} + \theta X_{i,t-1} + \delta_t + \mathrm{v}_j + \varepsilon_{i,t}, \qquad (3)$$

where $\Delta Y_{i,m,t}$ is one of the following: (1) debt repayment, (2) acquisitions, (3) investment, (4) change in cash, (5) selling, general, and administration expenses, (6) share repurchases, or (7) dividend payments. All the dependent variables are scaled by lagged assets. The main explanatory variable is either gross or net long-term debt issuance during the year. The vector $X_{i,t}$ controls for firm lagged characteristics that include the natural logarithm of assets, Tobin's Q, profitability (earning divided by assets), cash divided by assets, and leverage. $\delta_{j,t}$ represents year fixed effects, and v_j represents four-digit SIC industry fixed-effects. The main coefficients of interest in Regression (3) are β_m, which capture the fraction of a dollar raised by debt that is allocated to each outcome variable.

B. Financial and Operational Uses of Debt Issuance

I estimate regressions based on Equation (3) and report the results in Table V. Panel A reports results based on gross debt issuance, while Panel B presents results based on net debt issuance. All regressions include year and industry fixed effects, as well as firm characteristics, and standard errors are clustered at the firm level.

The coefficient on *LT Debt Issuance* in column (1) of Panel A of Table V is 0.544 and statistically significant, suggesting that more than half of gross long-term debt proceeds go to repaying maturing debt as well as redemptions of callable debt.[13] Column (2) shows that 0.131 of each dollar raised with debt

[13] Compustat data does not distinguish between scheduled payment of maturing debt and prepayments or early redemptions of debt.

(scaled by assets) is spent on acquisitions, and according to column (3), 0.091 of each dollar is used for capital expenditures, or investment. Further, 0.071 of each dollar raised by debt is held in cash and around 0.04 is used to finance selling, general, and administrative expenses (SG&A). There is no evidence for an economically meaningful use of debt in share repurchases or dividend payments. Interestingly, even though I do not impose any structure on the regressions presented in Table V, which are estimated independently from each other – the sum of the β_m – the coefficients on long-term debt issuance is 0.88, which suggests that the dependent variables in Panel A capture most of the financial and operational uses of debt.

In Panel B I focus on net debt issuance (i.e., gross debt issuance – debt repayment) and reestimate Regression (3) for the sample of firms with positive net debt issuance. Although there are between 49,677 and 60,226 firm-year observations in Panel A, conditional on having data on the dependent variables, there are between 19,373 and 24,790 firm-year observations with positive net debt issuance. The estimates in Panel B suggest that after making their scheduled principal payments as well as debt redemptions, firms spend about 0.279 of each dollar of debt scaled by assets on acquisitions, spend 0.144 on investment, add 0.261 to cash, and use 0.129 for SG&A.

C. Debt Uses over Time

After identifying the main financial and operational uses of debt, I next document how those uses have changed over time. I estimate decadal regressions of Equation (3) using net long-term debt issuance as the main explanatory variable in addition to the natural logarithm of assets, Tobin's Q, cash holdings, leverage, and year and industry fixed-effects. The results are reported in Table VI. The coefficients on firm characteristics are omitted from the table for brevity.

Panel A of Table VI shows that for firms with positive net long-term debt issuance during the decade 1970 to 1979, about 0.30 of each dollar (scaled by assets) raised by debt was used for investment and 0.09 was retained in cash. In addition, acquisitions account for 0.202 of each dollar of debt during the 1970s. During the decade 1980 to 1989, the coefficient on investment declined from 0.209 to 0.162, while the coefficient on $\Delta cash$ increased to 0.228. In addition, the coefficient on acquisitions increased from

0.202 to 0.241, and the coefficient on SG&A increased from a nonstatistically significant 0.031 to 0.116 (significant at the 1% level). The pattern of decline in the share of debt used to fund investment, accompanied by the rise in the amount of debt funds added to cash, continued in the 1990s. By the decade 2000 to 2009, only 0.10 of debt was used to fund investment, and 0.387 of each dollar of debt was added to cash reserves. As Panel F of Table VI shows, between 2010 and 2019, only 0.067 of debt issued was used for investment, while 0.332 and 0.271, respectively, were used for acquisitions and change in cash.

The time-series pattern that emerges from Table VI is consistent with the facts documented in Figures 1 and 3a–3d as well as with the literature on the decline in firm investment (Alexander and Eberly (2018); Eberly and Crouzet (2019)). Firms choose to issue debt, and instead of investing it in property, plant, and equipment, they hoard the cash and increase corporate savings.

Next, I investigate how firms of different size use debt to fund their financial and operational activities. I estimate regressions based on Equation (3) for each size quartile separately for the period 2000 to 2019 and report the results in Table VII.[14] The table is organized such that the results for all the outcome variables of the first quartile (smallest firms) are reported in the first column and those for the fourth quartile (largest firms) are reported in the last column. Similar to Panel B of Tables V and VI, the subsamples used in Table VII include firm-year observations with positive net debt.

As Table VII shows, large firms use much more of their net debt proceeds to fund acquisitions (0.545 for firms in the largest size quartile, compared to 0.093 for firms in the smallest size quartile). Likewise, larger firms use a greater fraction of their net debt issuance to fund investment compared to smaller firms (0.180 for firms in the largest size quartile, compared to 0.032 for firms in the smallest size quartile).

And yet, smaller firms tend to save more out of net debt. Firms in the first and second size quartile allocate 0.281 and 0.368, respectively, of each dollar of net debt scaled by assets, compared to 0.175 for firms in

[14] As in Table VI, the coefficients on firm characteristics are omitted from the table for brevity.

the fourth quartile. These results are consistent with evidence in Table III, which shows that smaller firms have higher holdings of cash and short-term investments as a fraction of total assets.

IV. Interest Rates and Interest Expenses

A. The Decline in Bond Yields

Interest rates have declined significantly worldwide. For example, in the United States, the 10-year Treasury peaked at 15.85% in September 1981 and has trended downward ever since, reaching around 8% by the end of 1990, 5.1% in December 2000, 3.3% in December 2010, and hitting its lowest level, 0.70%, in May 2020. In this section I study the consequences of declining interest rates to firms' interest expenses and investments.

Figure 5a plots mean bond yields at issuance by credit rating from 1980 to 2020. In each year I calculate the simple average of yields on nonconvertible bonds issued by nonfinancial firms using Mergent data. As Figure 5a illustrates, average bond yields declined from over 0.15 in the early 1980s to about 0.02 in 2020. The figure also shows that while the decline in bond yields was most pronounced for highly rated bonds, even risky bonds saw significant declines, ranging from 0.14 in the early 1980s to around 0.05 in following the Global Financial Crisis. Figure 5b shows similar patterns when calculating weighted-average yields using bond issue amounts as weights. Figure 6 plots mean bond spreads at issuance over maturity-matched Treasury. As Figure 6 shows, credit spreads do not show noticeable trends over time. Rather, most of the time variation in spreads appears cyclical, especially for riskier bonds. The combined evidence from Figures 5a, 5b, and 6 suggests that the decline in bond yields was driven largely by the downward trend in the yields on government bonds rather than by compensation for risk.

B. The Decline in Interest Expenses

To supplement the evidence on declining bond yields and to extend the analysis to firms that may rely on bank debt instead of bond issuance, I calculate the average interest on debt using Compustat data. Table

VII lists the mean and median interest expenses/debt over time from 1970 to 2020. As the table shows, mean (median) interest/debt was 7.283% (6.54%) in 1970, increasing to 9.774% (8.378%) in 1975, and reaching 12.704% (10.634%) in 1980. The median interest/debt was 10.267% in 1990 and declined to 8.614% in 1995 and to 8.609% by 2000. The rate that firms pay on their debt continued to decline in 2000s with a median of 6.868% in 2005 falling to 5.167% in 2015 and shrinking even further to 4.259% by 2020.

The table also splits the sample into investment-grade (S&P rating of BBB− or better) and below-investment-grade firms and reports mean and median interest/debt for each group between 1990 and 2020.[15] As Table VII shows, mean interest/debt for investment-grade firms declined from 9.868% in 1990 to 8.431% in 2000, 5.756% in 2010, and 3.832% in 2020. Interest rates paid by below-investment-grade firms were higher – reflecting their higher credit spread – but declined dramatically from a mean of 12.585% in 1990 to 10.690% in 2000, 8.575% in 2010, and 6.031% in 2020. Figure 7a depicts the evolution of median interest/debt over time from 1975 to 2020 as well as the median leverage. As the figure illustrates, although there was a clear downward trend in interest/debt, median leverage, after hitting its lowest level in 2010, has generally been increasing since then.

Given that some firms responded to declining rates by increasing leverage, it may be better to examine the behavior of the ratio of interest expenses to assets. Figure 7b does exactly that by plotting median interest expenses to assets against median leverage. As the figure shows, the decline in interest expenses/assets over time plateaued after 2010 – around the same time that median leverage began to increase. Nevertheless, because interest rates continued to fall after 2010, the increase in leverage during these years did not lead to higher interest expenses relative to assets.

Table VIII documents median and mean interest expenses to assets for the entire sample as well as for firms with low, moderate, and high leverage ratios. As the table shows, median interest expenses/assets were 0.018 in 1970 and then rose to 0.030 in 1980 before staying between 0.028 and 0.029 in 1985 and 1990, respectively. By 2000 median interest expenses divided by assets was 0.024, and the ratio declined

[15] Issuer-level rating from Compustat is available from 1986 onward.

to 0.016 in 2010 and 0.013 in 2020. For firms with a positive amount of debt but with leverage ratios below 0.20, median interest expenses to assets declined from 0.012 in 1980 to 0.008 in 2000 and to 0.002 in 2020. For firms with a leverage ratio above 0.2 but below 0.3 (moderate leverage), median interest expenses to assets declined from 0.026 in 1980 to 0.020 in 2000 and to 0.010 in 2020. Finally, median interest expenses to assets of firms with high leverage (above 0.3) were 0.04 in 1980, 0.037 in 2000, and 0.021 in 2020. Similarly, Table VIII also reports median interest expenses/assets separately for investment-grade and below-investment-grade firms. The median interest expenses/assets for an investment-grade firm was 0.044 in 1990 and declined to 0.030 in 2010 and to 0.032 in 2020. The ratio of investment-grade median interest expenses to assets was 0.027 in 1990 and declined to 0.016 in 2010 and to 0.012 in 2020.

V. Interest Expenses and Investment

The evidence in the previous section shows that interest expenses –relative to either total debt or total assets – declined significantly as Treasury rates trended down. In this section I study the effect of a firm's interest expenses on investment.

A. Baseline Results

In order to test the effect of interest expenses on investment, I estimate the following regression specification:

$$Inv_{i,t} = \beta * interest\ expenses_{i,t} + \theta X_{i,j,t} + \mathrm{v}_j + \varepsilon_{i,t}, \qquad (4)$$

where $Inv_{i,t}$ is capital expenditure scaled by lagged assets. The variable $interest\ expenses_{i,t}$ equals to interest expenses divided by total debt. $X_{i,t-1}$ is a vector of lagged firm characteristics that include the natural logarithm of assets, Tobin's Q, profitability (earning divided by assets), cash divided by assets, and leverage. $\delta_{j,t}$ represents year fixed effects, and v_j represents four-digit SIC industry fixed effects. The key coefficient of interest is β, which measures the effect of interest expenses on investment. Clearly, the main concern about this specification is the endogeneity of interest expenses – which I attempt to alleviate in the rest of the analysis.

I report the results of this analysis in column (1) of Table IX. The coefficient on *Q* suggests that firms with higher investment opportunities invest more. Moreover, and consistent with the empirical literature on liquidity constraints, profitability is positively correlated with investment while leverage is negatively correlated with investment to assets. Most important for the baseline analysis, interest expenses are negative correlated with investment, suggesting that, when we control for leverage, higher interest expenses are associated with lower investment.[16]

The negative coefficient estimate on interest expenses suffers from a potential endogeneity problem in which firms with worse investment opportunities are also riskier, and hence the interest that they pay on their debt is higher. In column (2) of the table I attempt to alleviate such a concern by including credit rating fixed effects. There are 21 ratings categories, and by saturating the regressions with credit rating dummies, I attempt to absorb variation related to credit risk. The inclusion of credit rating reduces the sample significantly from 34,780 to 10,263 because rating data are available only from 1986 onward and many firms are unrated. Nevertheless, the coefficient on interest expenses is negative and statistically significant at the 1% level after controlling for rating dummies.

B. Identifying the Effect of Interest Expenses Using the Maturing Debt Approach

To better identify the effect of interest expenses on investment, I follow the "maturing-debt" approach of Almeida et al. (2012), Benmelech, Frydman, and Papanikolaou (2019), and Benmelech, Bergman, and Seru (2021). In the context of the papers above, the empirical approach is used to exploit heterogeneity in the maturity of long-term debt across firms and tests whether firms with long-term debt maturing in a particular year reduce their investment by more than those firms not facing the need to refinance maturing long-term debt. Assuming that external finance is costly (e.g., Myers and Majluf (1984)), the conjecture is that firms

[16] Chava and Roberts (2008) demonstrate that investment is sensitive to financing using covenants violations. Rauh (2006) uses defined-benefit pensions funding needs to identify the effect of financial constraints on investment.

which must finance large amount of maturing long-term debt will adjust their real activity accordingly and reduce investment.

To identify the effect of interest expenses on investment, I interact maturing debt with the 10-year Treasury rate at the year in which the debt is maturing. The premise behind this approach is that when firms roll over their debt, they are issuing new debt at the rate prevailing in the market at that time. And to the extent that this rate is higher (lower) than the historical rate they paid on the maturing debt, their interest expenses will change.

The identification strategy hinges on the assumption that variation in the amount of long-term debt maturing in any given year is exogenous to corporate outcomes in that particular year. To lend credence to this assumption, the identification strategy relies on exploiting debt that was issued several years before the year examined. For example, I examine investment by firms that in year *t* have a large amount of maturing debt issued at least two, three, or four years before *t* and compare it to firms that have a small amount of debt maturing in year *t*. Since this portion of maturing debt was issued long before the year of maturity, variation in its level is arguably exogenous to market conditions, interest rates, and investment opportunities that prevail when the debt becomes due.

I estimate the following regression specification:

$$Inv_{i,t} = \beta_1 * LT\ debt\ due_{i,t} * 10Y\ rate_t + \beta_2 * LT\ debt\ due_{i,t} * Spread_t + \theta X_{i,j,t} + \mathrm{v}_j + \varepsilon_{i,t}, \quad (5)$$

where $Inv_{i,t}$ is capital expenditure scaled by lagged assets. The variable $LT\ debt\ due_{i,t}$ is the amount of long-term debt due each year that was issued two, three, and four years earlier divided by lagged assets. 10Y is the 10-year Treasury, and $LT\ debt\ due_{i,t} * 10Y\ rate$ is the interaction between the maturing debt variable and the 10-year Treasury and is designed to capture exogenous variations in interest expenses stemming from the prevailing Treasury rate at the time of debt rollover. $LT\ debt\ due_{i,t} * Spread_t$ is an interaction between the maturing debt variable and the Aaa–Baa spread and is designed to capture exogenous variation in the ability to roll over debt.[17] $X_{i,t-1}$ is a vector of lagged firm characteristics that include the natural logarithm of assets, Tobin's Q, profitability (earning divided by assets), cash divided by assets, and leverage. $\delta_{j,t}$ represents year fixed effects, and v_j represents four-digit SIC industry fixed-effects. The key coefficient of interest is β_1, which measures the effect of higher interest rates in time of debt rollover on investment.

As column (3) of Table IX demonstrates, I find a negative and statistically significant relation between the interaction of maturing debt and the 10-year Treasury and firm investment after controlling for firm characteristics and year and four-digit SIC effects. The coefficient of –0.531 (statistically significant at the 5% level) implies that firms that have maturing debt that requires refinancing and that amounts to 10% of their assets when the treasury rate is around 10% reduce their investment by 0.531%, or 7% relative to the unconditional mean. In contrast, when the 10-year Treasury rate is 2% investment is reduced by only 0.106%, or 1.42% relative to the unconditional mean. That is, consistent with the conjecture that refinancing maturing debt exposes the firm to prevailing rates, and similar to the baseline results in columns (1) and (2), the evidence suggests that there is an "interest expenses" channel that affects firm outcomes.

In addition to estimating the effect of maturing debt on interest expenses, the regression also captures the more traditional maturing debt mechanism in which firms may find it difficult to roll over their debt during times of disruptions in credit markets. Recall that $LT\ debt\ due_{i,t} * Spread_t$ is an interaction between the maturing debt variable and the Aaa–Baa spread and is designed to capture such rollover risks. The coeffect on that $LT\ debt\ due_{i,t} * Spread_t$ is –4.866 (statistically significant at the 1% level), confirming the notion that firms which must finance large amounts of maturing long-term debt will adjust reduce investment. The estimate implies that firms that have maturing debt that requires refinancing and amounts to 10% of their assets during disruptions in credit markets that are reflected in a Aaa–Baa spread of 200 basis points reduce their investment by 0.973%, or about 13% relative to the unconditional mean. Columns (4) and (5) repeat the analysis using different thresholds for maturing debt: long-term debt issued

[17] See Bottero et al., (2020); and Kalemli-Özcan et al., (2020).

three years ago (column (4)) and long-term debt issued four years ago (column (5)). The results in both columns (4) and (5) are very similar to those in column (3). Columns (6)–(8) repeat the analysis in columns (3)–(5) using a measure of the 10-year real rate. To calculate the real rate I assume that inflation follows a random walk and subtract from the 10-year Treasury the current inflation in lieu of expected inflation. The results in columns (6) and (7) are similar to those estimated with the nominal 10-year Treasury rate.

VI. Conclusion

The amount of corporate debt in the U.S. is currently high – and has been high already before the outbreak of the Covid-19 pandemic. But this high level of indebtedness masks substantial heterogeneity. Firms are hoarding more cash than ever before, and in terms of *net indebtedness,* smaller firms have record low net leverage. The decline in interest rates has led to a lower propensity to use debt funding to finance investment. Instead, firms are tapping into debt markets to increase their cash holdings. Finally, low interest rates have led to much lower interest expenses of firms that reduced the cash-flow burden of debt-service payments.

REFERENCES

Abraham, Facundo, Juan J. Cortina, and Sergio Schmukler, 2020, Growth of Global Corporate Debt: Main Facts and Policy Challenges, World Bank Policy Research Working Paper 9394.

Acharya, Viral, Heitor Almeida, and Murillo Campello, 2007, Is cash negative debt? A hedging perspective on corporate financial policies, *Journal of Financial Intermediation* 16, 515–554.

Adrian, Tobias, Nina Boyarchenko, and Domenico Giannone, 2019, Vulnerable Growth., *American Economic Review* 109(4), 1263–1289.

Albuquerque, Bruno, 2021, Corporate credit booms, financial constraints, and the investment nexus, Working Paper.

Bates, Thomas W., Kathleen M. Kahle, and René M. Stulz, 2009, Why do firms hold so much more cash than they used to? *Journal of Finance* 64, 1985–2021.

Benmelech, Efraim, Carola Frydman, and Dimitris Papanikolaou, 2019, Financial frictions and employment during the Great Depression, *Journal of Financial Economics* 133(1), 541-563.

Benmelech, Efraim, Nittai Bergman, and Amir Seru, 2021, Labor financing, *Review of Finance* 25(5), 1365-1393.

Benmelech, Efraim, Nitish Kumar, and Raghuram Rajan, 2021, The decline of secured debt, Working paper, University of Chicago Booth School.

Borio, Claudio, 2014, The financial cycle and macroeconomics: What have we learnt? *Journal of Banking and Finance* 45, 182–198.

Bordo, Michael D., and Joseph Haubrich, 2017, Deep recessions, fast recoveries, and financial crises: evidence from the American record, *Economic Inquiry* 55(1): 527-541.

Bottero, Margherita, Simone Lenzu, and Filippo Mezzanotti, 2020, Sovereign debt exposure and the bank lending channel: Impact on credit supply and the real economy, *Journal of International Economics* 126, Article 103328.

Chava, Sudheer, and Michael Roberts, 2008, How does financing impact investment? The role of debt covenants, *Journal of Finance* 63, 2085–2121.

Chen, Peter, Loukas Karabarbounis, and Brent Neiman, 2017, The global rise of corporate saving, *Journal of Monetary Economics* 89, 1–19.

Covas, Francisco, and Wounter Den Haan, 2011, The cyclical behavior of debt and equity finance, *American Economic Review* 101(2), 877-899.

Eisfeldt, Andrea, and Tyler Muir, 2016, Aggregate external financing and saving waves, *Journal of Monetary Economics* 84, 116–133.

Giesecke, Kay, Francis A., Longstaff, Stephen Schaefer and Ilya Strebulaev, 2014, Macroeconomic effects of corporate default crises: A long-term perspective, *Journal of Financial Economics* 111(2), 297-310.

Graham, John R., Mark T. Leary, and Michael R. Roberts, 2015, A century of corporate capital structure: The leveraging of corporate America, *Journal of Financial Economics* 118, 658–683.

Gurkaynak, Refet S., Brian Sack, and Jonathan H. Wright, 2007, The U.S. Treasury Yield Curve: 1961 to the Present, *Journal of Monetary Economics* 54, 2291–2304.

Ivashina, Victoria, Luc Laeven, and Enrique Moral-Benito, 2020, Loan types and the bank lending channel, Working paper, Harvard University.

Jorda, Oscar, Moritz Schularick and Alan M. Taylor, 2013, When credit bites back, *Journal of Money, Credit and Banking* 45(2), 2-38.

Leary, Mark T., and Michael Roberts, 2005, Do firms rebalance their capital structures? *Journal of Finance* 60(6), 2575-2619.

Kalemli-Özcan, Sebnem, Luc Laeven, and David Moreno, 2020, Debt overhang, rollover risk and corporate investment: Evidence from the European crisis, ECB Working Paper 2241.

Kaplan, Steven N., and Luigi Zingales, 1997, Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics* 112(1), 169-215.

Whited, Toni M. and Yufeng Wu, 2006, Financial constraints risks, *Review of Financial Studies* 19(2), 531-559.

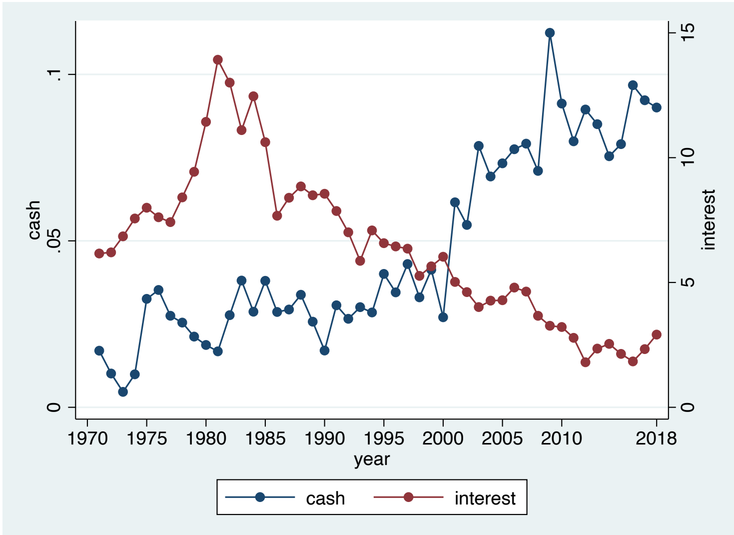
Myers, Stewart C., and Nicholas S. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, 187–221.

Rajan, Raghuram G., and Luigi Zingales, 1995, What do we know about capital structure? Some evidence from international data, *Journal of Finance* 50(5), 1421-1460.

Reinhart, Carmen M., and Kenneth S. Rogoff, 2014, Recovery from financial crises: Evidence from 100 episodes, *American Economic Review* 104(5), 50-55.

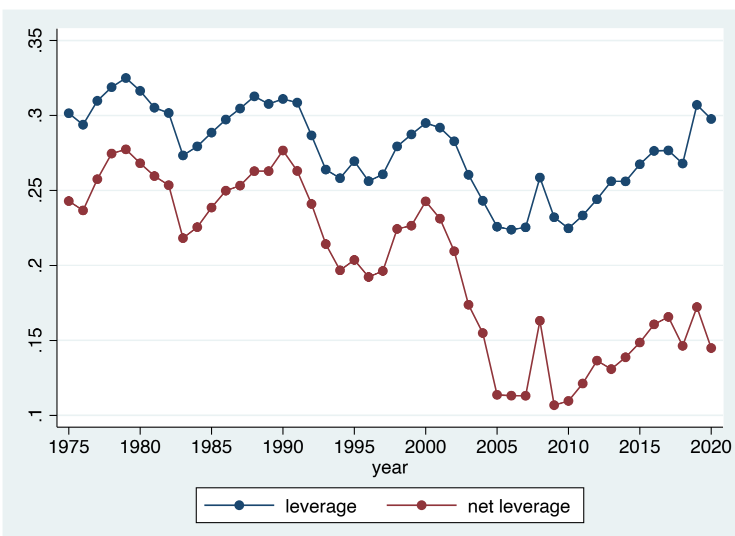
Schularick, Moritz, 2021, Corporate indebtedness and macroeconomic stablisation from a long-term perspective, Working paper.

Figure 1: Cash Holdings and Ten-Year Treasury Over Time, 1970-2018



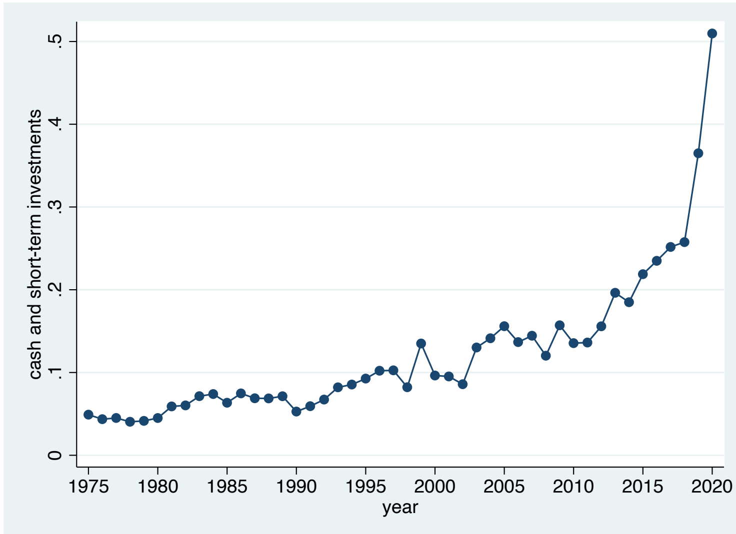
This figure displays coefficients from a regression in which the dependent variable is cash/assets and that includes firm characteristics and industry and year fixed-effects. Source: Compustat and FRED.

Figure 2: Median Leverage and Net Leverage, 1975-2020



This figure displays median leverage and net leverage from 1975 until 2020. Source: Compustat.

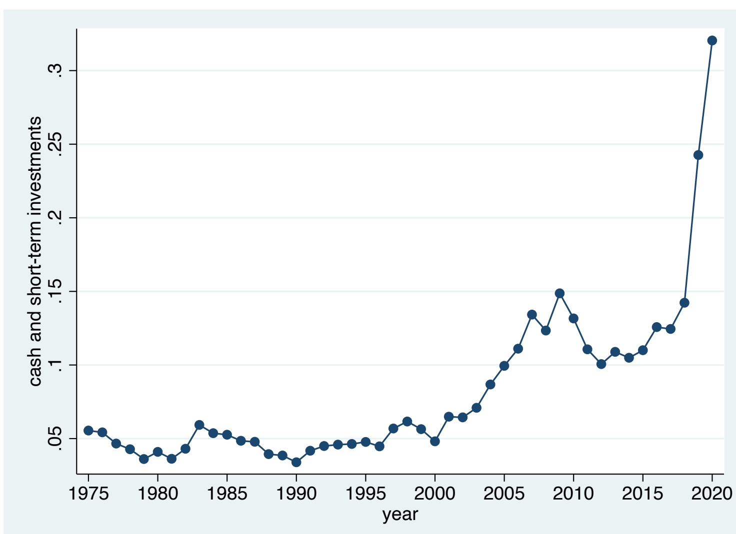
Figure 3a: Median Cash Holdings: First Size Quartile, 1975-2020



This figure displays median cash holdings by firms that are in the first quartile of the size (measured by total assets) distribution.

Source: Compustat.

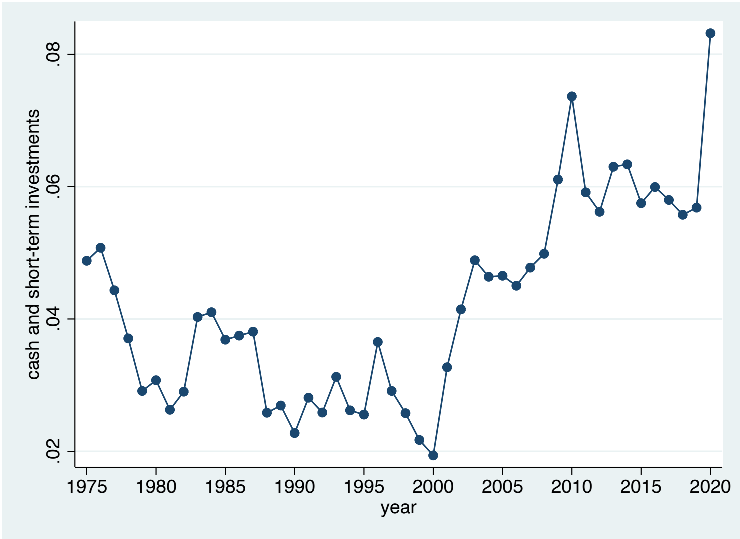
Figure 3b: Median Cash Holdings: Second Size Quartile, 1975-2020



This figure displays median cash holdings by firms that are in the second quartile of the size (measured by total assets) distribution.

Source: Compustat.

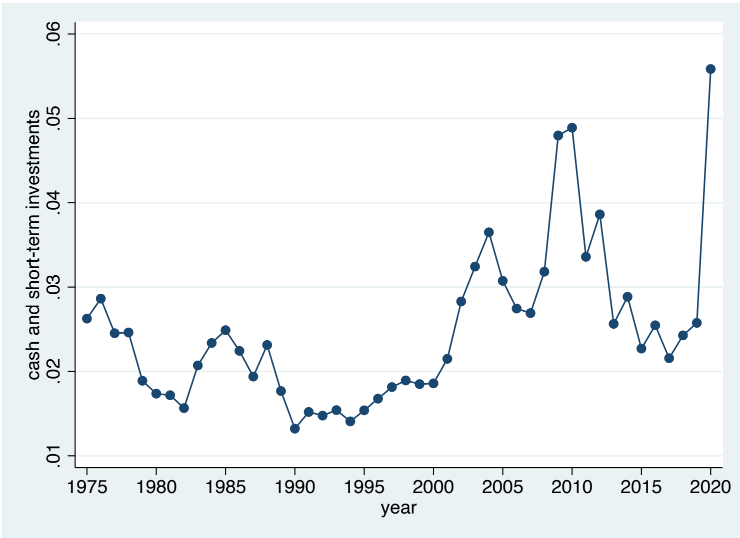
Figure 3c: Median Cash Holdings: Third Size Quartile, 1975-2020



This figure displays median cash holdings by firms that are in the third quartile of the size (measured by total assets) distribution.

Source: Compustat.

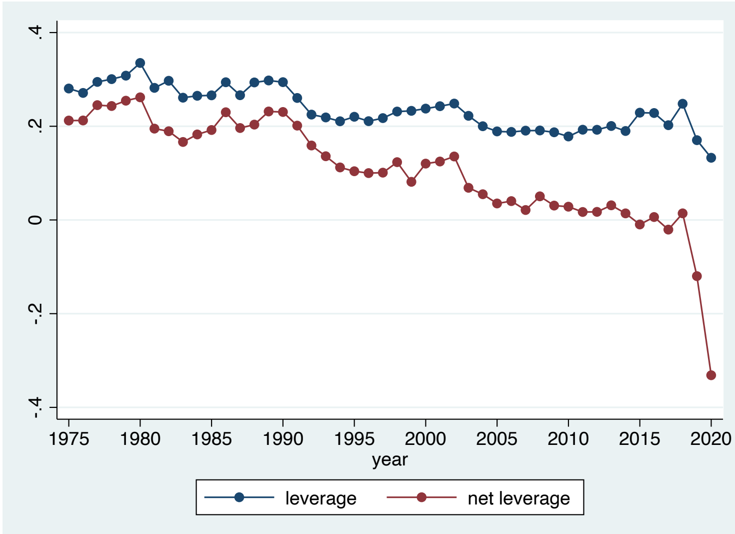
Figure 3d: Median Cash Holdings: Fourth Size Quartile, 1975-2020



This figure displays median cash holdings by firms that are in the fourth quartile of the size (measured by total assets) distribution.

Source: Compustat.

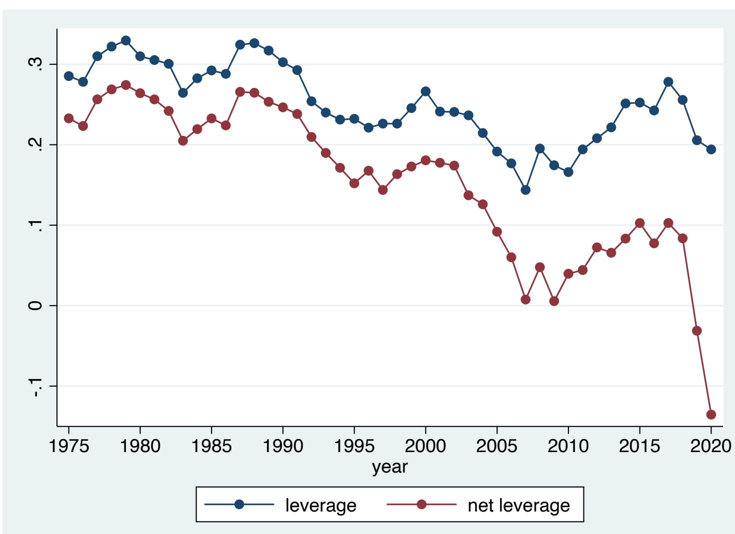
Figure 4a: Median Leverage and Net Leverage: First Size Quartile, 1975-2020



This figure displays median leverage and net leverage of firms that are in the first quartile of the size (measured by total assets) distribution.

Source: Compustat.

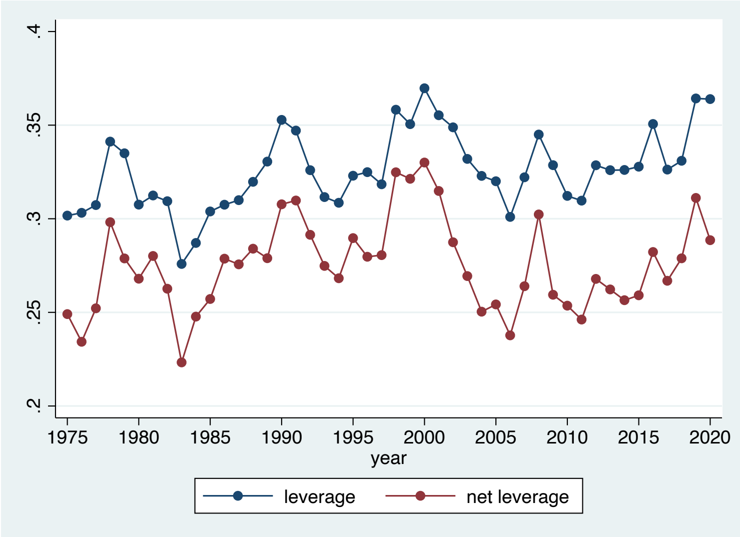
Figure 4b: Median Leverage and Net Leverage: Second Size Quartile, 1975-2020



This figure displays median leverage and net leverage of firms that are in the second quartile of the size (measured by total assets) distribution.

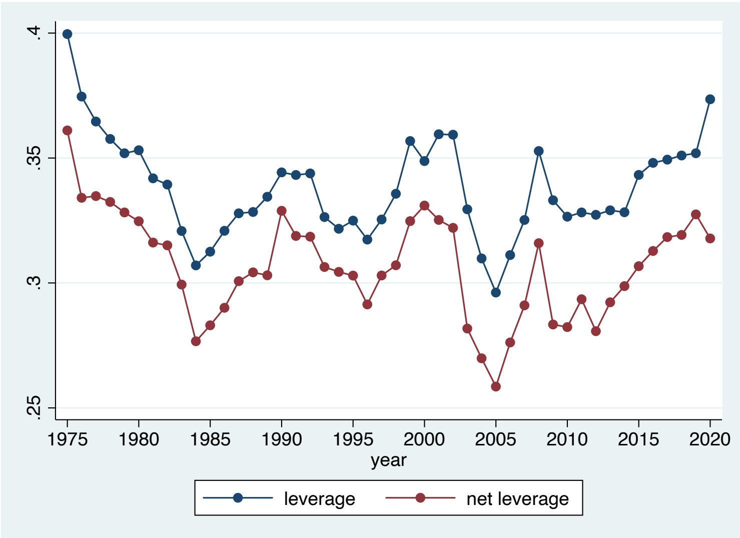
Source: Compustat.

Figure 4c: Median Leverage and Net Leverage: Third Size Quartile, 1975-2020



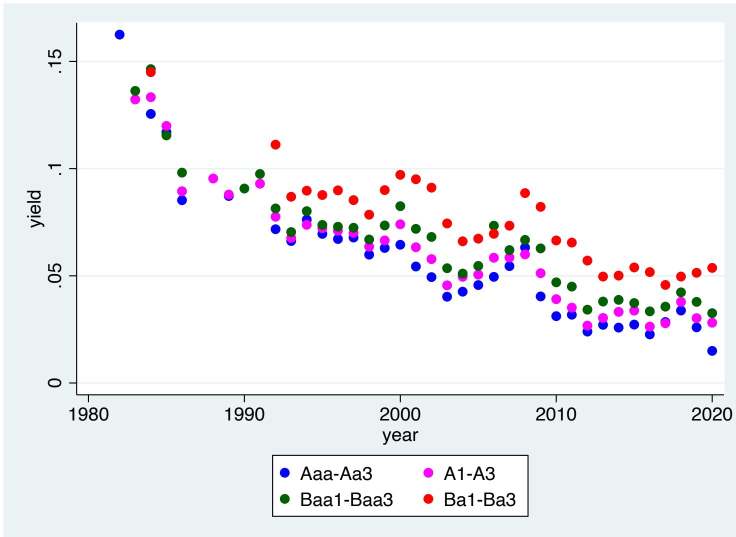
This figure displays median leverage and net leverage of firms that are in the third quartile of the size (measured by total assets) distribution.
Source: Compustat.

Figure 4d: Median Leverage and Net Leverage: Fourth Size Quartile, 1975-2020



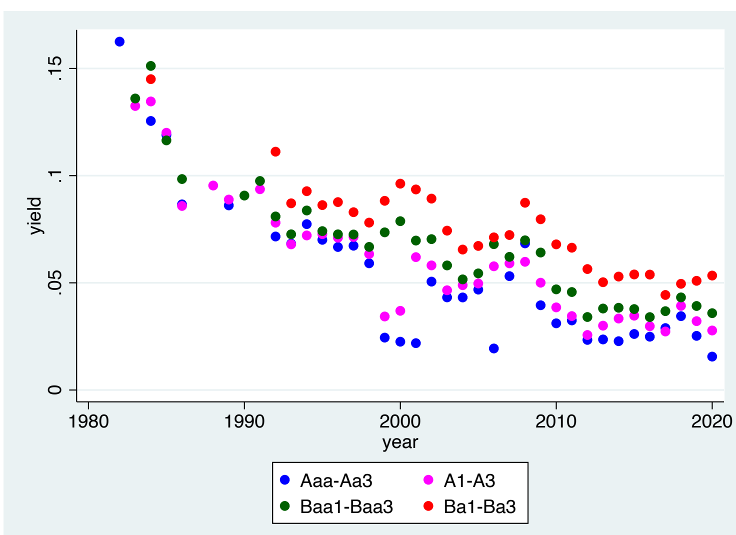
This figure displays median leverage and net leverage of firms that are in the fourth quartile of the size (measured by total assets) distribution.
Source: Compustat.

Figure 5a: Mean bond yields at issuance by credit rating, 1980-2020



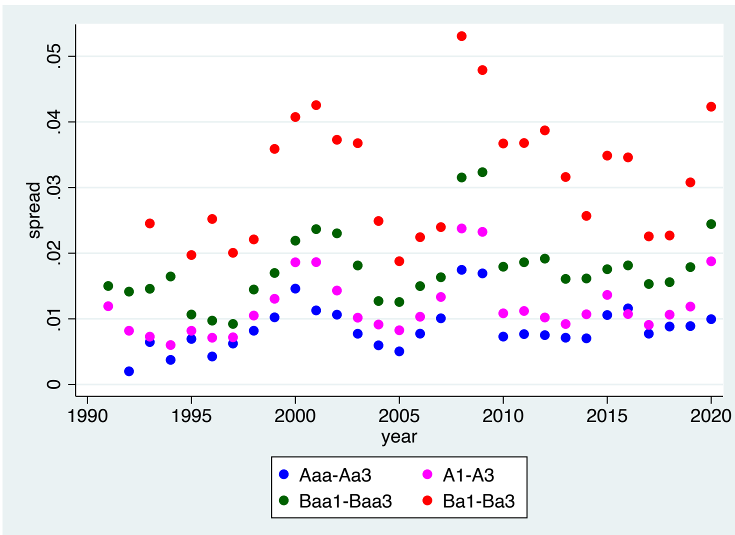
This figure displays mean bond yields by credit ratings between 1980 and 2020.
Source: Mergent.

Figure 5b: Weighted mean bond yields at issuance by credit rating, 1980-2020



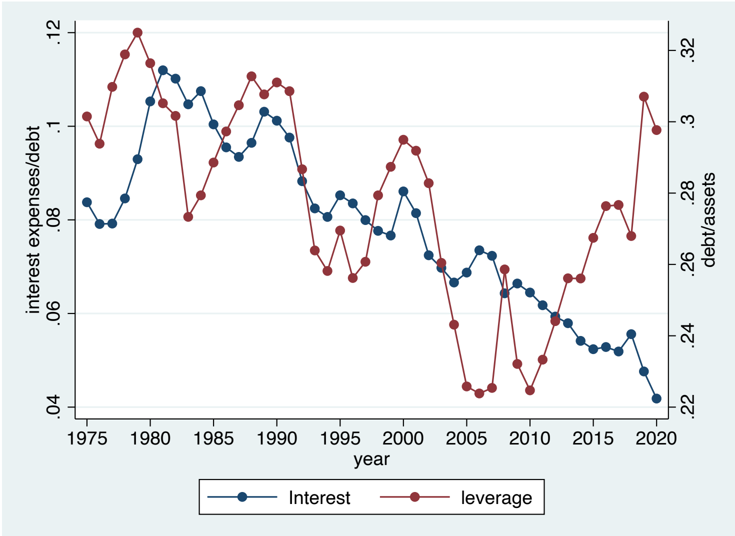
This figure displays weighted mean bond yields by credit ratings between 1980 and 2020.
Source: Mergent.

Figure 6: Mean bond spreads at issuance by credit rating, 1990-2020



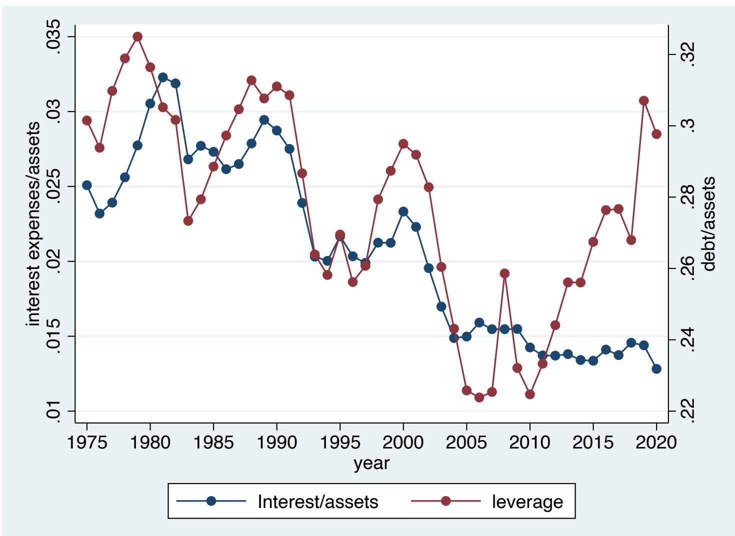
This figure displays mean bond spreads by credit ratings between 1990 and 2020. Source: Mergent.

Figure 7a: Median Leverage and Interest Expenses to Debt , 1980-2020



This figure displays median leverage and interest expenses to debt between 1975 and 2020. Source: Compustat.

Figure 7b: Median Leverage and Interest Expenses to Assets , 1980-2020



This figure displays median leverage and interest expenses to assets between 1975 and 2020. Source: Compustat.

Table I Leverage and Net Leverage: Summary Statistics

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Observations
Cash and ST Investments	0.121	0.174	0.018	0.054	0.142	84,223
Leverage (including leases)	0.314	0.241	0.152	0.287	0.423	76,224
Net Leverage (including leases)	0.191	0.330	0.034	0.218	0.374	76,222
Leverage (excluding leases)	0.305	0.230	0.149	0.281	0.414	85,728
Net Leverage (excluding leases)	0.181	0.318	0.030	0.206	0.359	84,038

This table reports summary statistics for different measures of leverage and cash.

Table II: Leverage, Net Leverage, and Cash over Time

	(1)	(2)	(3)	(4)	(5)
Year	Leverage (including leases)	Leverage (excluding leases)	Net Leverage (including leases)	Net Leverage (excluding leases)	Cash & ST Investments
1970	0.289	0.313	0.219	0.211	0.073
1975	0.307	0.295	0.237	0.225	0.071
1980	0.314	0.289	0.248	0.223	0.066
1985	0.310	0.290	0.213	0.195	0.095
1990	0.330	0.321	0.245	0.238	0.082
1995	0.295	0.285	0.177	0.169	0.116
2000	0.334	0.328	0.201	0.198	0.130
2005	0.299	0.295	0.140	0.142	0.154
2010	0.302	0.298	0.146	0.146	0.153
2015	0.349	0.343	0.180	0.181	0.163
2018	0.362	0.355	0.180	0.180	0.176
2019	0.353	0.340	0.123	0.115	0.225
2020	0.329	0.317	0.045	0.039	0.278

This table displays the evolution of leverage and cash holdings over time.

Table III: Leverage, Net Leverage, and Cash by Firm Size Quartiles

Year	(1) Leverage (including leases)	(2) Leverage (excluding leases)	(3) Net Leverage (including leases)	(4) Net Leverage (excluding leases)	(5) Cash & ST Investment
First Quartile	0.303	0.288	0.105	0.092	0.196
Second Quartile	0.286	0.275	0.145	0.134	0.140
Third Quartile	0.330	0.320	0.242	0.229	0.088
Fourth Quartile	0.343	0.335	0.279	0.263	0.065

This table presents average leverage and cash holdings stratified by firm size quartiles.

Table IV Determinants of Net Debt

Dependent Variable	Net Leverage	Leverage	Cash	Leverage	Cash	Net Leverage
Log(assets)_{t-1}	0.035**	-0.0005	-0.004 ***			
	(0.0015)	(0.001)	(0.001)			
Q_{t-1}	-0.026 ***	0.0004	0.027 ***	-0.001	0.028 ***	-0.029 ***
	(0.004)	(0.003)	(0.002)	(0.003)	(0.002)	(0.004)
$\text{Profitability}_{t-1}$	-0.130 ***	-0.187 ***.	-0.057 ***	-0.210 ***	-0.054 ***	-0.156 ***
	(0.013)	(0.010)	(0.008)	(0.011)	(0.007)	(0.013)
Tangibility_{t-1}	0.349 ***	0.163 ***	-0.186 ***	0.160 ***	-0.185 ***	0.344 ***
	(0.018)	(0.014)	(0.009)	(0.014)	(0.008)	(0.018)
Assets Quartile 1_{t-1}				-0.083 ***	0.074 ***	-0.157 ***
				(0.013)	(0.008)	(0.017)
$\times$ 10Y Treasury_t				1.003 ***	-0.696***	1.699 ***
				(0.171)	(0.104)	(0.222)
Assets Quartile 2_{t-1}				-0.072 ***	0.088 ***	-0.159 ***
				(0.011)	(0.007)	(0.014)
$\times$ 10Y Treasury_t				0.807 ***	-0.707 ***	1.514 ***
				(0.144)	(0.085)	(0.180)
Assets Quartile 3_{t-1}				0.016	0.032 ***	-0.015
				(0.010)	(0.006)	(0.013)
$\times$ 10Y Treasury_t				-0.094	-0.221 ***	0.126
				(0.134)	(0.071)	(0.165)
Adjusted R^2	0.281	0.172	0.472	0.180	0.461	0.283
Observations	63,108	63,109	63,108	61,892	61,891	61,891
Fixed Effects						
year	Yes	Yes	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results of OLS regressions relating net leverage, leverage and cash to firm characteristics. The dependent variable is one of the following: (net debt)/total assets, debt/total assets or (cash & ST investments)/total assets. All regressions include lagged values of the natural logarithm of book assets, Tobin's Q, profitability, and tangibility, as well as interactions between size quartile and the 10-year Treasury rate. All regressions include 4-digit SIC industry and year fixed effects. The regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table V: Financial and Operational Uses of Debt Issuance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Panel A: Gross Debt Issuance			
Dependent Variable	Debt Repayment	Acquisition	Investment	ΔCash	SG&A	Share Repurchase	Dividends
LT Debt Issuance$_t$	0.544 ***	0.131 ***	0.091 ***	0.071 ***	0.039***	0.000	-0.003 ***
	(0.009)	(0.005)	(0.004)	(0.008)	(0.010)	(0.001)	(0.001)
Q$_{t-1}$	-0.010 ***	0.003 ***	0.018 ***	0.032 ***	0.106 ***	0.004 ***	0.005 ***
	(0.001)	(0.0005)	(0.0008)	(0.002)	(0.005)	(0.0003)	(0.0003)
Cash$_{t-1}$	-0.023 ***	0.020 ***	0.002	-0.143 ***	-0.175 ***	0.001	-0.004
	(0.004)	(0.003)	(0,003)	(0.011)	(0.018)	(0.001)	(0.002)
log(Assets)$_{t-1}$	-0.002 ***	0.003 ***	0.0002	0.004 ***	-0.031 ***	0.002 ***	0.002 ***
	(0.0003)	(0.0002)	(0.0003)	(0.001)	(0.002)	(0.0001)	(0.0001)
Profitability$_{t-1}$	0.034 ***	0.021 ***	0.038 ***	-0.050 ***	-0.542 ***	0.008 ***	0.010 ***
	(0.003)	(0.002)	(0.003)	(0.010)	(0.020)	(0.001)	(0.001)
Leverage$_{t-1}$	0.071 ***	-0.018 ***	-0.029 ***	-0.020	-0.026	-0.007 ***	-0.011***
	(0.005)	(0.002)	(0.003)	(0.006)	(0.020)	(0.001)	(0.001)
Adjusted R^2	0.614	0.160	0.305	0.074	0.598	0.100	0.363
Observations	58.857	55,184	59,815	60,226	49,677	57,044	59,621
Number of firms	7,271	7,206	7,290	7,318	6,440	7,100	7,271
				Panel B: Net Debt Issuance>0			
Dependent Variable		Acquisition	Investment	ΔCash	SG&A	Share Repurchase	Dividends
Net LT Debt Issuance$_t$		0.279 ***	0.144 ***	0.261 ***	0.129***	-0.003 *	-0.005 ***
		(0.011)	(0.008)	(0.020)	(0.018)	(0.002)	(0.001)
Q$_{t-1}$		-0.005 ***	0.019 ***	0.024 ***	0.097 ***	0.005 ***	0.006 ***
		(0.001)	(0.001)	(0.003)	(0.005)	(0.0005)	(0.0004)
Cash$_{t-1}$		0.015 **	0.017 **	-0.120 ***	-0.179 ***	-0.005 **	-0.008 ***
		(0.007)	(0.007)	(0.021)	(0.027)	(0.002)	(0.002)
log(Assets)$_{t-1}$		0.005 ***	-0.003 ***	0.006 ***	-0.030 ***	0.002 ***	0.002 ***
		(0.0004)	(0.0005)	(0.001)	(0.002)	(0.0002)	(0.0001)
Profitability$_{t-1}$		0.067 ***	0.078 ***	-0.035 ***	-0.524 ***	0.009 ***	0.011 ***
		(0.005)	(0.005)	(0.016)	(0.027)	(0.002)	(0.001)
Leverage$_{t-1}$		-0.017 ***	-0.021 ***	-0.016	-0.065 ***	-0.007 ***	-0.011***
		(0.004)	(0.004)	(0.010)	(0.018)	(0.001)	(0.001)
Adjusted R^2		0.249	0.353	0.122	0.629	0.124	0.411
Observations		21,911	24,631	24,790	19,373	23,580	24,522
Number of firms		5,485	5,592	5,620	4,919	5,420	5,578
Fixed Effects							
industry		Yes	Yes	Yes	Yes	Yes	Yes
year		Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results of OLS regressions relating financial and operating variables to long-term debt issuance during the same year. All dependent variables measure flows in a given year of one of the following: debt repayment, acquisitions, investment, change in cash holdings, SG&A, share repurchases, and dividend payments, and are all scaled by assets. The main explanatory variable is either gross long-term debt issuance scaled by assets (Panel A) or net long-term debt issuance scaled by assets. The analysis in Panel B is conditional on net long-term debt issuance being positive. All regressions include lagged values of the natural logarithm of book assets, Tobin's Q, cash, profitability, and leverage as well as 4-digit SIC industry and year fixed effects. The regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table VI: Financial and Operational Uses of Positive Net Debt Issuance over Time

Dependent Variable	Acquisition	Investment	ΔCash	SG&A	Share Repurchase	Dividends
Panel A: Net Debt Issuance>0: 1971-1979						
Net LT Debt Issuance$_t$	0.202 ***	0.309 ***	0.091 ***	0.031	0.002	-0.009 ***
	(0.032)	(0.032)	(0.012)	(0.029)	(0.003)	(0.002)
Adjusted R^2	0.246	0.507	0.204	0.684	0.114	0.607
Observations	4,163	5,189	5,204	4,014	5,152	5,168
Number of firms	1,302	1,503	1,507	1,243	1,502	1,501
Panel B: Net Debt Issuance>0: 1980-1989						
Net LT Debt Issuance$_t$	0.241 ***	0.162 ***	0.228 ***	0.116 ***	0.004	-0.006 ***
	(0.024)	(0.019)	(0.043)	(0.034)	(0.003)	(0.002)
Adjusted R^2	0.257	0.401	0.146	0.548	0.097	0.547
Observations	4,090	5,190	5,230	3,833	5,081	5,199
Number of firms	1,718	1,845	1,853	1,520	1,836	1,847
Panel C: Net Debt Issuance>0: 1990-1999						
Net LT Debt Issuance$_t$	0.304 ***	0.146 ***	0.235 ***	0.131 ***	-0.004 *	-0.008 ***
	(0.023)	(0.015)	(0.032)	(0.030)	(0.003)	(0.002)
Adjusted R^2	0.331	0.417	0.122	0.603	0.179	0.409
Observations	5,339	5,569	5,652	4,384	5,287	5,590
Number of firms	2,262	2,290	2,322	1,921	2,209	2,306
Panel D: Net Debt Issuance>0: 2000-2009						
Net LT Debt Issuance$_t$	0.265 ***	0.100 ***	0.387 ***	0.191 ***	-0.006	-0.001
	(0.015)	(0.016)	(0.061)	(0.044)	(0.004)	(0.002)
Adjusted R^2	0.278	0.355	0.165	0.747	0.252	0.414
Observations	4,074	4,247	4,259	3,474	3,896	4,160
Number of firms	1,857	1,906	1,914	1,643	1,786	1,881
Panel E: Net Debt Issuance>0: 2008-2009						
Net LT Debt Issuance$_t$	0.276 ***	0.243 ***	0.436 ***	0.159 *	-0.011	0.012
	(0.072)	(0.054)	(0.145)	(0.088)	(0.009)	(0.009)
Adjusted R^2	0.468	0.501	0.228	0.876	0.355	0.527
Observations	743	778	778	631	724	761
Number of firms	599	623	623	518	583	610
Panel F: Net Debt Issuance>0: 2010-2019						
Net LT Debt Issuance$_t$	0.332 ***	0.067 ***	0.271***	0.058	-0.011 **	0.002
	(0.027)	(0.012)	(0.043)	(0.047)	(0.005)	(0.003)
Adjusted R^2	0.329	0.324	0.174	0.827	0.278	0.522
Observations	3,766	3,942	3,949	3,254	3,703	3,913
Number of firms	1,516	1,554	1,556	1,341	1,491	1,549

This table reports the results of OLS regressions relating financial and operating variables to net long-term debt issuance during the same year. The analysis is conditional on net long-term debt issuance being positive. Regressions are estimated separately for each of the decades: 1970-1979, 1980-1989, 1990-1999, 2000-2009 and 2010-2019, as well as for the Global Financial Crisis (2008-2009). All dependent variables measure flows in a given year of one of the following: acquisitions, investment, change in cash holdings, SG&A, share repurchases, and dividend payments, and are all scaled by assets. The table reports the coefficients and standard errors of the main explanatory variable: net long-term debt issuance scaled by assets. All regressions also include lagged values of the natural logarithm of book assets, Tobin's Q, cash, profitability, and leverage as well as 4-digit SIC industry fixed effects. The regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table VII: Net Debt Uses by Firm Size, 2000-2019

	Smallest Quartile 1	Quartile 2	Quartile 3	Largest Quartile 4
Acquisition	0.093 ***	0.279 ***	0.536 ***	0.545 ***
	(0.019)	(0.033)	(0.040)	(0.077)
Adjusted R^2	0.248	0.415	0.485	0.465
Observations	1,560	1,834	2,246	2,200
Number of firms	875	920	812	536
Investment	0.032 **	0.044 ***	0.143 ***	0.180 ***
	(0.016)	(0.016)	(0.025)	(0.051)
Adjusted R^2	0.348	0.444	0.437	0.463
Observations	1,578	1,867	2,326	2,418
Number of firms	882	931	829	556
ΔCash	0.281 ***	0.368 ***	0.259 ***	0.175 ***
	(0.067)	(0.069)	(0.061)	(0.035)
Adjusted R^2	0.262	0.289	0.263	0.246
Observations	1,581	1,869	2,328	2,430
Number of firms	884	933	830	561
SG&A	0.192 ***	0.147 ***	0.059 ***	0.030
	(0.071)	(0.045)	(0.027)	(0.026)
Adjusted R^2	0.793	0.619	0.764	0.768
Observations	1,414	1,582	2,021	1,711
Number of firms	786	803	744	446
Share Repurchase	0.008	-0.006 *	-0.020 ***	-0.004
	(0.010)	(0.004)	(0.007)	(0.012)
Adjusted R^2	0.213	0.209	0.404	0.439
Observations	1,405	1,698	2,206	2,290
Number of firms	811	863	795	542
Dividends	-0.000	0.001	0.005	-0.014 **
	(0.001)	(0.003)	(0.005)	(0.006)
Adjusted R^2	0.270	0.553	0.517	0.619
Observations	1,548	1,845	2,303	2,377
Number of firms	872	921	820	555

This table reports the results of OLS regressions relating financial and operating variables to net long-term debt issuance during the same year. The analysis is conditional on net long-term debt issuance being positive. Regressions are estimated separately for each size quartile: Column (1) presents the results for the first quartile (smallest firms), while Column (4) presents the results for the largest quartile (largest firms). All dependent variables measure flows in a given year of one of the following: acquisitions, investment, change in cash holdings, SG&A, share repurchases, and dividend payments, and are all scaled by assets. The table reports the coefficients and standard errors of the main explanatory variable: net long-term debt issuance scaled by assets. All regressions also include lagged values of the natural logarithm of book assets, Tobin's Q, cash, profitability, and leverage as well as year and 4-digit SIC industry fixed effects. The regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table VII: Interest/Debt over Time

	All Firms		Investment Grade		Non-Investment Grade			
Year	Mean	Median	Mean	Median	Mean	Median	difference in means	Two-sample t-test
1970	7.283%	6.54%	-	-	-	-	-	-
1975	9.774%	8.378%	-	-	-	-	-	-
1980	12.704%	10.634%	-	-	-	-	-	-
1985	11.917%	10.119%	-	-	-	-	-	-
1990	12.414%	10.267%	9.868%	8.994%	12.585%	10.971%	2.718%	3.228
1995	11.596%	8.614%	7.510%	7.678%	10.826%	9.861%	3.147%	5.530
2000	11.698%	8.609%	8.431%	7.073%	10.690%	9.764%	2.259%	2.850
2005	10.198%	6.868%	6.450%	5.956%	10.092%	8.097%	3.643%	4.631
2010	9.794%	6.424%	5.756%	5.675%	8.575%	7.926%	2.820%	7.395
2015	8.295%	5.167%	4.526%	4.532%	6.220%	5.917%	1.694%	9.362
2020	7.244%	4.259%	3.832%	3.569%	6.031%	4.963%	2.220%	3.694

This table displays means and medians interest/debt over time. Columns (1) and (2) present means and medians interest/debt for the entire sample. Columns (3) and (4) present means and medians for firms with investment-grade rating, while Columns (5) and (6) present means and medians for firms with below investment-grade rating.

Table VIII: Interest Expenses to Assets over Time

Year	Median	Mean	0<Lev≤0.2 Median	0.2<Lev≤0.3 Median	0.3<Lev Median	Below-Investment-Grade Median	Investment-Grade Median
1970	0.018	0.020	0.009	0.017	0.028	-	-
1975	0.024	0.025	0.009	0.019	0.032	-	-
1980	0.030	0.034	0.012	0.026	0.040	-	-
1985	0.028	0.031	0.012	0.024	0.039	-	-
1990	0.029	0.034	0.011	0.025	0.041	0.044	0.027
1995	0.022	0.027	0.009	0.020	0.034	0.044	0.023
2000	0.024	0.034	0.008	0.020	0.037	0.043	0.023
2005	0.016	0.028	0.007	0.015	0.029	0.028	0.015
2010	0.016	0.027	0.005	0.014	0.027	0.030	0.016
2015	0.015	0.032	0.005	0.012	0.024	0.025	0.014
2020	0.013	0.022	0.002	0.010	0.021	0.022	0.012

This table displays means and medians interest/assets over time. Columns (1) and (2) present means and medians interest/assets for the entire sample. Columns (3) reports medians for firms with low leverage, Columns (4) reports medians for firms with moderate leverage, and Column (5) reports medians for firms with high leverage. Columns (6) and (7) report medians for firms with below-investment-grade and investment-grade ratings.

Table IX: Interest Expenses Employment and Investment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Investment	Investment	Investment	Investment	Investment	Investment	Investment	Investment
Interest Expenses$_t$	-0.032 ***	-0.055 ***						
	(0.003)	(0.011)						
Q_{t-1}	0.020 ***	0.007 **	0.019 ***	0.019 ***	0.019 ***	0.019 ***	0.019 ***	0.019 ***
	(0.001)	(0.003)	(0.022)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cash$_{t-1}$	-0.021 ***	0.039 ***	-0.023	-0.023 ***	-0.022 ***	-0.023***	-0.023 ***	-0.023 ***
	(0.004)	(0.013)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
log(Assets)$_{t-1}$	0.0002	-0.001	0.0004	0.0004	0.0005	0.0004	0.0004	0.0005
	(0.0003)	(0.001)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Profitability$_{t-1}$	0.036 ***	0.179***	0.037 ***	0.037 ***	0.037 ***	0.037 ***	0.037 ***	0.037 ***
	(0.004)	(0.019)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Leverage$_{t-1}$	-0.030 ***	-0.023 ***	-0.026 ***	-0.026 ***	-0.026 ***	-0.026 ***	-0.026 ***	-0.026 ***
	(0.003)	(0.006	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LT debt due			0.056 ***			0.063 ***		
issued 2 year ago			(0.022)			(0.021)		
×Spread			-4.866 ***			-6.035 ***		
			(1.843)			(1.900)		
×10Y Treasury			-0.531 **					
			(0.242)					
×10Y Real Rate						-0.889 ***		
						(0.313)		
LT debt due				0.055 **			0.049 **	
issued 3 year ago				(0.022)			(0.020)	
×Spread				-3.372 *			-4.704 ***	
				(1.807)			(1.807)	
×10Y Treasury				-1.078 ***				
				(0.283)				
×10Y Real Rate							-1.311 ***	
							(0.352)	
LT debt due					0.044 **			0.037 ***
issued 4 year ago					(0.021)			(0.018)
×Spread					-2.596			-3.470 ***
					(1.597)			(1.574)
×10Y Treasury					-1.014 ***			
					(0.293)			
×10Y Real Rate								-1.394 ***
								(0.354)
Adjusted R^2	0.310	0.370	0.304	0.305	0.305	0.305	0.305	0.305
Observations	34,780	10,263	35,698	35,698	35,698	35,698	35,698	35,698
Number of firms	4,933	1,291	5,097	5,097	5,097	5,097	5,097	5,097
Fixed Effects								
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating	No	Yes	No	No	No	No	No	No
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results of OLS regressions relating investment to interest expenses. The dependent variable is capital expenditures divided by lagged assets. All regressions include lagged values of the natural logarithm of book assets, Tobin's Q, cash, profitability, and leverage, as well 4-digit SIC industry and year fixed effects. Columns (2) also includes credit rating fixed-effects. In Columns (1) and (2) the main explanatory variable is interest expenses. In the reminder of the table the main explanatory variables are the interaction terms between maturing long-term debt and the 10-year Treasury. The regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.