Tradeoff theory and leverage dynamics of high-frequency debt issuers*

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Abstract

We examine wether tradeoff theory explains leverage dynamics of high-frequency net-debt issuers (net of debt rollovers). Our issue-frequency sort screens out low-leverage firms who rarely issue and extremely high-leverage firms who may not issue due to financial distress. The remaining industrial firms raise the bulk of all public and private debts. The persistence of their debt-issuance program over the public lifecycle strongly suggests both low issuance costs and high debt-financing benefits. Nevertheless, we find little evidence to suggest that high-frequency net-debt issuers actively manage leverage towards a capital structure target.

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1 Introduction

We study the capital structure and funding dynamics of listed firms that *persistently* fund themselves by issuing net-debt (net of debt rollovers). These firms raised the bulk of all public and private industrial debts over the past three decades. Our sort on issue frequency effectively screens out both low-leverage firms (who rarely issue) and extremely high-leverage firms (who cannot issue due to financial distress)—firms that may have frustrated earlier tradeoff tests.[1] Evidently, high-frequency net-debt issuers view debt-financing as uniquely beneficial, and the high issue frequency reveals low fixed issue cost. A priori, this dual feature of our sample firms favors the predictions of dynamic tradeoff theory. In other words, if these firms do not manage leverage towards a target, then who does?

We make two primary contributions. First, we document the lifecycle leverage and funding dynamics of the high-frequency net-debt issuers, and contrast their leverage dynamics with that of low-frequency issuers. High-frequency net-debt issuers (henceforth HFIs) are firms in the top quartile of the annual cumulative net-debt issue frequency distribution across the Compustat universe. Low-frequency issuers (LFIs) are in the bottom quartile of this distribution. The net-debt issue frequency in a given year after public listing is the sum of all past quarterly net-debt issues, looking back to the year of listing. The average annual issue frequency of the HFIs is high by any standard. For example, it is twice as high as the issue frequency of the average industrial Compustat firm, and twelve times higher than that of the LFIs. At the same time, we show that there is little difference between the net *equity* issue frequencies across HFIs, LFIs and the average firm.

Firms emerging as HFIs are quite different from those emerging from a straight sort on leverage ratios. The average market leverage ratio of the HFIs is 32%, which is significantly lower than the average of 52% in the upper quartile of a leverage-ratio-based sort. This difference in average leverage ratios arises because the HFIs tend to exclude firm-years with prohibitive debt issuance costs, including periods of severe financial distress. This is precisely the point of our empirical design: since firms in severe financial distress are more concerned with outright survival than by managing leverage towards a target, the leverage dynamics of the HFIs—both alone and benchmarked by the LFIs—seem more appropriate for examining capital structure theories than the unconditional Compustat population.

[1] "Because [capital structure] theories are not general, testing them on a broad, heterogeneous sample of firms can be uninformative" (Myers, 2001, p.99). Graham and Leary (2011) makes a similar point: "[W]e may gain more clarity on the drivers of financing decisions by focusing on appropriate subsets of firms." (p.340).

Interestingly, firms emerging as HFI (or LFI) shortly after going public tend to persist in that classification for the remainder of their public lifecycle. We observe a similar persistence in firm characteristics: HFIs have high asset tangibility and growth but low R&D expenditures and Tobin's Q, which the extant literature associates with high debt capacity. In contrast, LFIs have high R&D and Tobin's Q but low asset tangibility and growth. While such persistence in debt preference (and also firm characteristics) may indicate a time invariant effect in leverage policy (Lemmon, Roberts, and Zender, 2008), we also find evidence of high leverage volatility within the group of HFIs (relative to that of LFIs). This persistent volatility adds to the evidence in DeAngelo and Roll (2015) of substantial leverage-ratio volatility over long periods. We show that the leverage volatility of the HFIs likely results from a pecking-order type of funding policy, where large investment shocks are often financed with new debt.

Our second contribution is to use the leverage dynamics of HFIs and LFIs to examine intuitive predictions of dynamic capital structure theory. External financing costs in general, and debt-issuance costs in particular, play a key role in dynamic theory in the tradition of Fischer, Heinkel, and Zechner (1989) and Goldstein, Ju, and Leland (2001), in the financing pecking order of Myers (1984), and in financing and investment models such as that of DeAngelo, DeAngelo, and Whited (2011). Since our HFIs exhibit a combination of relatively high leverage and (by the high issue frequency) low fixed issue costs, their leverage dynamics present new opportunities for testing associated theoretical predictions.

We begin with differences in the speed-of-adjustment (SOA) to target leverage deviations of HFIs and LFIs. Given the extremely low debt-issue frequency of the LFIs, it is reasonable to expect that the SOA coefficient estimate for HFIs exceeds that of LFIs. Instead, we find that the SOA estimates are statistically indistinguishable across the two types of firms—both with a target leverage deviation half-life of about 2.5 years. While this half-life confirms SOA estimates reported in the extant literature (based on Compustat-wide samples),[2] the similarity of the coefficient estimates for HFIs and LFIs reported here is surprising. It indicates that SOA estimates tend to be driven by *passive* changes in equity values rather than by active debt issues, as also suggested by Welch (2004).[3]

We then use the HFIs to revisit the puzzling inverse relation between leverage and profitability first documented by Titman and Wessels (1988) and Rajan and Zingales (1995), and which Myers (1993) characterizes as the "most telling evidence against the static tradeoff theory" (p.6). As recently empha-

[2]Flannery and Rangan (2006), Hovakimian and Li (2012), Faulkender, Flannery, Hankins, and Smith (2012).

[3]Active equity issue frequencies are similar across HFIs and LFIs, and we have checked that the equity issue size is unrelated to target leverage deviations.

sized by Danis, Rettl, and Whited (2014) in their empirical work, when debt issuance is costly, dynamic tradeoff theory predicts a positive leverage-profitability correlation only in periods when firms rebalance capital structure. In other periods, firms permit the leverage ratio to float, which mechanically creates an inverse relation between leverage and profitability. Focusing on capital structure rebalancing events that are financed with new debt and/or internal cash-balance draw-downs, Danis, Rettl, and Whited (2014) find evidence of a positive conditional leverage-profitability correlation. However, for our HFIs, we find that the leverage-profitability correlation is negative and significant in quarters when firms issue debt and repurchase equity.[4]

In sum, notwithstanding their persistent debt-issue activity and extensive use of debt, there is little evidence that HFIs manage leverage towards a target. Rather, these firms appear to raise this debt primarily to finance an intensive investment program, with little evidence of mean reversion in leverage ratios or of a positive leverage-profitability correlation when firms rebalance. Overall, the HFIs are likely taking advantage of an asset structure and other firm characteristics that, in most periods, fundamentally lower the cost of debt financing relative to other sources of capital.

The rest of the paper is organized as follows. Section 2 explains our issue frequency sort and the evidence of persistence in the classifications of firms as HFIs and LFIs. Section 3 documents striking differences in firm characteristics and lifecycle funding policies of the HFIs and LFIs. In Section 3.3, we link debt issues to investments and the financing deficit, and show that HFIs issue debt also when "over-levered". In Section 4, we show that leverage volatilities and speed-of-adjustment coefficient estimates of HFIs and LFIs are statistically indistinguishable, while Section 5 estimates the leverage-profitability correlations conditional on capital structure rebalancings. Section 6 concludes the paper.

2 Issue-frequency sorts

In this section, we describe the mechanism for sorting the Compustat universe into high- and low-frequency net-debt issuers (HFIs and LFIs), and we demonstrate that this sort singles out firms that persist in their respective issue-frequency category throughout their lifetimes as publicly traded companies. As such, the lifecycle issue-frequency, and therefore the dynamics of the leverage ratio, appears to be determined by asset composition more than by listing age *per se*, a fact that becomes evident

[4]In Eckbo and Kisser (2018b), we further show that this conclusion is robust to expanding the sample to the entire Compustat universe of industrial firms.

below. HFIs and LFIs are fundamentally different firms—not just in terms of market leverage—which our issue-frequency sort captures to a surprising degree.

As indicated in the introduction, while the issue-frequency sort produces HFIs that have relatively high leverage (relative to LFIs), it is not a sort on leverage itself. A direct sort on leverage produces substantially higher average market leverage (52% versus 32% for the top quartile of the annual frequency distribution) because it includes firms with extreme leverage due to financial distress. Since external financing costs may be prohibitive for such companies, they are less likely to be classified as HFIs. Conversely, the percentage of LFIs that have zero leverage (all-equity-financed firms) is somewhat lower than a direct sort on leverage would produce, because some LFIs have leverage ratios above the lower quartile of the leverage-frequency distribution.

The fact that sorting firms on their debt-issue frequency reduces the impact of firm-quarters with extreme leverage renders the sorting mechanism particularly interesting from the point of view of examining capital structure theories. This is because the same theories are not designed to handle cases with extreme leverage. For example, severe financial distress pushes the firm into survival mode, in which the normal trade-off between debt-financing benefits and expected bankruptcy costs becomes of second-order importance. At the other extreme, zero- or near-zero leverage firms remain a puzzle as these firms appear to forego a risk-free debt-related corporate tax shield (Strebulaev and Yang, 2013). By reducing the impact of firm-quarters with extreme leverage, the leverage dynamics of the HFIs increase the chance that an interior solution to firms' capital structure optimization will fit the data. Hence the power of the issue-frequency sort.

2.1 Sample selection

We use the annual merged CRSP/Compustat (CCM) file to sample firms, and quarterly CCM data to construct the annual issue frequency count, 1984-2016. Table 1 details the sample selection, with Panel A for annual and Panel B for quarterly data. As is common in the capital structure literature, we exclude foreign firms, financial companies and regulated utilities, as well as firms with missing entries of key Compustat balance sheet and cash flow characteristics.

In Panel C, we merge the quarterly and annual financial statement information and impose two additional sample restrictions. The most restrictive is to require the firm to go public during the sample period, which excludes 4,001 firms that went public prior to 1984. We condition the analysis below on public listing age in order to control for the effect of a firm's product market maturity on the debt issue frequency. That is, since older firms may have built collateralizable assets which may affect the propensity to issue debt, we structure the issue frequency analysis in event time since the year of going public. The final sample consists of 9,340 firms and an unbalanced panel of 66,056 firm-years and 240,028 firm-quarters.

2.2 Sorting mechanism and issue frequencies

We build the cumulative annual issue counts from the sample firms' quarterly Compustat cash flow statements. All variable definitions are in Tables 2. A quarterly net-debt issue (NDI) is defined as the difference between the sum of all forms of public and private debt issues and debt retirements. This definition ensures that we are not counting debt rollovers (which appear in the cash flow statement as an equal issue and retirement). Let N_{it} denote the cumulative number of *positive* quarterly net-debt issues (NDI^{+}) by firm i from the public listing year (event year 0) through event year t. We have that

$$N_{it} = \sum_{\tau=0}^{t} \sum_{q=1}^{4} I_{iq\tau}, \tag{1}$$

where $I_{iq\tau}$ is an index that takes a value of one if firm i issues positive net-debt of at least 2.5% of total assets in quarter q of event year $\tau \leq t$ ($NDI^{+}_{iq\tau} \geq 2.5\%$). In a given event year t, firm i is labelled high-frequency issuer (HFI) if N_{it} is in the upper quartile of the distribution of N_t. Moreover, firm i is low-frequency issuer (LFI) if N_{it} is in the lower quartile of the distribution, and medium-frequency issuer (MFI) if it is neither HFI nor LFI.[5]

Table 3 (using the 2.5% issue size threshold in Eq. 1) and Table 4 (using a 5% issue size threshold) list the average annual cumulative frequencies of net-debt issues (NDI^{+}), net-debt retirements (NDI^{-}), and equity issues (EI) by the HFIs and LFIs since public listing. Panel D presents frequencies corresponding to a broader measure of equity issues (dSM) that also accounts for stock-financed acquisitions or direct stock issues to employees (Fama and French, 2005). The issue counts for NDI^{-} in Panel B, EI in Panel C and dSM in Panel D are for the firms classified as HFI or LFI in Panel A. While the tabulation

[5] In terms of the Fama-French FF12 industries, the sample representation of HFIs and LFIs is as follows: business equipment (HFIs 14%, LFIs 39%), shops (HFIs 21%, LFIs 8%), health care (HFIs 10%, LFIs 22%), consumer non-durables (HFIs 8%; LFIs 4%), consumer durables (HFIs 4%, LFIs 2%), manufacturing (HFIs 12%, LFIs 7%), energy (HFIs 8%, LFIs 2%), chemicals (HFIs 3%, LFIs 2%), and other (HFIs 21%, LFIs 14%).

stops with event year 20 for expositional simplicity, the empirical analysis below uses all firm-years in the sample.

In the year of public listing, two thirds of the sample firms do not issue net-debt, while most of the remaining firms issue once only. Thus, (because the median debt issue frequency is zero) there are no MFIs in year 0. Moreover, as the median firm age since going public is five years (average seven), ten years into the public lifecycle the annual number of sample HFIs and LFIs shown in Table 3 drops off quickly. This drop-off is, of course, a consequence of studying firms over their public lifecycle.

The issue sort creates a dramatic difference in the number of issues between HFIs and LFIs. In Panel A of Table 3 and over the first five years of public listing ($t = 5$), HFIs (LFIs) on average make 7.37 (0.41) quarterly net-debt issues. The large spread between HFIs and LFIs is evident throughout the public lifecycle and increases to 21.21 (HFIs) versus 2.70 (LFIs) twenty years following public listing. Moreover, the debt issues of HFIs are also large: HFIs undertake 61% of the total sample of 36,587 positive net-debt issues and receive 54% of the dollar value of total issue proceeds over the sample period. LFIs undertake only 4% of the issues and raise 7% of the issue proceeds.

As shown in Panel A of Table 4, raising the issue size threshold to 5% reduces the average number of net-debt issues by but maintains the large spread between HFIs and LFIs. For example, the number of issues by HFIs (LFIs) is 4.82 (0.0) in year five, and 13.39 (1.62) in year twenty. Moreover, with the 5% threshold, HFIs raise 58% and LFIs 10% of the total issue proceeds over the sample period.[6]

Maintaining the HFI/LFI classifications from Panel A, panels B and C of Tables 3 and 4 show the annual spread in net-debt retirement (NDI^-) and for equity issues. The tabulated frequency of net-debt retirements is interesting since, in classical dynamic tradeoff models, it is never optimal to reduce leverage outside of default or strategic renegotiation (Danis, Rettl, and Whited, 2014; Admati, DeMarzo, Hellweg, and Pfleiderer, 2017). In fact, Table 3 shows a significant number of net-debt retirements. For example, the average number of net-debt retirements after five years of listing is 4.32 for HFIs and 1.19 for LFIs, and it is 17.18 and 3.73, respectively, after twenty years. Moreover, in year five, the percentage of total retirement volume is 48% for HFIs and 16% for LFIs (46% versus 6% after twenty years).

Also interesting, Panel C of Tables 3 and 4 show that HFIs and LFIs have similar equity issue

[6]While it is common in the security-issuance literature to use a 5% issue-size threshold (Leary and Roberts, 2005; Eckbo, Masulis, and Norli, 2007; Leary and Roberts, 2010), we focus primarily on the 2.5% threshold because it creates greater dispersion in the number of security issues per firm. However, the algorithm in Eq. (1) identifies much the same firms when using a 5% net-debt issue size threshold ($NDI^+ \geq 5\%$) as with the 2.5% threshold.

frequencies. For example, with a 2.5% equity issue size threshold and after ten years of listing, HFIs and LFIs have on average made 3.78 and 4.87 equity issues, respectively. Increasing the debt-issue size threshold to 5% hardly changes the number of equity issues (3.49 versus 3.21, respectively for year ten). The total sample median is 3 equity issues after ten years (2 issues with a 5% threshold), which is similar to the frequency of seasoned equity offerings reported elsewhere in the literature.[7]

Panel D of Tables 3 and 4 implements a broader measure of equity issues that also accounts for equity issues which do not raise cash, such as stock-financed acquisitions or direct stock issues to employees. This alternative measure on average doubles the issue frequency and it increases the spread between HFIs and LFIs. For example, after ten years and using the 5% threshold in Table 4, the average sample firm has made 5.88 issues, as compared to the average of 3.37 equity-for-cash issues in Panel C. This increase is consistent with the finding of Fama and French (2005) that stock-financed mergers account for a large fraction of overall equity issues.

2.3 Issue-frequency persistence

Recall from Eq. (1) that, in any given year t, the number N_{it} of net-debt issues cumulates all quarterly issues since public listing. If firm i undertakes a substantial number of net-debt issues early in its public life, it may maintain status as HFI for a period forward even if it stops. Tables 5 and 6 demonstrate that such a mechanical classification is negligible in the data. Instead, these two tables show that firms that are classified as HFI early on after public listing tend to persist in that classification because they persist in issuing debt. We consider this discovery—that a certain set of firms emerge as HFIs and LFIs early in their public life-cycle and persist in that classification—a core empirical contribution of this paper.

In Table 5, we shorten the look-back period in Eq. (1) from the year of public listing to three years in Columns (1)-(4) and to zero (no look-back) in Columns (5)-(8). The three-year look-back period reduces the scope for the type of mechanical classification effect mentioned in the previous paragraph, while the within-year count eliminates it completely. Focusing on the last row of the table, Columns (1) and (4) show that 85% (91%) of the firms originally classified as HFI (LFI) using Eq. (1) are on average also classified as HFI (LFI) with a three-year look-back period. With zero cumulation (Columns 5 and 8), the corresponding overlap is 79% (96%). Thus, the HFI/LFI classification is strongly influenced by recent

[7] Fama and French (2005), Eckbo, Masulis, and Norli (2007), Leary and Roberts (2010).

issue activity.[8]

Second, as expected when firms persist in their issue activity, Table 6 demonstrates that the HFI/LFI classification predicts future (out-of-sample) net-debt issues. The table shows coefficient estimates (odds ratios) for the following logit model:

$$Y_{i,t+v} = \alpha + \beta_1 HFI_{i,t} + \beta_2 LFI_{i,t} + \gamma X_{i,t} + \epsilon_{i,t+v}, \tag{2}$$

where $Y_{i,t+v}$ takes a value of one if firm i undertakes at least one (quarterly) net debt issue in year $t+v$ and zero otherwise, and $HFI_{i,t}$ and $LFI_{i,t}$ indicate whether firm i is HFI or LFI, respectively. Thus, this regression tests whether a firm's current classification as HFI or LFI predicts future net-debt issues by the same firm. The vector X of controls contains a standard choice of firm characteristics, which we introduce when discussing Table 7 below.

In Table 6, the baseline sample consists of medium-frequency issuers (MFIs). An estimated odds ratio of 1.0 therefore indicates that the HFI/LFI classifications do not increase or reduce the likelihood of a future net-debt issue relative to that of MFIs. As shown in the first row, with a one-year forecast horizon HFI increases the probability of a net-debt issue in year $t+1$ by 103% (the difference 2.03-1.00), while LFI lowers the issue probability by 29% (the difference 1.00-0.71). The predictive power of HFI and LFI remains strong also with two- and three-year forecast periods, and for firms that have been publicly traded for nine years or more.

Finally, as our sample of HFIs/LFIs are identified in event time (relative to the year of going public), we check the time series evolution of these HFIs and LFIs in calendar time. The idea here is to check whether the HFIs/LFIs tend to occur in some calendar years and not in others. If so, the fraction of all firms that are classified as HFI/LFIs would be high in some years and low in others. There is little evidence of such calendar time-series variation. Across the 1984-2016 sample period, the annual average fraction of the sample firms classified as HFI (LFI) is 0.29 (0.38). This fraction averages 0.43 (0.35) in the 1980s, dropping to 0.34 (0.37) in the 1990s, and stabilizes at an annual average of 0.24 (0.39) since year 2000. We detect no obvious calendar time effects in these classifications but nevertheless include

[8] To further corroborate this evidence of issue persistence, we also examined the annual issue frequencies using samples of HFIs/LFIs that remain constant throughout the lifecycle. For example, we would examine the average number of issues using HFIs classified using Eq. (1) for year five only. While not tabulated, five years later, in event year 10 relative to the listing year, these HFIs average 11.44 number of issues, which is close to the average of 12.76 based on the original issue sort with annual rebalancing.

calendar-year fixed effects in the regressions below.

3 Firm characteristics and funding dynamics

In this section, we establish that HFIs and LFIs exhibit differences in firm characteristics and funding policies, which date back to the year of public listing. These differences are important as they strongly indicate that listing age is less important than fundamental asset structure in explaining leverage dynamics.

3.1 Firm characteristics

Table 7 lists average firm characteristics of HFIs and LFIs sorted by year since public listing. As expected, the table shows significant differences in firm characteristics that the capital structure literature often associates with differential issue costs and debt financing benefits. What is more surprising is that these differences emerge already shortly after public listing and then persist over the public lifecycle.

HFIs have relatively high leverage ratios whether considering gross debt or debt net of cash balances. On average, the market leverage ratio (L in Column 1) is 32% for HFIs and 7% for LFIs. The annual fraction of the sample firms that are all-equity financed (AE in Column 2) averages 40% for LFIs and only 3% for HFIs. Moreover, the cash ratio C in Column (3) is much lower for HFIs than for LFIs: 11% versus 40%, respectively.[9]

As shown in columns (4)-(6), HFIs are larger than LFIs (total assets averaging $849 million versus $514 million), have greater asset tangibility (PPE/Assets of 0.32 versus 0.17), and are more profitable: $Prof$ averages 3% and -5% of total assets, respectively (40% of the LFIs have $Prof < 0$ versus 24% for HFIs).[10] The higher profitability of HFIs translates into a higher propensity to pay dividends (24% versus 15% for LFIs). In Column (7), the average ratio of dividends to book equity is 0.02 (0.01) for HFIs (LFIs). Column (8) further adds share repurchases and reports a payout yield of 4% for both categories

[9] While not tabulated, there is evidence that the high cash holdings of LFIs reflect basic operating policy. To see this, we first estimate the coefficients of a standard cash model accounting for firm and age fixed effects and using the full sample of firms, and then construct separate target cash balances for LFIs and HFIs using the coefficient estimates. Defining excess cash holding as the difference between the actual and estimated target cash holdings, the level of excess cash is similar across LFIs and HFIs: 0.5% and -.04%, respectively. In other words, the firm characteristics in the empirical target cash model go a long way in explaining the differential cash policies of LFIs and HFIs. It also suggests that much of the build-up of cash balances reported elsewhere (Bates, Kahle, and Stulz, 2009) is concentrated among LFIs.

[10] The average profitability for LFIs turns positive only in year 13 after public listing, compared to year 2 for HFIs.

of firms.[11] Interestingly, conditional on paying dividends ($Div > 0$), the size of the HFI dividend is lower than for LFIs (6.8% versus 8.2%, and 11.8% versus 14.3% when we add share repurchases to the total payout).

Furthermore, columns (9)-(12) of Table 7 reveal interesting differences between the average investment rates of HFIs and LFIs. In Column (9), capital expenditures scaled by lagged book assets (I_{CX}) averages 10% versus 6% for LFIs. Column (10) is based on total cash investments and also includes cash outlays for patent purchases and acquisitions, increasing the scaled investments I_{CF} to 15% for HFIs and 9% for LFIs. Moreover, much as Lewellen and Lewellen (2016), Column (11) reports the average investment I_{FA}, which is computed from the yearly changes in fixed assets in the firm's balance sheet.[12] I_{FA} fully captures cash-financed investment plus any portion of corporate acquisitions that is paid for in stock. This increases the average scaled investment to 24% for HFIs and 17% for LFIs, which very close to the average growth in book assets (column 12). In sum, while HFIs on average invest more in fixed assets than do LFIs, total long-term investment is large for both groups. Moreover, the average contribution of stock-financed acquisitions to long-term investments (the difference between columns 10 and 9) is similar across HFIs and LFIs: 9% versus 8%.

Notwithstanding the larger rate of investments in fixed assets, Tobin's Q in Column (13) is on average substantially lower for HFIs than for LFIs (1.65 vs. 2.71). The likely reason for this difference is shown in Column (14), which documents a substantially higher rate of R&D expenditures for LFIs than for HFIs: 12% versus only 3%. R&D expenditures are designed to generate valuable future growth options, which likely translate into higher Tobin's Q to a greater extent than do investments in fixed assets (Fama and French, 1998; Carlson, Fisher, and Giammarino, 2004).

3.2 Lifecycle funding policies

In this section, we show that the differences in firm characteristics across HFIs and LFIs also translate into significant differences in average funding policies over the public life-cycle. We begin by investigating cash funding policy using the seven sources of funds identified by the firm's annual cash flow statement.

[11]When scaling by market equity instead, the corresponding dividend yields are 0.4% (LFIs) and 0.7% (LFIs). Similarly, total payout yields are 1.6% and 1.9%, respectively.

[12]The yearly changes in fixed assets are adjusted for non-cash charges that affect fixed assets such as depreciation and write-downs. See Table 2 and Appendix Table 1 for the exact variable definitions.

Let $R_j \equiv S_j / \sum_i^7 S_i$ denote the contribution of funding source S_j, where

$$\sum_{i=1}^{7} S_i \equiv CF^+ + EI + NDI^+ + \Delta C^- + I^- + \Delta W^- + O^+. \tag{3}$$

Here, CF^+ is the positive portion of operating cash flow, EI is proceeds from equity issues, NDI^+ is positive net debt issues, ΔC^- is draw-down of cash balances, I^- is sale of investments, sale of property, plant and equipment (PPE) and cash flows from other investment activities, ΔW^- is reduction in net working capital, and O^+ is a small residual that maintains the cash flow identity.[13]

Panel A of Table 8 and Figure 1 show the annual funding pattern after combining the seven funding sources into four ratios: the *Asset Sales* ratio $R_{AS} \equiv (\Delta C^- + \Delta W^- + O^+ + I^-)/\sum_i^7 S_i$, the *Net-Debt Issue* ratio $R_{NDI^+} \equiv NDI^+/\sum_i^7 S_i$, the *Equity Issue* ratio $R_{EI} \equiv EI/\sum_i^7 S_i$, and the positive *Operating Cash Flow* ratio $R_{CF^+} \equiv CF^+/\sum_i^7 S_i$.[14] As expected, HFIs exhibit substantially greater net-debt funding ratios than LFIs, with annual values of R_{NDI^+} averaging 24% for HFIs and only 2% for LFIs (median values of 13% and 0%). In contrast, the importance of equity in the overall funding mix is more similar across HFIs and LFIs. The value of R_{EI} in Panel A of Table 8 averages 18% for HFIs and 30% for LFIs, with median values of 2% and 8%.[15] In sum, HFIs rely more on external finance than do LFIs (42% vs. 31%, respectively).

Notice also that, since the HFIs generate more positive operating cash flow than LFIs (R_{CF^+} averages 34% vs. 29%), asset sales must be a particularly important funding source for LFIs. This is confirmed by our data: the lifecycle funding contribution of asset sales (R_{AS}) is substantial for both categories of firms, and larger for LFIs than for HFIs (40% versus 24%, respectively). The large contribution of the *illiquid* asset sales portion of R_{AS} for LFIs (17%) is interesting in of itself, as it not anticipated by the traditional financing pecking order (Arnold, Hackbarth, and Puhan, 2017; Edmans and Mann, 2017; Eckbo and Kisser, 2018a).

For relatively high-R&D firms such as LFIs, raising cash through asset sales may be attractive as it avoids the strict disclosure requirements associated with public equity issuances and which risks disclosing

[13]In 1988, Statement of Financial Accounting Standards (SFAS) instituted a new and uniform reporting system for working capital, including its component assets and liabilities. We work with net working capital over the entire sample period. Separate analysis on the post-1988 period shows that splitting net working capital into assets and liabilities does not affect our main conclusions below.

[14]By construction, these four ratios sum to one.

[15]Excluding the year of public listing substantially reduces the contribution from equity issues over the remaining life cycle as R_{EI} drops to 7% for HFIs and 13% for LFIs.

valuable proprietary information produced by the R&D activity (Hall and Lerner, 2010; Brown, Martinsson, and Petersen, 2012; Bena and Li, 2014). A similar argument goes for acquisitions paid in stock. In Panel B of Table 8, we replace EI in Eq. (3) with the broader equity issue measure dSM (which, as discussed above, includes stock issues to pay for acquisitions). This increases the funding contribution of equity to an average of 23% for HFIs and 34% for LFIs. Notwithstanding this increase, the contribution of (illiquid) assets sales remains a substantial 16% for LFIs, down from the 17% shown in Panel A.

3.3 Debt issues and the financing deficit

Under the financing pecking order argument of Myers (1984), debt issues track what Shyam-Sunder and Myers (1999) label the financing deficit, defined as the sum of dividends and investment outlays, net of internally generated funds. Regressing debt issues by S&P 1500 companies on the deficit, Myers (1984) finds a slope coefficient that is statistically indistinguishable from one, as predicted by the pecking order. However, subsequent research has found that equity issues are used more extensively than anticipated by the original pecking order argument (Frank and Goyal, 2003; Leary and Roberts, 2010; Lemmon and Zender, 2010). Since HFIs issue both debt *and* invest intensively (relative to LFIs), running the financing deficit regression for our HFIs adds to this pecking order discussion.

The results of the financing deficit regression for HFIs are in Table 9. We use a slightly altered specification relative to the extant literature in that we separate $Capex$ from the usual definition of the deficit, creating the variable $NetDeficit$.[16] This allows us to ask more specifically whether debt issues finance also relatively large investments, and it is consistent with the evidence in Table 6 above that large investment help predict debt issues. Moreover, we follow Lemmon and Zender (2010) and add squared terms so as to permit the functional form to be nonlinear in both $Capex$ and $NetDeficit$. Thus, the regression specification is as as follows:

$$\frac{NDI_{i,t}}{TA_{i,t}} = \alpha + \beta_1 Capex_{i,t} + \beta_2 NetDeficit_{i,t} + \beta_3 Capex_{i,t}^2 + \beta_4 NetDeficit_{i,t}^2 + \epsilon_{i,t}, \tag{4}$$

where NDI/TA is net-debt issue or retirement scaled by total assets. Industry- and firm-fixed effects are also included. We estimate this regression for the full sample of HFIs as well as for under and over-levered issuers. $D^*_{i,t-1}$ is a dummy indicating that the firm is over-levered at the end of year $t-1$, i.e.,

[16] $NetDefecit \equiv (dv + aqc + ivch - siv - ivstch - sppe - ivaco - oancf + chech)/at$. See Appendix Table 1 for Compustat mnemonics.

$L_{i,t-1} - L^*_{i,t-1}(X_{i,t-2}) > 0$. $L^*_{i,t}(\beta X_{i,t-1})$ is the estimated target leverage ratio where the determinants $X_{i,t-1}$ are the lagged values of size, profitability, Q, cash ratio, tangibility, depreciation, R&D expenses, capital expenditures, the median industry leverage ratio, year and firm-fixed effects.[17]

In the full-sample regressions (Columns 1 and 2 of Table 9, which do not condition on D^*_{t-1}), the coefficient estimates for both $Capex$ and $Capex^2$ are positive and significant, indicating that HFIs *increase* their use of debt to finance large investments. Constraining the sample to firms that are *not* over-levered ($D^*_{t-1} = 0$, columns 3 and 4) largely preserves the full-sample coefficient estimates on $Capex$ and $Capex^2$. More interesting, for over-levered HFIs ($D^*_{t-1} = 1$, columns 5 and 6), the coefficient estimate on $Capex$ *increases* to .9, regardless of whether firm-fixed effects are included or not. This indicates that the (estimated) target leverage ratio does not constrain the debt funding decision, as suggested by the pecking order.[18] At the same time, the coefficient on $Capex^2$ turns negative, indicating that the largest investment shocks are financed with a combination of debt and equity.

The coefficient estimates on the net-deficit variables in Table 9 are also interesting. They indicate that individual components of the financing deficit matter for financing policy. Lemmon and Zender (2010) show that firms finance relatively large total financing deficits with equity rather than with debt (indicated by a negative coefficient estimate for the squared total financing deficit). Table 9 further shows that this conclusion is largely driven by components in the financing deficit *other* than $Capex$. Also, the coefficient estimate on $NetDeficit^2$ is unaffected by whether or not the firm is over-levered, indicating that the financing policy regarding deficit-components other than $Capex$ tends to be unaffected by target leverage deviations.

4 Relative leverage dynamics of high-frequency issuers

In the remainder of this paper, we examine whether the substantial debt-issue activity of HFIs suggest that these firms actively manage leverage towards a target. Specifically, dynamic tradeoff theory implies

[17]Because this regression relies on the cash flow identity, it is subject to a potential endogeneity bias that is common to all pecking order tests. However, as argued by Leary and Roberts (2010) this type of bias is unlikely to cloud inferences: Because the pecking order theory assumes that external capital is more costly than internal funds, optimal investment is lower when financed externally. For a firm that explores debt financing, the empirical concern is that issuance costs reduce investment so much that it could be financed internally, thereby providing evidence against the pecking order when, in fact, the firm was behaving in accordance with the theory. However, in that case, the firm would not need to issue debt in the first place and one would not observe this outcome in the data.

[18]This finding squares with that of Denis and McKeon (2012) who identify identify 2,314 net-debt issues by US public industrial firms (1971-2006) that are large enough to raise the issuer's leverage ratio to at least 10% above the target leverage ration estimate.

that the mean reversion (speed-of-adjustment) in leverage ratios increases as debt-issue costs fall and debt-financing benefits rise. As shown above, while their respective equity-issue frequencies are similar, HFIs exhibit much greater debt-issue frequencies than LFIs, indicating lower issue costs for HFIs. Moreover, HFIs maintain much higher leverage and debt funding ratios than LFIs throughout their life-cycles as public firms, indicating greater debt-financing benefits for HFIs. Thus, we gain new perspectives on whether HFIs manage leverage towards a target by benchmarking the volatility and speed-of-adjustment of HFIs with those of the LFIs. In Section 5 below, we further test whether leverage and profitability are positively correlated in periods when firms rebalance capital structure (and negative otherwise) as also implied by dynamic tradeoff theory.

4.1 Relative leverage ratio stability

The potential stability of leverage ratios has received significant empirical interest. Over the period 1965-2003, Lemmon, Roberts, and Zender (2008) sort Compustat industrial companies annually on market leverage and form quartile portfolios, each of which are tracked for twenty years. They show that, on average, the spread in leverage between the quartiles is largely preserved throughout the two decades. They conclude from this to indicate that variation in leverage ratios is driven to a large extent by unobserved time-invariant effect generating relatively stable capital structures. However, DeAngelo and Roll (2015) report that leverage cross-sections a few years apart differ markedly, with differences growing each year—and not reverting or stabilizing.

We add to this debate by examining the magnitude and persistence of the leverage volatility of HFIs and LFIs. The first column of Table 10 shows the average (market) leverage ratio in the year of public listing (L_0). For example, for the HFIs in Panel A, $L_0 = 21\%$ in year 0 for the full sample, while it is $L_0 = 18\%$ for the sample of HFIs that have been listed ten years or more. For the LFIs in Panel B, $L_0 = 8\%$ in the full sample (in year 0) and 4% for the subsample who have been listed ten years or more. Column (2) provides the average leverage ratio in event year t (L_t), while column (3) computes that difference between column (1) and (2)—the change in average leverage ratios across event time. For example, in year ten after listing, the HFIs in Panel A have experienced a leverage ratio change averaging $L_{10} - L_0 = 16\%$. The corresponding change for the LFIs in Panel B is only 2%.

Columns (4)-(6) of Table 10 summarize the cross-sectional distribution of the leverage change. First, columns (4) and (5) list the percent of the sample with leverage ratio changes of at least $\pm 20\%$. In Panel

A, 45% of the HFIs increase leverage by at least 20% over the first five years of public listing, while only 7% of the LFIs in Panel B do so. As for reductions in the leverage ratio (Column 5), after five years of listing, 5% of the HFIs (3% LFIs) have reduced their leverage ratios by at least 20%. This indicates a substantially greater leverage volatility among HFIs than among LFIs.

Column (6) of Table 10 shows the average leverage ratio volatility σ_L, measured as the average of the standard deviation of the firm-level leverage ratio from year 0 up to year t, using a minimum of five annual observations. For the HFIs in Panel A, the sample-wide average standard deviation is 17%, which is stable across listing age. In contrast, for LFIs, the average standard deviation of the leverage ratio is only 5%.

It is possible that the leverage ratio volatility is a reflection of the volatility of the leverage target itself. Column (7) of Table 10 addresses this issue. It reports the average volatility of the estimated target leverage ratio, σ_L^*, measured as the average of the standard deviation of the firm-level target leverage ratio from year 0 up to year t, using a minimum of five annual observations. For HFIs, the difference between the actual and target leverage volatilities averages 0.17-.08=.09. Moreover, this difference is stable across listing age. For LFIs, the difference $\sigma_L - \sigma_L^*$ is also stable but much smaller, averaging 0.05-0.04=0.01.

In sum, Table 10 shows that both the actual and the target leverage volatilities is substantially greater for HFIs than for LFIs. In order to test whether these differences in volatilities violate tradeoff theory, we turn to estimation of the relative speed-of-adjustment of HFIs and LFIs.

4.2 Relative speed-of-adjustment in leverage ratios

To investigate whether HFIs revert faster to a leverage target than LFIs, we estimate the following dynamic panel regression

$$L_{i,t} - L_{i,t-1} = \alpha + \eta_i + \phi \left(L^*_{i,t}(\beta X_{i,t-1}) - L_{i,t-1} \right) + \epsilon_{i,t}. \tag{5}$$

The dependent variable is the change in the market leverage ratio, $L^*_{i,t}$ is firm i's current-period leverage target, and η_i is a firm-fixed effect. The parameter ϕ is the speed-of-adjustment (SOA) estimate and captures the fraction of the target deviation that is closed in a particular year. Finally, the lagged firm characteristics $X_{i,t-1}$, which form the estimate of L^* are size, profitability, Q, cash ratio, tangibility, depreciation, R&D expenses, capital expenditures, and the median industry leverage ratio.[19]

We present four alternative SOA coefficient estimations in Table 11. Panel A presents the baseline estimates using all firm-year observations. In Panel B, however, we condition the sample on firm age and only estimate the leverage adjustment behavior if firms are listed for at least five years following public listing. In Panel C, we also focus on firms with long time-series and, in addition, we require the panel to be balanced. We do so by first sorting firms into HFIs and LFIs using event-year ten relative to the year of going public, and then hold this sample constant in the estimation of Eq. (5) using all firm-years.[20] In Panel D, we instead investigate whether the equity issue and retirement activity reflects deviations from target leverage.

Turning to the coefficient estimates in Panel A, ϕ is 0.32 for HFIs and 0.27 for LFIs, both statistically significant at the 1% level. These estimates suggest that it takes on average 2.5-3.0 years to recover half of the target leverage deviation ($ln(0.5)/ln(1+\phi)$). Importantly, the third column suggests that the SOA coefficients for HFIs and LFIs are statistically indistinguishable from each other. Panel B shows that focusing on mature firms only does not change this conclusion. Similarly, using the balanced panel of firms in Panel C also fails to indicate a statistically different speed-of-adjustment behavior between HFIs and LFIs.[21]

The finding of statistically indistinguishable SOA coefficient estimates for HFIs and LFIs is surprising. Recall from Panel A of Table 3 that LFIs on average undertake roughly one net-debt issue during the first ten years of listing (with the 2.5% threshold), and only 2.7 issues over the first twenty years. In contrast, HFIs undertake on average 12.76 net-debt issues over the first ten years and 21.21 issue over the twenty years after public listing. Recall also that the average issue size is no smaller for HFIs than for LFIs (Panel C of Table 8). This means that, for LFIs, the dynamic behavior of the market leverage ratio in Eq. (5) is largely driven by changes in the denominator of the leverage ratio, i.e. by dynamics of the asset side of the balance sheet.

[19] These characteristics also follow closely the tradition in the extant literature estimating SOA coefficients. See. e.g., Fama and French (2002), Flannery and Rangan (2006), Hovakimian and Li (2012) and Faulkender, Flannery, Hankins, and Smith (2012). Since the regressor $L^*_{i,t}$ is estimated, and since the lagged dependent variable $L_{i,t-1}$ also features as a regressor [Eq. 5 is equivalent to $L_{i,t} = \alpha + \eta_i + \phi L^*_{i,t}(\beta X_{i,t-1}) + (1-\phi)L_{i,t-1} + \epsilon_{i,t}$], we use GMM estimation (Blundell and Bond, 1998; Lemmon, Roberts, and Zender, 2008; Flannery and Hankins, 2013).

[20] In this estimation, the number of firms is held constant for the first eleven years and thereby approaches a balanced dynamic panel.

[21] In untabulated results, we also show that these findings are robust to controlling for total investment into fixed assets (as opposed to only *Capex*) and to including target leverage volatility (from Table 10) as a separate explanatory variable. In both cases, results are unchanged.

To further explore the puzzling high SOA coefficient for LFIs, we replace the dependent variable in equation 5 with scaled net equity issues in Panel D. This exercises produces a near-zero SOA estimate for both HFIs and LFIs, which rules out that LFIs actively manage target leverage using equity issues. Also shown, replacing net equity issues obtained from the cash flow statement with the broader Fama and French (2005) equity issue measure (which accounts for stock issued in acquisitions or direct issues to employees) produces a similar inference. Thus, not unlike Welch (2004), we infer that the high SOA estimate for our subsample of LFIs is largely driven by *passive* equity growth.

4.3 Relative speed-of-adjustment when investment is low

Combining the pecking order theory underlying the financing deficit regressions in Section 3.3 above with dynamic tradeoff theory yields a rich set of predictions concerning leverage dynamics. For example, as in DeAngelo, DeAngelo, and Whited (2011), firms with long-term target leverage ratios may optimally issue debt to finance investments even if the debt issue causes the firm to be over-leveraged in the short run. Empirically, this type of funding behavior can mask true tradeoff behavior in the data, causing the SOA coefficient estimate in Eq. 5 to be understated, in particular for investment-intensive firms such as the HFIs. Below, we condition the SOA estimation on periods of high and low investment in order to account for this potential.

Because average and median investment into capital expenditures is large (10% and 5%, respectively) and also difficult to compare across industries, we define periods of high investment using two alternative measures. The first, $Ecapex^I_{it}$, is the difference between firm i's capital expenditures (I_{CX}) in period t and the median I_{CX} in the firm's 3-digit SIC industry. The second, $Ecapex^D_{it}$, is the difference between firm i's level of I_{CX} and the firm's current period accounting depreciation allowance standardized by lagged total assets. $Ecapex^D$ is also interesting as it reflects the firm's real asset growth.

Our conditional SOA regression is motivated by Halling, Yu, and Zechner (2016) who test whether firms adjust leverage differently in periods of recessions or expansions. Adapting their framework, we instead estimate whether the adjustment process is different for periods of high and low investment:

$$L_{i,t} - L_{i,t-1} = \alpha + \eta_i + \phi_1 \left(L^*_{i,t}(\beta X_{i,t-1}) - L_{i,t-1} \right) |_{Ecapex_t \leq 0} + \phi_2 \left(L^*_{i,t}(\beta X_{i,t-1}) - L_{i,t-1} \right) |_{Ecapex_t > 0} + \epsilon_{i,t}, \tag{6}$$

This regression jointly estimates a time-varying target leverage ratio for each HFI. Importantly, it permits periods of low investment ($Ecapex_t \leq 0$) to exhibit a different leverage adjustment than periods of high investment ($Ecapex_t > 0$).[22] The estimates of ϕ_1 and ϕ_2 are shown in the first row of each of the two panels of Table 12. Panel A employs the industry definition of excess investment ($Ecapex^I$), while Panel B uses the depreciation definition ($Ecapex^D$). In either panel, we do not find evidence that $\phi_1 > \phi_2$.

As discussed above, passive changes in equity also impact the dynamics of the leverage ratio and therefore potentially the SOA estimate. To address this concern, we use scaled net-debt issues as dependent variable: $NDI_{i,t}/MV_{i,t}$ (conclusions are unchanged if we scale by book value of total assets). As shown by the second row in each of panels A and B, the SOA coefficient estimate now indicate that HFIs manage NDI so as to increase the speed-of-adjustment to target leverage deviations in periods with zero or negative excess investment.

5 Leverage and profitability at rebalancing points

In classical trade-off theory of capital structure, firms select the optimal leverage ratio by equating marginal debt-related tax benefits with marginal expected bankruptcy cost. The more profitable the firm, the greater the optimal leverage ratio in this balance. With zero capital structure rebalancing costs, firms continuously maintain the optimal leverage ratio, implying a positive correlation between leverage and profitability unconditionally (in all periods). However, with positive rebalancing costs—first modeled by Fischer, Heinkel, and Zechner (1989)—firms optimally rebalance at discrete points in time when the rebalancing benefit is sufficient to cover the cost. In periods with capital structure inactivity due to rebalancing costs, the leverage-profitability correlation becomes (mechanically) negative as higher values of profitability increase equity value and so reduce market leverage. Conversely, in periods when the firm optimally rebalance capital structure (by issuing debt to finance an equity payout), dynamic tradeoff theory predicts that more profitable firms choose higher leverage.[23]

The high net debt issue frequency of HFIs makes them a particularly interesting *test asset* for the leverage profitability correlation. To examine whether more profitable HFIs choose higher leverage when

[22] We know from Table 7 above that HFIs also make substantial non-capex investments (the difference between I_{FA} and I_{CX}). Computing *Ecapex* using all long-term investment except capital expenditures does not change the conclusions below.

[23] Danis, Rettl, and Whited (2014): "[A] positive association between profitability and leverage is an intuitive result of any tradeoff model." (p.427). For good measure, they confirm this intuition using simulations of a dynamic tradeoff model such as that of Goldstein, Ju, and Leland (2001).

rebalancing, we employ the basic regression framework of Danis, Rettl, and Whited (2014):

$$L_t = \alpha + \gamma_0 Profit_{t-1} + \gamma_1 Profit_{t-1} \times Rebal_t + \gamma_2 Rebal_t + \beta X_{t-1} + \epsilon_t, \tag{7}$$

where L is the market leverage ratio and $Profit$ is operating profitability. Moreover, X_{t-1} is a vector of lagged control variables including firm size, asset tangibility, market-to-book ratio and $Risk$. $Rebal_t$ is a dummy variable that takes on a value of one when the firm actively rebalances capital structure (up or down) in period t and zero otherwise. Let $Rebal^+$ indicate a leverage-increasing rebalancing event:

$$Rebal_t^+ \quad = \quad 1 \text{ if } \frac{\Delta D_t^e}{A_t} > s \text{ and } \frac{ER_t^e}{A_t} > s, \tag{8}$$

and zero otherwise. ΔD^e is the quarter's increase in long-term debt in excess of debt retirement, ER^e the equity retirement (repurchases and dividends) in excess of equity issues, and the constant issue-size threshold s is in percent of assets (below, either 2.5% or 5%). Thus, a leverage-increasing rebalancing event takes place when the firm issues debt net of debt retirements and pays dividends or retires equity net of of equity issues in amounts that exceed the size threshold s. Overall, 80% of the payment to equity-holders are distributed through stock repurchase and 20% through a cash dividend.[24]

Again, if classical dynamic trade-off considerations drive the leverage-increasing rebalancing activity, the leverage-profitability correlation is predicted to be positive in quarters with active rebalancing, and a negative correlation in other periods, i.e.:

$$\text{H0 (dynamic tradeoff with costly rebalancing)} : \gamma_0 + \gamma_1 > 0 \text{ and } \gamma_0 < 0. \tag{9}$$

Columns (1) and (2) of Table 13 show the corresponding coefficient estimates for leverage-increasing rebalancing events. Note first that, notwithstanding the high net-debt issue activity of HFIs, leverage increasing recapitalizations are rare: they occur in less than 2% of the firm-quarters. Because $Risk$ requires at least five years of contiguous data, the average age of the HFIs in Column (2) is higher then

[24] Danis, Rettl, and Whited (2014) use net leverage (debt minus cash holdings) as dependent variable in Eq. (7) and in their definition of a rebalancing event, and they do not consider leverage-reducing rebalancings. In our vernacular, their net leverage indicator is $Rebal_t^+ = 1$ if $\frac{\Delta D_t^e - \Delta C_t}{A_t} > s$ and $\frac{ER_t^e}{A_t} > s$, where ΔC_t is the change in the firm's cash balance over quarter t, which implies that the equity distribution may be (co-)financed with cash draw-downs. We use the gross leverage definition in Eq. (10) because cash-balance draw-downs are costless and so cannot support the rebalancing inactivity which is at the core of dynamic tradeoff theory. See also Eckbo and Kisser (2018b).

in Column (1). Also, while the table uses an issue size threshold of s =2.5%, we have verified that the results are similar with a threshold of s =5%.

The Wald statistic in Table 13 tests the hypothesis that $\gamma_0 + \gamma_1 = 0$. In both Columns (1) and (2), the estimate of γ_0 is negative and significant, as predicted by H0 (negative leverage-profitability correlation conditional on rebalancing inactivity). More important, the sum $\gamma_0 + \gamma_1$ is negative in both columns, and significantly negative in Column (1), which fails to support H0. Thus, notwithstanding that HFIs persistently issue net-debt over the public lifecycle, Columns (1) and (2) of Table 13 fails to support that more profitable HFIs choose higher leverage when they actively rebalance up the leverage ratio.[25]

Finally, recall the the large number of debt retirements in Tables 3 and 4 above. While active leverage reductions fall outside of classical dynamic tradeoff theory, contracting theory provides a possible rationale for debt retirements.[26] For example, shareholders may optimally repurchase a debt issue that blocks a valuable investment project, or when covenant violations threatens to transfer significant control rights from equity-holders to bond-holders. In these cases, one would also expect more profitable firms to have greater optimal leverage ratios—a positive conditional leverage-profitability correlation.

To examine this prediction, we single out leverage-decreasing rebalancing events using the dummy variable $Rebal^-$ in in Eq. (7), where

$$Rebal_t^- \quad = \quad 1 \text{ if } \frac{\Delta D_t^e}{A_t} < -s \text{ and } \frac{ER_t^e}{A_t} < -s. \tag{10}$$

Columns 3 and 4 in Table 13 show the associated coefficient estimates. The Wald test rejects the proposition that $\gamma_0 + \gamma_1$ also for these leverage-reducing events.

As shown in Table 14, the above conclusions are robust to using two alternative definitions of operating profitability. Panel A replaces $Profit_{t-1}$ with the lagged value-weighted average operating profitability since public listing. Panel B uses the lagged ratio of the change in retained earnings relative to the year of public listing (which reflects cumulative earnings less total dividend distributions) scaled by book assets. In both panels, the leverage profitability relation remains significantly negative as before.

[25]Our conclusion holds also with Danis, Rettl, and Whited (2014)'s net-leverage definition of a rebalancing event.

[26]E.g., Smith and Warner (1979), Aghion and Bolton (1992), Dewatripont and Tirole (1994).

6 Conclusion

This paper is the first to identify and systematically study high-frequency net-debt issuers (the HFIs). These firms are publicly listed U.S. industrial corporations that raised the bulk of all private and public debts over the past three decades through a program of persistent net-debt issues. Our sort on net-debt issuance frequency (net of debt retirements) screens out low-leverage firms but more importantly also high-leverage firms who cannot issue due to financial distress and which may have frustrated earlier test of tradeoff theory. Since these firms evidently view debt-financing as uniquely beneficial, and face sufficiently low debt issue costs to issue frequently, they constitute a particularly interesting sample for examining capital structure predictions in general, and those of dynamic tradeoff theory in particular.

In the first part of the paper, we describe the capital structure dynamics and investment funding of the HFIs and contrast this with low-frequency net-debt issuers (the LFIs). The lifecycle persistence of these characteristics is interesting: HFIs stand out already at the time of public listing as relatively large, investment-intensive firms with high leverage and low Tobin's Q. These firm characteristics contrast with those of low-frequency net-debt issuers (LFIs), which we show are relatively small R&D-intensive firms with low leverage and high Q.

As we show, there is only minimal migration between firms in the HFI and LFI categories. Market leverage ratios quickly rise to an average of 32% for HFIs versus an average of 7% for LFIs. Moreover, while as much as 40% of the LFIs have zero leverage in a typical firm-year, only 3% of HFIs ever reduce leverage to zero during their lifetime as public companies (in which case the HFI retires all of its outstanding debts in the last quarter of the year, for subsequently to issue new debts the following year). While HFIs tend to finance a relatively capital-intensive investment program externally through debt issues, LFIs tend to finance a relatively intensive R&D program internally. The equity issue frequency is similar across the two groups of firms.

In the second part of the paper, we perform two well-known but methodologically distinct examinations of whether HFIs manage leverage towards a target. Dynamic tradeoff theory suggests that HFIs and LFIs should have sharply different leverage dynamics. Our first test approach compares the leverage ratio volatility and the speed-of-adjustment (SOA) across HFIs and LFIs. This approach uses the entire leverage time-series, and the SOA regression also requires joint estimation of a leverage target. Because the HFIs likely face higher debt-financing benefits and lower fixed debt-issuance costs than the LFIs, tradeoff theory suggests that the HFIs should have lower leverage ratio volatility and greater SOA than the LFIs.

We instead find that the leverage ratio volatility of HFIs is substantially higher and that LFIs and HFIs receive statistically indistinguishable SOA estimates. We also show that the similar SOA coefficients are not driven by active equity issues and that controlling for investment shocks does not increase the SOA estimate for the HFIs. Given the extremely low debt-issue frequency of the LFIs, this suggests that traditional SOA estimates are substantially driven by passive changes in equity value rather than by active management toward a leverage target.

Our second test approach is to estimate the cross-sectional leverage-profitability correlation of the HFIs at rebalancing points. This approach, which extant research has recently applied to the Compustat universe of industrials, is particularly powerful as it does not require estimation a leverage target. Intuitively, when firms rebalance capital structure, more profitable companies should move to a higher leverage ratio. We find instead that the leverage-profitability correlation at rebalancing points is negative for the HFIs. This conclusion holds whether a rebalancing event is defined with or without permitting cash draw-downs to finance the equity repurchase (in addition to a debt issue). Moreover, it is robust to alternative measures of profitability, and it holds also when using leverage-decreasing rebalancings.

Finally, consistent with the standard pecking order argument, we show that HFIs prefer to finance even large investment shocks with new debt, even if already overleveraged. This suggests that debt-issue capacity is valuable, and it may help explain also the high net-debt repurchase activity of the HFIs. In sum, while there is little doubt that debt financing ranks high in financing pecking order, there is little evidence that the HFIs manage capital structure towards a target.

Appendix 1: Compustat mnemonics used for variable construction

Variable	Description (Compustat mnemonics)	Mean	Median	St.Dev.
A. Compustat balance sheet items				
che	Cash and cash equivalents	117.3	13.2	1048.9
ppent	Property, plant and equipment (net of depreciation)	230.7	14.3	1123.4
at	Total assets	782.1	101.8	3434.4
dlc	Debt in current liabilities	22.6	0.7	153.0
dltt	Long-term debt	198.1	2.6	958.8
lt	Tota liabilities	440.2	34.5	1946.7
pstkl	Preferred stock liquidation value	4.2	0.0	73.3
txditc	Deferred taxes and investment tax credit	29.5	0.0	255.2
B. Compustat income statement items				
sale	Revenues	725.6	89.2	3437.1
xrd	Research and development expenditures	20.5	0.1	169.0
oibdp	Operating profits	95.3	6.5	536.7
dp	Depreciation expenses (Income statement)	34.9	3.7	157.4
C. Compustat cash flow statement items				
ibc	Income Before Extraordinary Items	22.5	0.7	407.6
dpc	Depreciation and Amortization	36.3	3.9	160.2
ocf_oth[a]	Other Operating Cash Flow (= xidoc + txdc +esubc + sppiv + fopo + fsrco + exre)	20.1	1.0	289.3
nwc_inv[b]	Investment into Net Working Capital [= (recch + invch + apalch + txach + aoloch)*(-1)]	4.8	0.6	89.5
oancf	ibc + dpc + ocf_oth - nwc_inv	74.1	3.1	462.1
capx	Capital Expenditures	47.3	3.9	254.3
aqc	Acquisitions	24.9	0.0	217.9
ivch	Increase in Investments	41.2	0.0	684.2
siv	Sale of Investments	37.8	0.0	613.1
sppe	Sale of Property, Plant and Equipment	2.4	0.0	49.9
ivstch	Short-term Investments - Change	-3.1	0.0	136.5
ivaco[c]	Investing Activities - Other	0.6	0.0	148.3
inv_total	capx + aqc + ivch - siv - sppe - ivstch - ivaco	75.6	6.1	441.0
sstk	Sale of Common and Preferred Stock	24.0	1.3	138.5
prstkc	Purchase of Common and Preferred Stock	22.4	0.0	213.0
dv	Cash Dividends	10.9	0.0	122.2
dltis	Long-Term Debt - Issuance	102.4	0.0	593.4
dltr	Long-Term Debt - Reduction	81.3	0.8	510.4
dlcch	Changes in Current Debt	0.0	0.0	59.3
fincf_oth[d]	Other Financing Cash Flow [= (txbcof + fiao)]	-1.8	0.0	100.7
fin_total	sstk - prstkc - dv + dltis - dltr + dlcch + fincf_oth	10.1	1.2	308.7
chech	Change in cash and cash equivalents	8.6	0.2	158.8
D. Compustat other financial items				
csho	Common shares outstanding	44.0	16.6	175.4
prcc_f	Stock price	15.2	8.5	25.4
ajex	Stock split adjustment factor	1.3	1.0	3.1
fa[e]	Fixed assets [= at - (che + rect + invt + aco)]	115.93	10.04	728.32

[a] ocf_oth is the sum of extraordinary items and discontinued operations (xidoc), deferred taxes (txdc), equity in net loss (esubc), loss from sale of PPE and investments (sppiv), funds from operations–other (fopo), other sources of funds (fsrco) and exchange rate effects (exre). The item fsrco is 0 if the company reports according to format code 7 (scf=7), exre is zero in case of format codes scf=1, 2 or 3.

[b] nwc_inv is constructed as follows: For format code 7, it is the sum of (multiplied by minus 1) accounts receivable-decrease (recch), inventory-decrease (invch), accounts payable and accrued liabilities-increase (apalch), income taxes-accrued-increase (txach), assets and liabilities-other (aoloch). For format code 1, it is the variable wcapc. In case of format codes 2 and 3, it is $wcapc * (-1)$.

[c] ivaco is replaced by fuseo*(-1) in case of format codes 1, 2 or 3.

[d] fincf_oth is the sum of excess tax benefits of stock options (txbcof) and other financing activities (fiao).

[e] We set entries for rect, invt and aco equal to zero if missing. Similarly, if the resulting value for fa is negative, we set it to zero.

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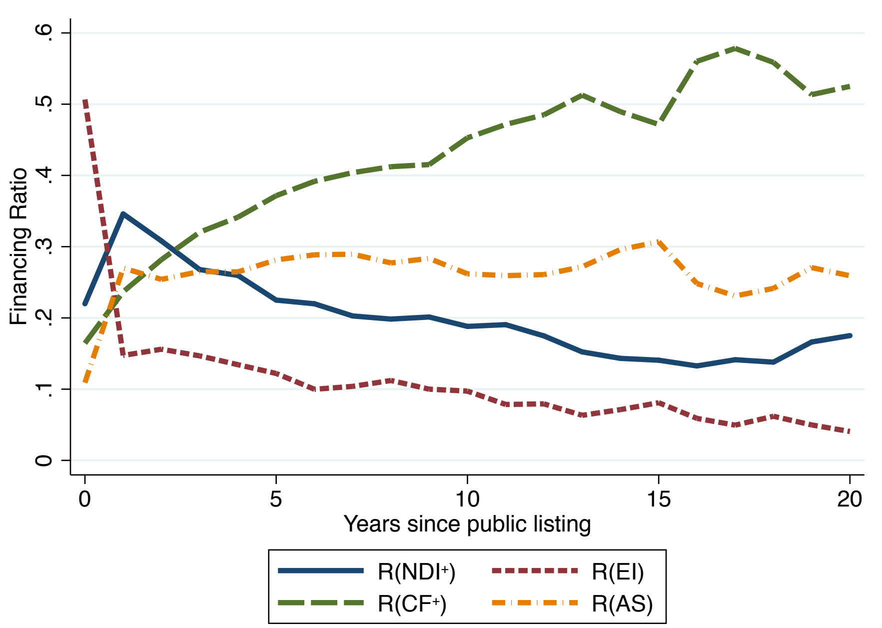
Figure 1: **Lifecycle funding ratios for HFIs and LFIs**

The classification of firms into high- and low-frequency net-debt issuers (HFIs and LFIs) is as detailed in Table 3 with the 2.5% issue size threshold. The figure plots four funding ratios $R_j \equiv S_j^+ / \sum_i^7 S_i^+$, where $\sum_i^7 S_i^+$ is the firm's total cash contribution from each of its seven (non-negative) sources of funds: $\sum_i^7 S_i^+ = EI + NDI^+ + CF^+ + \Delta C^- + I^- + \Delta W^- + O^+$. EI is proceeds from equity issues, NDI^+ is positive net debt issues (net of debt retirements), CF^+ is positive operating cash flow, ΔC^- is cash drawdowns, I^- is sale of illiquid assets (sale of investments, PPE and other investments), ΔW^- is reduction in net working capital, and O^+ is "other" sources of funds (a small residual closing the cash flow identity). By construction, the following four ratios in the graph sum vertically to one: $R_{EI} = EI / \sum_i^7 S_i^+$, $R_{NDI^+} = NDI^+ / \sum_i^7 S_i^+$, $R_{CF^+} = CF^+ / \sum_i^7 S_i^+$, and $R_{AS} = (\Delta C^- + I^- + \Delta W^- + O^+) / \sum_i^7 S_i^+$. Year 0 is the year of public listing. Variable definitions are in Tables 2 and 1. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

A: Average funding ratios since public listing for HFIs



B: Average funding ratios since public listing for LFIs

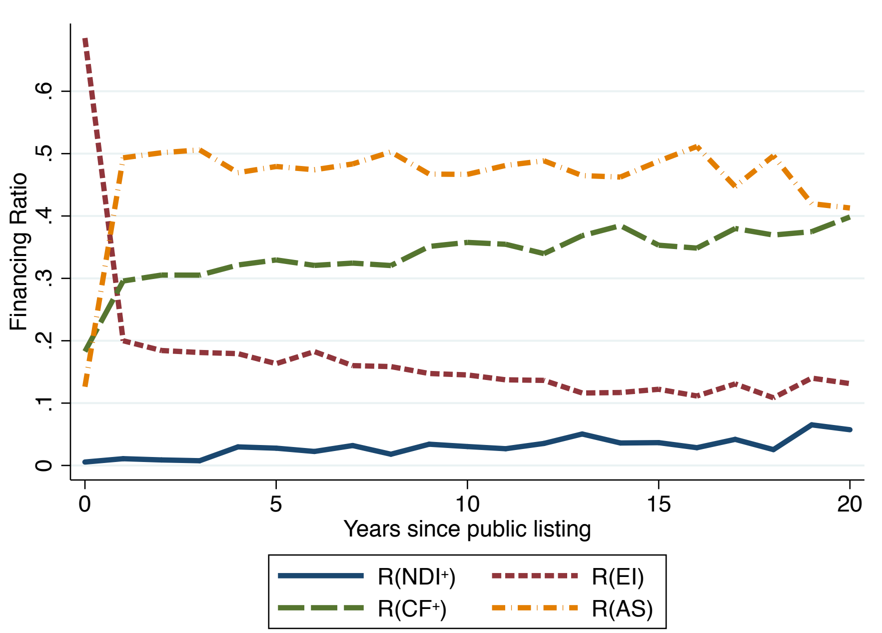


Table 1: Sample selection

Sample restriction	Observations	Firms
A: Annual CRSP/Compustat (CCM) sample, 1984-2016		
Initial CCM sample	217,674	21,915
U.S. domiciled firms only	-22,521	-2,385
Nongovernmental, industrial firms only[a]	-62,811	-5,662
No multiple annual observations	-1,865	0
No missing information on book value of assets	-266	-23
Firm age positive[b]	-174	-15
= Subsample	130,037	13,830
Consistent cash-flow statement data[c]	-568	-31
Consistent other financial statement data[d]	-2,559	-81
= Intermediate sample	126,910	13,718
B: Quarterly CRSP/Compustat (CCM) sample, 1984-2016		
Initial CCM Sample	877,248	22,448
U.S. domiciled firms only	-165,579	-3,515
Nongovernmental, industrial firms only[a]	-177,700	-4,640
No multiple quarterly observations	-7,126	0
No missing information on book value of assets	-1,638	-9
Consistent cash-flow statement data[c]	-24,236	-344
Consistent other financial statement data[d]	-27,432	-102
= Intermediate Sample	473,537	13,838
C: Merged CRSP/Compustat (CCM) sample, 1984-2016		
Merged Sample	445,046	13,384
Went public during sample period	-179,500	-4,044
Contiguous annual observations[e]	-25,518	0
Final quarterly CRSP/Compustat sample	240,028	9,340
Final annual CRSP/Compustat sample	66,056	9,340

[a] Eliminates utilities (SIC codes 4899-5000), financial firms (SIC codes 5999-7000), and government entities (SIC codes greater than 8999).

[b] Firm age is the difference between the reporting date of the annual financial statement and the date of the first month a company is reported in the CCM monthly stock price database, rounded to the next smaller integer.

[c] For cash-flow data consistency, we first set missing entries for items in the cash flow statement to zero and then drop observations in case total sources or uses of funds equal zero or deviate by more than 1% from each other.

[d] For balance sheet data consistency, we first replace missing values of the number of shares outstanding (cshoq, results in 2,100 replacements) and the stock price (prccq, results in 1,373 replacements) with the previously reported value in case the current observation is missing. We then require non-missing data for the market value of the firm's equity (prcc_f × csho), Tobin's Q (dltt + dlc + prcc_f × csho)/at), total debt (dltt + dlc), cash holdings (che), property plant and equipment (ppent) and operating profits (oibdp). We further drop observations in case the book leverage ratio is outside the unit interval or cash holdings are negative. The last criterium is not applied to the quarterly dataset (given that consistency is ensured at the annual level). Whenever quarterly operating profits are missing, we use Compustat's own variable definitions as follows: Compustat defines earnings before interest and taxes (oiadpq) as the difference between operating profits and depreciation expenditures (dpq): oiadpq = oibdpq - dpq. Operating profits are further defined by Compustat as the difference between revenues (saleq) and operating costs (xoprq): oibdpq = saleq - xoprq. In case the entry for oibdpq is missing, we therefore set it to oibdpq = oiadpq + dpq (results in 2 replacements of missing values) or, if still missing, to saleq - xoprq (results in 34,456 replacements of missing values).

[e] We eliminate observations once the underlying annual data become non-contiguous.

Table 2: **Variable construction (Compustat mnemonics in Appendix Table 1)**

Variable	Description (Compustat mnemonics)	Mean	Median	St.Dev.
A. Selected firm characteristics (All Financial Statements)				
L	*Market leverage*: (dlcc + dlt)/(prcc_f*csho + dlcc + dlt)	0.18	0.09	0.23
NL	*Net Market leverage*: (dlcc + dlt - che)/(prcc_f*csho + dlcc + dlt - che)	0.02	0.00	0.09
BL	*Book leverage*: (dlcc + dlt)/at	0.20	0.14	0.21
C	*Cash ratio*: che/at	0.25	0.15	0.26
$Size^a$	log(at)	4.14	4.08	1.87
$Prof^b$	*Profitability*: (oibdp)/at	-0.01	0.09	0.31
Tan	*Tangibility*: ppent/at	0.24	0.16	0.23
Q	*Tobin's Q*: (prcc_f*csho + dlcc + dlt)/at	2.14	1.41	2.17
$R\&D$	xrd/at	0.08	0.00	0.15
Div	dv/at	0.01	0.00	0.02
$Capex$	capx/at	0.06	0.04	0.08
$Depr$	dp/at	0.05	0.04	0.04
I_{CX}	capx/lag(at)	0.07	0.04	0.10
I_{CF}	(inv_total + ivstch)/lag(at)	0.11	0.06	0.20
I_{FA}	(fa - lag(fa) + dpc + esubc + sppiv + fopo + (xidoc - xido))/lag(at)	0.20	0.10	0.35
$Ecapex^I$	I_{CX} - I_{CX}(industry)	0.11	0.06	0.20
$Ecapex^D$	(capx - dp)/lag(at)	0.20	0.10	0.35
B. Sources of funds (Cash Flow Statement)				
EI	*Equity Issues*: sstk	24.0	1.3	138.5
DI	*Debt Issues*: dltis + max[dlcch,0]	104.8	0.2	599.2
CF^+	*Positive operating Cash Flow*: max[oancf + nwc_inv,0]	84.0	5.5	459.8
ΔC^-	*Draw-down of Cash balance*: max[chech*(-1),0]	11.7	0.0	92.9
I^-	*Asset sales*: siv + min[ivstch,0] + min[ivaco,0] + sppe	50.4	0.2	629.6
ΔW^-	*Decrease in net Working capital*: max[nwc_inv*(-1),0]	7.8	0.0	54.0
O^+	*Other sources*: max[fincf_oth,0]	3.8	0.0	48.7
C. Uses of funds (Cash Flow Statement)				
ER	*Distributions to equity-holders*: dv + prstkc	33.3	0.0	282.8
DR	*Debt Retirements*: dltr + min[dlcch,0]*(-1)	83.7	1.1	513.9
CF^-	*Negative operating Cash Flow*: max[(oancf + nwc_inv)*(-1),0]	5.0	0.0	30.0
ΔC^+	*Build-up of Cash balance*: max[chech,0]	20.3	0.2	126.9
I^+	*Investments*: ivch + aqc + min[ivstch*(-1),0] + min[ivaco*(-1),0] + capx	126.0	10.2	885.7
ΔW^+	*Increase in net Working capital*: max[nwc_inv,0]	12.6	0.6	70.0
O^-	*Other uses*: max[fincf_oth*(-1),0]	5.6	0.0	89.6
D. Composite Variables (Cash Flow Statement)				
NDI	*Debt issue minus debt retirement*: DI - DR	21.1	0.0	268.8
NDI^+	*Positive portion of debt issue minus debt retirement*: max[DI - DR,0]	34.1	0.0	245.6
NDI^-	*Negative portion of debt issue minus debt retirement*: max[DR - DI,0]	12.9	0.0	105.0
NEI	*Equity issue minus equity distributions*: EI - ER	-9.3	0.3	282.9
ΔD^e	*Long-term debt issues*: dltis - dltr	21.1	0.0	267.8
ER^e	*Net equity retirement*: dv + prstkc - sstk	9.3	-0.3	282.9
$NetDeficit$	Dv + aqc + ivch - siv - ivstch - sppe - ivaco - oancf + chech	0.08	-0.02	0.35
E. Other Financial Statement variables				
dSM^c	(csho*ajex - lag(csho)*lag(ajex))*(lag(prcc_f)/lag(ajex) + prcc_f/ajex)/2	30.14	2.45	404.95

[a] When computing size, we adjust the book value of assets by inflation using January 1984 as the base year.

[b] The variable risk is computed using quarterly values for $Prof$ (oibdpq/atq) over a period of at least 5 contiguous years.

[c] The variable dSM is missing for the first observation of a firm and we therefore replace missing values with EI to make sure dSM also reflects the initial public offering.

Table 3: Issues and retirements with a 2.5% issue size threshold

Starting in the year of public listing ($t = 0$), firm i is classified as a high- or low frequency net-debt issuer (HFI or LFI) in year t as follows: First, calculate firm i's cumulative number of quarterly positive net-debt issues in year t, N_{it}, as follows: $N_{it} = \sum_{\tau=0}^{t} \sum_{q=1}^{4} I_{iq\tau}$, where $I_{iq\tau}$ takes a value of one if $NDI^{+}_{iq\tau} \geq 2.5\%$ in quarter q of event year $\tau \leq t$ and zero otherwise. NDI^{+} is the positive portion of total debt issue minus debt retirement as given by quarterly Compustat cash flow statements. Then, firm i is classified as a HFI (LFI) in year t if N_{it} is in the upper (lower) quartile of the frequency distribution of N_t. The cumulative quarterly number of issues for the HFIs and LFIs are within-group averages, while the mean and median are for the total sample of firms. The issue counts for the net-debt retirements (NDI^{-}) in Panel B, cash equity issues (EI) in Panel C and total equity issues (dSM) in Panel D are for the firms classified as HFI or LFI in Panel A. Variable definitions are found in Tables 2 and 1. Total sample of 9,340 public US firms and 66,056 firm-years, 1984-2016.

	Total sample of firms			Fraction received of aggregate issue proceeds		Cumulative quarterly number of issues			
Event year	All	LFI	HFI	LFI	HFI	Average LFI	Sample Mean	Sample Median	Average HFI
A. Net-debt issues (NDI^{+})									
0	9340	6194	3146	0.03	0.97	0.00	0.42	0	1.25
1	8251	3669	2582	0.02	0.71	0.00	1.12	1	2.81
3	5813	1641	1667	0.01	0.55	0.00	2.38	2	5.54
5	4174	1492	1386	0.10	0.64	0.41	3.49	3	7.37
10	2078	630	575	0.09	0.48	0.88	6.00	5	12.76
15	1097	298	282	0.07	0.48	1.39	8.13	7	17.12
20	539	163	150	0.12	0.39	2.70	10.74	9	21.21
B. Net-debt retirements (NDI^{-}) by HFIs/LFIs in Panel A									
0	9340	6194	3146	0.75	0.25	0.55	0.54	0	0.52
1	8251	3669	2582	0.27	0.32	0.65	0.94	1	1.25
3	5813	1641	1667	0.07	0.37	0.71	1.84	1	2.80
5	4174	1492	1386	0.16	0.48	1.19	2.81	2	4.32
10	2078	630	575	0.08	0.39	1.59	5.09	4	8.46
15	1097	298	282	0.07	0.40	2.16	7.37	6	13.10
20	539	163	150	0.06	0.46	3.73	9.94	8	17.18
C. Cash equity issues (EI) by HFIs/LFIs in Panel A									
0	9340	6194	3146	0.71	0.29	0.99	0.97	1	0.93
1	8251	3669	2582	0.38	0.37	1.42	1.41	1	1.41
3	5813	1641	1667	0.19	0.43	2.24	2.21	2	2.18
5	4174	1492	1386	0.31	0.41	3.00	2.89	2	2.76
10	2078	630	575	0.34	0.33	4.87	4.24	3	3.78
15	1097	298	282	0.26	0.29	6.05	4.98	3	3.94
20	539	163	150	0.39	0.21	7.06	5.32	3	3.85
D. Total equity issues (dSM) by HFIs/LFIs in Panel A									
0	9340	6194	3146	0.71	0.29	1.14	1.09	1	1.01
1	8251	3669	2582	0.40	0.28	2.28	2.03	2	1.80
3	5813	1641	1667	0.30	0.27	4.36	3.59	3	3.14
5	4174	1492	1386	0.40	0.36	5.99	4.99	4	4.10
10	2078	630	575	0.43	0.28	10.59	8.08	6	6.18
15	1097	298	282	0.21	0.43	13.97	10.34	8	7.10
20	539	163	150	0.12	0.23	15.49	11.56	9	7.91

Table 4: Issues and retirements with a 5% issue size threshold

Starting in the year of public listing ($t = 0$), firm i is classified as a high- or low frequency net-debt issuer (HFI or LFI) in year t as follows: First, calculate firm i's cumulative number of quarterly positive net-debt issues in year t, N_{it}, as follows: $N_{it} = \sum_{\tau=0}^{t} \sum_{q=1}^{4} I_{iq\tau}$, where $I_{iq\tau}$ takes a value of one if $NDI^{+}_{iq\tau} \geq 5\%$ in quarter q of event year $\tau \leq t$ and zero otherwise. NDI^{+} is the positive portion of total debt issue minus debt retirement as given by quarterly Compustat cash flow statements. Then, firm i is classified as a HFI (LFI) in year t if N_{it} is in the upper (lower) quartile of the frequency distribution of N_t. The cumulative quarterly number of issues for the HFIs and LFIs are within-group averages, while the mean and median are for the total sample of firms. The issue counts for the net-debt retirements (NDI^{-}) in Panel B, cash equity issues (EI) in Panel C and total equity issues (dSM) in Panel D are for the firms classified as HFI or LFI in Panel A. Variable definitions are found in Tables 2 and 1. Total sample of 9,340 public US firms and 66,056 firm-years, 1984-2016.

Event year	Total sample of firms: All	LFI	HFI	Fraction received of aggregate issue proceeds: LFI	HFI	Cumulative quarterly number of issues: Average LFI	Sample Mean	Sample Median	Average HFI
A. Net-debt issues (NDI^{+})									
0	9340	6844	2496	0.08	0.92	0.00	0.31	0	1.18
1	8251	4430	3821	0.08	0.92	0.00	0.79	0	1.70
3	5813	2163	1453	0.05	0.50	0.00	1.58	1	4.18
5	4174	1231	1490	0.03	0.71	0.00	2.22	2	4.82
10	2078	671	659	0.08	0.57	0.42	3.64	3	7.73
15	1097	370	299	0.14	0.46	0.94	4.79	4	10.30
20	539	182	140	0.22	0.48	1.62	6.30	5	13.39
B. Net-debt retirements (NDI^{-}) by HFIs/LFIs in Panel A									
0	9340	6844	2496	0.82	0.18	0.41	0.41	0	0.40
1	8251	4430	3821	0.39	0.61	0.43	0.63	0	0.85
3	5813	2163	1453	0.21	0.31	0.50	1.11	1	1.89
5	4174	1231	1490	0.10	0.48	0.56	1.62	1	2.67
10	2078	671	659	0.10	0.44	0.86	2.71	2	4.75
15	1097	370	299	0.17	0.42	1.22	3.74	3	7.21
20	539	182	140	0.07	0.50	1.87	5.01	4	9.96
C. Cash equity issues (EI) by HFIs/LFIs in Panel A									
0	9340	6844	2496	0.77	0.23	0.94	0.92	1	0.86
1	8251	4430	3821	0.44	0.56	1.29	1.29	1	1.30
3	5813	2163	1453	0.24	0.40	1.87	1.92	1	2.09
5	4174	1231	1490	0.23	0.46	2.39	2.45	2	2.61
10	2078	671	659	0.30	0.38	3.21	3.37	2	3.49
15	1097	370	299	0.30	0.29	3.80	3.84	2	3.64
20	539	182	140	0.49	0.20	4.12	4.06	2	3.65
D. Total equity issues (dSM) by HFIs/LFIs in Panel A									
0	9340	6844	2496	0.77	0.23	1.03	1.00	2	0.91
1	8251	4430	3821	0.44	0.56	1.79	1.70	2	1.59
3	5813	2163	1453	0.39	0.29	3.05	2.84	3	2.87
5	4174	1231	1490	0.27	0.39	4.26	3.84	3	3.65
10	2078	671	659	0.45	0.31	6.44	5.88	5	5.40
15	1097	370	299	0.23	0.47	8.01	7.22	5	6.15
20	539	182	140	0.12	0.65	8.63	7.79	6	6.31

Table 5: Debt-issue frequency sorts with shorter cumulation periods

In the original sort, firms are classified as HFI or LFI in event year t based on the cross-sectional distribution of quarterly net-debt issues cumulated from the year of public listing (year $t = 0$): $N_{it} = \sum_{\tau=0}^{t} \sum_{q=1}^{4} I_{iq\tau}$, where $I_{iq\tau}$ takes a value of one if $NDI^{+}_{iq\tau} \geq 2.5\%$ in quarter q of event year $\tau \leq t$ and zero otherwise. This table shows the overlap between the firms in the original HFI and LFI sort and two alternative sorts: one based on a three-year trailing cumulation of quarterly net-debt issues, and the other based on zero cumulation (within-year quarterly issue count only). The table displays the fraction of the original HFIs and LFIs that would also be classified as HFI or LFI under the two alternative sorts. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

	Overlap with 3-year trailing cumulation $N^3_{it} = \sum_{\tau=t-2}^{t} \sum_{q=1}^{4} I_{iq\tau}$				Overlap with zero cumulation $N^0_{it} = \sum_{q=1}^{4} I_{iq\tau}$			
	Overlap between HFIs with 3-year cumulation and the original		Overlap between LFIs with 3-year cumulation and the original		Overlap between HFIs with zero cumulation and the original		Overlap between LFIs with zero cumulation and the original	
	HFI	LFI	HFI	LFI	HFI	LFI	HFI	LFI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
1	1.00	0.00	0.00	1.00	0.95	0.00	0.05	1.00
2	1.00	0.00	0.00	1.00	0.86	0.00	0.14	1.00
3	0.96	0.00	0.00	1.00	0.81	0.00	0.19	1.00
4	0.87	0.00	0.01	0.77	0.77	0.08	0.23	0.92
5	0.74	0.00	0.02	0.81	0.71	0.07	0.29	0.93
10	0.79	0.04	0.08	0.79	0.65	0.09	0.35	0.91
15	0.69	0.05	0.11	0.78	0.55	0.10	0.45	0.90
20	0.61	0.09	0.15	0.69	0.55	0.14	0.45	0.86
Avg.	0.85	0.01	0.04	0.91	0.79	0.04	0.21	0.96

Table 6: Predicting net-debt issue activity using HFIs and LFIs

Firms are classified as HFI or LFI in event year t based on the cross-sectional distribution of quarterly net-debt issues cumulated from the year of public listing (year $t = 0$): $N_{it} = \sum_{\tau=0}^{t} \sum_{q=1}^{4} I_{iq\tau}$, where $I_{iq\tau}$ takes a value of one if $NDI^{+}_{iq\tau} \geq 2.5\%$ in quarter q of event year $\tau \leq t$ and zero otherwise. The table presents odds ratios of a logit model determining the probability of a net debt issue in year $t + v$, conditional on the current issue frequency classification and a vector X of covariates:

$$Y_{i,t+v} = \alpha + \beta_1 HFI_{i,t} + \beta_2 LFI_{i,t} + \gamma X_{i,t} + \epsilon_{i,t+v}$$

where $Y_{i,t+v}$ is a dummy variable equal to one in case at least one quarterly net debt issue occurred in year $t + v$. In this regression, $HFI_{i,t}$ ($LFI_{i,t}$) is a dummy variables that takes on a value of one if firm i is classified as a high-frequency (low-frequency) net-debt issuer in period t, and zero otherwise. Thus, the baseline sample is medium-frequency issuers (MFIs, all firms that are neither HFI or LFI). The covariates in $X_{i,t}$ are: investment (*Capex*), R&D expenditures (*R&D*), market leverage ratio (L), cash ratio (C), logarithm of assets (*Size*), operating profitability (*Prof*), tangibility (*Tan*), Tobin's Q (Q) and depreciation expenditures (*Depr*). All covariates are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Table 2 and Table 1 in the paper. *, ** indicate significance at the 5% and 1% level, respectively. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

				Firm-specific explanatory variables (X)								
	N	HFI	LFI	*Capex*	*R&D*	L	C	*Size*	*Prof*	*Tan*	Q	*Depr*
Net debt issue in year t+1:												
All	56,716	2.03**	0.71**	60.68**	0.78*	0.80**	0.04**	0.93**	0.49**	0.72**	1.02**	0.01**
Age > 4	26,621	1.94**	0.61**	53.51**	1.47*	0.82*	0.02**	0.98*	0.44**	0.58**	1.06**	0.07**
Age > 9	12,692	1.90**	0.69**	38.46**	1.41	0.89	0.02**	1.02	0.39**	0.54**	1.09**	0.16*
Net debt issue in year t+2:												
All	48,465	1.76**	0.80**	7.48**	0.38**	1.00	0.10**	0.92**	0.55**	0.96	1.01	0.03**
Age > 4	23,043	1.80**	0.67**	4.72**	0.69	0.99	0.06**	0.98*	0.49**	0.85	1.05**	0.31*
Age > 9	10,902	1.85**	0.76**	3.29*	0.70	1.17	0.06**	1.02	0.43**	0.77	1.07**	0.98
Net debt issue in year t+3:												
All	41,507	1.66**	0.85**	2.92**	0.25**	1.21**	0.14**	0.92**	0.54**	1.08	1.00	0.09**
Age > 4	19,929	1.69**	0.72**	2.25*	0.44**	1.29**	0.11**	0.98*	0.51**	0.99	1.03**	0.46
Age > 9	9,336	1.78**	0.75**	0.95	0.48*	1.43*	0.12**	1.02	0.48**	0.90	1.03	2.11

Table 7: Public lifecycle characteristics of HFIs and LFIs

The sort of firms into high- and low-frequency issuers (HFIs and LFIs) is as in Table 3 (using Eq. (1) and a 2.5% issue size threshold). The table lists, starting with the year of public listing (event year 0), average annual values of key firm characteristics, several of which are scaled by current book value of assets. The characteristics are market leverage ratio (L), fraction of the sample that are all-equity financed (AE), cash ratio (C), book asset value ($Assets$), asset tangibility (Tan, defined as $PPE/Assets$), operating profitability ($Prof$), the ratio of dividends to book equity (Div), the ratio of dividends and share repurchases to book equity ($Payout$), capital expenditures ($Capex$), three measures of long-term investment (I, all scaled by the lagged book asset value: I_{CX} is investment into capital expenditures, I_{CF} is total long-term investment obtained from the cash flow statement and I_{FA} is total long-term investment obtained from balance sheet changes in fixed assets), the asset growth rate (g_A), Tobin's Q (Q) and $R\&D$ expenditures. All ratios are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are found in Tables 2 and 1. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

Year	L (1)	AE (2)	C (3)	$Assets$ (4)	Tan (5)	$Prof$ (6)	Div (7)	$Payout$ (8)	$Capex$ (9)	I_{CX} (10)	I_{CF} (11)	I_{FA} (12)	g_A (13)	Q (14)	$R\&D$ (15)
A: High frequency net-debt issuers (HFIs)															
0	0.21	0.04	0.22	406	0.28	-0.05	0.03	0.06	0.11	NA	NA	NA	0.00	2.52	0.05
1	0.31	0.01	0.11	415	0.32	-0.04	0.01	0.03	0.11	0.15	0.23	0.40	0.44	1.90	0.04
2	0.35	0.02	0.09	505	0.33	0.01	0.01	0.03	0.09	0.12	0.18	0.29	0.31	1.63	0.03
3	0.36	0.02	0.08	517	0.34	0.04	0.01	0.03	0.08	0.10	0.16	0.25	0.24	1.54	0.03
4	0.38	0.01	0.07	617	0.33	0.04	0.01	0.03	0.08	0.10	0.15	0.24	0.22	1.43	0.03
5	0.37	0.02	0.08	631	0.34	0.05	0.01	0.03	0.07	0.09	0.13	0.19	0.16	1.37	0.03
10	0.34	0.03	0.08	1103	0.34	0.08	0.01	0.04	0.07	0.08	0.12	0.18	0.16	1.33	0.02
15	0.32	0.08	0.09	1796	0.30	0.09	0.02	0.06	0.06	0.07	0.09	0.14	0.08	1.26	0.02
20	0.25	0.07	0.08	2654	0.29	0.11	0.03	0.07	0.06	0.06	0.12	0.16	0.11	1.31	0.01
Avg.	0.32	0.03	0.11	822	0.32	0.03	0.02	0.04	0.08	0.10	0.15	0.24	0.22	1.65	0.03
Median	0.28	0.00.	0.04	118	0.24	0.10	0.00	0.00	0.05	0.05	0.07	0.12	0.09	1.14	0.00
B: Low frequency net-debt issuers (LFIs)															
0	0.08	0.27	0.41	291	0.19	-0.04	0.02	0.05	0.07	NA	NA	NA	0.00	3.30	0.08
1	0.07	0.36	0.41	287	0.17	-0.10	0.01	0.02	0.06	0.08	0.12	0.24	0.25	2.83	0.12
2	0.06	0.44	0.42	285	0.17	-0.10	0.01	0.02	0.05	0.06	0.10	0.19	0.15	2.62	0.14
3	0.04	0.49	0.43	267	0.16	-0.07	0.01	0.03	0.05	0.06	0.09	0.17	0.16	2.63	0.14
4	0.08	0.41	0.39	465	0.17	-0.06	0.01	0.03	0.05	0.06	0.09	0.16	0.15	2.57	0.13
5	0.07	0.43	0.39	500	0.17	-0.05	0.01	0.03	0.05	0.05	0.09	0.18	0.16	2.45	0.14
10	0.06	0.48	0.40	835	0.14	-0.01	0.01	0.06	0.04	0.04	0.07	0.15	0.13	2.25	0.12
15	0.05	0.53	0.39	945	0.13	0.01	0.02	0.08	0.03	0.03	0.07	0.13	0.13	2.19	0.12
20	0.06	0.45	0.35	1648	0.15	0.01	0.03	0.09	0.03	0.03	0.07	0.11	0.11	2.14	0.11
Avg.	0.07	0.40	0.40	514	0.17	-0.05	0.01	0.04	0.05	0.06	0.09	0.17	0.16	2.71	0.12
Median	0.00	0.00	0.36	78	0.10	0.06	0.00	0.00	0.03	0.03	0.05	0.09	0.05	1.87	0.06

Table 8: Lifecycle funding sources of HFIs and LFIs

The sort of firms into high- and low-frequency issuers (HFIs and LFIs) is as in Table 3 (using Eq. (1) and a 2.5% issue size threshold). In Panel A, the annual (non-negative) cash contribution of the i'th funding source is the ratio $R_j \equiv S_j / \sum_i^7 S_i$, where the denominator is the sum of the seven individual funding sources in the firm's total cash flow statement:

$$\sum_i^7 S_i = NDI^+ + EI + CF^+ + \Delta C^- + \Delta W^- + I^- + O^+$$

The four columns are: R_{NDI^+} is the net debt issue ratio (NDI^+ in the numerator), R_{EI} is the equity issue ratio, R_{CF^+} is the operating cash flow contribution, $R_{\Delta C^-}$ is the contribution from cash draw-downs, $R_{\Delta W^-}$ is contribution of reductions in net working capital and R_{I^-} is the fraction of funds provided by illiquid asset sales. Panel B replaces the cash inflow from equity issues (EI) with the total measure (dSM) which also accounts for stock-financed acquisitions or direct stock issues to employees. The variable dSM is computed following Fama and French (2005) using the changes in the number of shares outstanding and the average stock prices (both split adjusted) over the fiscal year. Panel C is again based on EI and displays R_j only for periods with positive net debt issues ($NDI^+ > 0$, using the 2.5% issue size threshold). Variable definitions are in Tables 2 and 1. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

	R_{NDI^+}		R_{EI}		R_{CF^+}		$R_{\Delta C^-}$		$R_{\Delta W^-}$		R_{I^-}		R_{O^+}	
Year	HFI	LFI	HFI	LFI	HFI	LFI	HFI	LFI	HFI	LFI	HFI	LFI	HFI	LFI
A: Funding ratios (cash only)														
0	0.22	0.01	0.51	0.69	0.16	0.18	0.03	0.04	0.03	0.03	0.03	0.04	0.02	0.02
1	0.35	0.01	0.15	0.20	0.24	0.30	0.12	0.26	0.06	0.06	0.07	0.15	0.02	0.01
2	0.31	0.01	0.16	0.18	0.28	0.31	0.07	0.20	0.09	0.08	0.08	0.20	0.02	0.01
3	0.27	0.01	0.15	0.18	0.32	0.31	0.07	0.17	0.10	0.10	0.08	0.22	0.02	0.01
4	0.26	0.03	0.13	0.18	0.34	0.32	0.06	0.16	0.11	0.08	0.08	0.21	0.02	0.02
5	0.23	0.03	0.12	0.16	0.37	0.33	0.06	0.17	0.11	0.08	0.09	0.22	0.02	0.01
6	0.22	0.02	0.10	0.18	0.39	0.32	0.07	0.15	0.11	0.08	0.10	0.23	0.02	0.01
7	0.20	0.03	0.10	0.16	0.40	0.32	0.06	0.15	0.12	0.09	0.10	0.23	0.02	0.01
8	0.20	0.02	0.11	0.16	0.41	0.32	0.06	0.14	0.11	0.07	0.09	0.27	0.01	0.02
9	0.20	0.03	0.10	0.15	0.42	0.35	0.07	0.14	0.11	0.08	0.09	0.24	0.02	0.01
10	0.19	0.03	0.10	0.15	0.45	0.36	0.06	0.15	0.09	0.07	0.10	0.24	0.01	0.01
15	0.14	0.04	0.08	0.12	0.47	0.35	0.07	0.12	0.13	0.08	0.10	0.27	0.01	0.01
20	0.18	0.06	0.04	0.13	0.53	0.40	0.07	0.12	0.08	0.09	0.10	0.20	0.01	0.01
Average	0.24	0.02	0.18	0.30	0.34	0.29	0.07	0.14	0.09	0.07	0.08	0.17	0.02	0.02
Median	0.13	0.00	0.02	0.08	0.29	0.18	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
B: Funding ratios involving also non-cash generating equity issues ($EI = dSM$)														
Average	0.22	0.02	0.23	0.34	0.32	0.27	0.06	0.13	0.08	0.06	0.07	0.16	0.01	0.01
Median	0.12	0.00	0.06	0.18	0.26	0.17	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C: Funding sources (cash only) with positive net-debt issues														
Average	0.30	0.31	0.20	0.12	0.29	0.25	0.06	0.11	0.07	0.05	0.07	0.14	0.02	0.01
Median	0.25	0.26	0.02	0.03	0.24	0.18	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00

Table 9: Debt issues and investment in modified financing-deficit regressions

The table reports coefficient estimates using the following regression:

$$\frac{NDI_{i,t}}{A_{i,t}} = \alpha + \beta_1 Capex_{i,t} + \beta_2 NetDeficit_{i,t} + \beta_3 Capex^2_{i,t} + \beta_4 NetDeficit^2_{i,t} + \epsilon_{i,t}.$$

where NDI/A is net-debt issues (or retirements) scaled by total assets, and $Capex$ and $NetDeficit$ are capital expenditures and the financing deficit net of $Capex$, respectively, also scaled by total assets. $NetDeficit \equiv dv + aqc + ivch - siv - ivstch - sppe - ivaco - oancf + chech$, where all Compustat mnemonics are scaled by total assets. $D^*_{i,t-1}$ is a dummy indicating that the firm is over-levered at the end of year $t-1$, i.e., $L_{i,t-1} - L^*_{i,t-1}(X_{i,t-2}) > 0$. $L^*_{i,t}(\beta X_{i,t-1})$ is the estimated target leverage ratio where the determinants $X_{i,t-1}$ are the lagged values of size, profitability, Q, cash ratio, tangibility, depreciation, R&D expenses, capital expenditures, the median industry leverage ratio and year-fixed effects. The target is estimated on a rolling basis and further accounts for firm fixed effects. The classification of firms into HFIs is based on the the cumulative quarterly net debt issue frequency classification as detailed in Table 3, using the 2.5% issue size threshold. Columns (1) and (2) present coefficient estimates for the full sample of HFIs, columns (3) and (4) condition on periods when firms are under-levered ($D^*_{t-1} = 0$) and columns (5) and (6) on periods of over-leverage ($D^*_{t-1} = 1$). All variables are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Tables 2 and 1. Standard errors are in parentheses, *, ** indicate significance at the 5% and 1% level, respectively. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years), 1984-2016.

	All HFIs		$D^*_{t-1} = 0$		$D^*_{t-1} = 1$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Capex$	0.44**	0.55**	0.50**	0.55**	0.92**	0.97**
	(0.03)	(0.04)	(0.04)	(0.07)	(0.05)	(0.07)
$NetDeficit$	0.55**	0.63**	0.58**	0.64**	0.70**	0.77**
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
$Capex^2$	0.39**	0.31*	0.52**	0.61**	-0.47**	-0.48*
	(0.09)	(0.12)	(0.13)	(0.20)	(0.17)	(0.21)
$NetDeficit^2$	-0.43**	-0.48**	-0.42**	-0.39**	-0.53**	-0.54**
	(0.01)	(0.01)	(0.02)	(0.03)	(0.03)	(0.04)
Industry	yes	no	yes	no	yes	no
Firm	no	yes	no	yes	no	yes
Age	yes	yes	yes	yes	yes	yes
N	19424	19424	6175	6175	5445	5445
R^2	0.41	0.45	0.48	0.51	0.65	0.7

Table 10: Leverage ratio dynamics following public listing

The sort of firms into high- and low-frequency issuers (HFIs and LFIs) is as in Table 3 (using Eq. (1) and a 2.5% issue size threshold). Column (1) lists the average (market) leverage ratio in the year of public listing, L_0, for successively smaller samples of firms surviving in event time following the listing year. Column (2) shows the average leverage ratio in event year t, while Column (3) computes the leverage change (the difference between columns 1 and 2). Column (4) and (5) list the fraction of firms experiencing a leverage ratio change of at least ±20%, while Column (6) shows leverage volatility σ_L computed as the average standard deviation of the firm-level leverage ratio up to event year t, using a minimum of five yearly observations. Column (7) displays the volatility of the leverage target, which is estimated on a rolling basis using lagged values of size, profitability, Q, cash ratio, tangibility, depreciation, R&D expenses, capital expenditures, the median industry leverage ratio year- and firm fixed effects. All variables are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Tables 2 and 1. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

	Leverage ratio at public listing L_0	Leverage ratio in event year t L_t	Change in leverage ratio relative to public listing $L_t - L_0$			Leverage volatility	
						σ_L	σ_L^*
Event year	(1)	(2)	Avg. (3)	% > 0.2 (4)	% ≤ −0.2 (5)	(6)	(7)
A: High-frequency issuers (HFIs)							
0	0.21	0.21	n.A.	n.A.	n.A.	.	.
1	0.19	0.31	0.11	0.26	0.02	.	.
2	0.18	0.35	0.16	0.40	0.03	.	.
3	0.18	0.36	0.19	0.43	0.03	.	.
4	0.17	0.38	0.21	0.48	0.04	.	.
5	0.17	0.37	0.20	0.45	0.05	0.18	0.08
10	0.18	0.34	0.16	0.38	0.07	0.16	0.08
15	0.19	0.32	0.13	0.32	0.09	0.17	0.08
20	0.18	0.25	0.07	0.31	0.15	0.16	0.08
Avg.	0.19	0.32	0.13	0.32	0.04	0.17	0.08
B: Low-frequency issuers (LFIs)							
0	0.08	0.08	n.A.	n.A.	n.A.	.	.
1	0.06	0.07	0.01	0.03	0.01	.	.
2	0.05	0.06	0.01	0.04	0.02	.	.
3	0.04	0.04	0.00	0.03	0.02	.	.
4	0.06	0.08	0.02	0.07	0.03	.	.
5	0.06	0.07	0.02	0.07	0.03	0.05	0.04
10	0.04	0.06	0.02	0.06	0.02	0.05	0.05
15	0.03	0.05	0.02	0.05	0.01	0.05	0.05
20	0.04	0.06	0.02	0.09	0.04	0.06	0.05
Avg.	0.06	0.07	0.01	0.04	0.02	0.05	0.04

Table 11: **Speed-of-adjustment to target leverage deviations**

The table reports estimates of the speed-of-adjustment coefficient ϕ in the regression:

$$Y_{i,t} = \alpha + \eta_i + \phi \left(L^*_{i,t}(\beta X_{i,t-1}) - L_{i,t-1} \right) + \epsilon_{i,t}.$$

where in Panels A to C the dependent variable $Y_{i,t}$ is firm i's change in market leverage ratio ($L_{i,t} - L_{i,t-1}$). Panel D replaces the dependent variable with two measures of net equity issue activity: net-equity issues obtained from the cash flow statement (NEI) or a broader measure (dSM) that also accounts for stock-financed acquisitions (Fama & French 2005). Both measures are scaled by firm market value ($MV_{i,t}$). The term $\epsilon_{i,t}$ is the regression error, α is the constant, η_i is a firm fixed effect, $L^*_{i,t}(\beta X_{i,t-1})$ is the (estimated) target leverage ratio where the determinants $X_{i,t-1}$ are the lagged values of size, profitability, Q, cash ratio, tangibility, depreciation, R&D expenses, capital expenditures, the median industry leverage ratio and year-fixed effects. In Panels A and D, the classification of firms into HFIs and LFIs is based on the the original cumulative quarterly net debt issue frequency sort in Table 3 (with the 2.5% issue size threshold). Panel B conditions on firm age and only estimates the leverage adjustment behavior if firms are listed for at least five years following public listing. Panel C first sorts firms into HFIs and LFIs using event-year ten relative to the year of going public, and then hold this sample constant in the estimation of Eq. (5) using all firm-years. All variables are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Tables 2 and 1. Coefficient estimates are shown in the first row of each panel, with * and ** indicating significance at the 5% and 1% level, respectively. The second row contains either standard errors (in parentheses) or t-values. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years) and 2,831 LFIs (total of 25,096 firm-years), 1984-2016.

GMM estimates of SOA-coefficient ϕ			
Dependent variable $Y_{i,t}$	HFI (1)	LFI (2)	HFI - LFI (1)-(2)
A: Original HFI/LFI sort for full sample period			
$L_{i,t} - L_{i,t-1}$	0.313**	0.270**	0.043
	(0.018)	(0.029)	1.259
B: Original HFI/LFI sort when $Age \geq 5$			
$L_{i,t} - L_{i,t-1}$	0.301**	0.300**	0.001
	(0.021)	(0.036)	0.020
C: Balanced panel for HFIs/LFIs as of $Age = 10$			
$L_{i,t} - L_{i,t-1}$	0.324**	0.303**	0.020
	(0.020)	(0.032)	0.537
D: Original HFI/LFI sort for full sample period			
$\frac{NEI_{i,t}}{MV_{i,t}}$	0.010	-0.015	0.025
	(0.009)	(0.017)	1.311
$\frac{dSM_{i,t}}{MV_{i,t}}$	0.046**	-0.009	0.055
	(0.014)	(0.028)	1.765

Table 12: Speed-of-adjustment to target leverage deviations conditional on investment spikes

The table reports estimates of the speed-of-adjustment coefficient ϕ in the regression:

$$Y_{i,t} = \alpha + \eta_i + \phi L^*_{i,t}(\beta X_{i,t-1}) - \phi_1 L_{i,t-1}|_{Ecapex_t \leq 0} - \phi_2 L_{i,t-1}|_{Ecapex_t > 0} + \epsilon_{i,t},$$

where the dependent variable $Y_{i,t}$ is either firm i's change in market leverage ratio ($L_{i,t} - L_{i,t-1}$) or the size of net-debt issues and retirements (NDI) scaled by firm market value (MV). The term $\epsilon_{i,t}$ is the regression error, α is the constant, η_i is a firm fixed effect, $L^*_{i,t}(\beta X_{i,t-1})$ is the (estimated) target leverage ratio where the determinants $X_{i,t-1}$ are the lagged values of size, profitability, Q, cash ratio, tangibility, depreciation, R&D expenses, capital expenditures, the median industry leverage ratio and year-fixed effects. Panel A distinguishes between high and low periods of investment using the industry definition for *Ecapex*. Panel B distinguishes between high and low periods of investment using the depreciation definition for *Ecapex*. All variables are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Tables 2 and 1. Coefficient estimates are shown in the first row of each panel, with * and ** indicating significance at the 5% and 1% level, respectively. The second row contains either standard errors (in parentheses) or t-values. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years), 1984-2016.

GMM estimates of SOA-coefficient ϕ			
Dependent variable $Y_{i,t}$	ϕ_1 (1)	ϕ_2 (2)	ϕ_1 - ϕ_2 (1)-(2)
A: Industry definition ($Ecapex^I$)			
$L_{i,t} - L_{i,t-1}$	0.302**	0.365**	-0.063*
	(0.019)	(0.023)	-2.11
$\frac{NDI_{i,t}}{MV_{i,t}}$	0.214**	0.125**	0.089
	(0.014)	(0.017)	4.01
B: Depreciation definition ($Ecapex^D$)			
$L_{i,t} - L_{i,t-1}$	0.316**	0.359**	-0.043
	(0.021)	(0.021)	-1.47
$\frac{NDI_{i,t}}{MV_{i,t}}$	0.224**	0.136**	0.088
	0.015	0.016	4.01

Table 13: The leverage-profitability correlation at rebalancing points

The table reports coefficient estimates from the following panel (firm-quarter) regression:

$$L_t = \alpha + \gamma_0 Profit_{t-1} + \gamma_1 Profit_{t-1} * Rebal_t + \gamma_2 Rebal_t + \beta X_{t-1} + \epsilon_t,$$

where $Rebal$ is a rebalancing period that either increases ($Rebal^+$) or decreases leverage ($Rebal^-$) with

$$Rebal_t^+ = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > s\% \text{ and } \frac{ER_t^e}{A_t} > s\%,$$

and

$$Rebal_t^- = 1 \text{ if } \frac{\Delta D_t^e}{A_t} < -s\% \text{ and } \frac{ER_t^e}{A_t} < -s\%,$$

$L \equiv D/MV$ is the market leverage ratio in quarter t, D is book value of long-term debt, MV is D plus the market value of total equity, ΔD^e is increase in long-term debt in excess of debt retirement, ER^e is equity retirement in excess of equity issues, A is book value of total assets, $Profit$ is operating profitability, and the constant issue-size threshold s (here 2.5%) is in percent of book assets A. The vector X of lagged control variables includes Q, Tan, $Size$ and $Risk$ (the standard deviation of $Profit$ measured over 5 years of contiguous data), which reduces sample size (as shown in columns 2 and 4). The sort of firms into high frequency issuers (HFIs) is as in Table 3 (using Eq. (1) and a 2.5% issue size threshold). Wald indicates the p-values for the test of whether $\gamma_0 + \gamma_1 = 0$, otherwise the standard error for each coefficient is shown in parenthesis. All variables are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Tables 2 and 1. *, ** indicate significance at the 5% and 1% level, respectively. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years), 1984-2016.

	Leverage increasing $Rebal = Rebal^+$		Leverage-decreasing $Rebal = Rebal^-$	
	Full sample	$Age \geq 5$	Full Sample	$Age \geq 5$
Regressor	(1)	(2)	(3)	(4)
Firm profitability and rebalancings				
$Prof$ (γ_0)	-0.567**	-0.923**	-0.567**	-0.924**
	(0.01)	(0.03)	(0.01)	(0.03)
Rebal x Prof (γ_1)	-0.128	0.510*	-0.167**	0.104
	(0.10)	(0.23)	(0.06)	(0.13)
Rebal	-0.037**	-0.041**	-0.078**	-0.070**
	(0.01)	(0.01)	(0.00)	(0.01)
Firm controls				
$Size$	0.023**	0.014**	0.023**	0.014**
	(0.00)	(0.00)	(0.00)	(0.00)
Q	-0.064**	-0.089**	-0.063**	-0.089**
	(0.00)	(0.00)	(0.00)	(0.00)
Tan	0.122**	0.140**	0.123**	0.141**
	(0.00)	(0.00)	(0.00)	(0.00)
$Risk$	0	-0.753**	0	-0.749**
	0	(0.04)	0	(0.04)
Quarter fixed effects	yes	yes	yes	yes
Adj. R^2	0.28	0.29	0.29	0.29
Rebalancings	977	518	1,595	673
Total obs.	66,431	36,982	66,431	36,982
Trade-off hypothesis: $\gamma_0 < 0$ **and** $\gamma_0 + \gamma_1 > 0$				
$\gamma_0 + \gamma_1$	-0.695	-0.413	-0.734	-0.82
Wald	0.000	0.072	0.000	0.000

Table 14: **The leverage-profitability correlation with alternative profitability measures**

The table reports coefficient estimates from the following panel (firm-quarter) regression:

$$L_t = \alpha + \gamma_0 Profit_{t-1} + \gamma_1 Profit_{t-1} * Rebal_t + \gamma_2 Rebal_t + \beta X_{t-1} + \epsilon_t,$$

where *Rebal* is a rebalancing period that either increases ($Rebal^+$) or decreases leverage ($Rebal^-$) with

$$Rebal_t^+ = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > s\% \text{ and } \frac{ER_t^e}{A_t} > s\%,$$

and

$$Rebal_t^- = 1 \text{ if } \frac{\Delta D_t^e}{A_t} < -s\% \text{ and } \frac{ER_t^e}{A_t} < -s\%,$$

$L \equiv D/MV$ is the market leverage ratio in quarter t, D is book value of long-term debt, MV is D plus the market value of total equity, ΔD^e is increase in long-term debt in excess of debt retirement, ER^e is equity retirement in excess of equity issues, A is book value of total assets, and the constant issue-size threshold s (here 2.5%) is in percent of book assets A. The vector X of lagged control variables includes Q, Tan, $Size$ and $Risk$ (the standard deviation of operating profits to assets measured over 5 years of contiguous data), which reduces sample size (as shown in columns 2 and 4). In Panel A, $Prof$ is measured as the value-weighted ratio of operating profits to book assets since the year of public listing. In Panel B, $Prof$ is measured as the ratio of the change in retained earnings (req) since the year of listing scaled by book assets . The sort of firms into high frequency issuers (HFIs) is as in Table 3 (using Eq. (1) and a 2.5% issue size threshold). Wald indicates the p-values for the test of whether $\gamma_0 + \gamma_1 = 0$, otherwise the standard error for each coefficient is shown in parenthesis. All variables are winsorized at the 1(99) percent level or must lie between zero and one (cash ratio and leverage). Variable definitions are in Tables 2 and 1. *, ** indicate significance at the 5% and 1% level, respectively. Total sample of 9,340 U.S. public firms (66,056 firm-years), with an annual average of 1,616 HFIs (total of 19,424 firm-years), 1984-2016.

	Leverage increasing $Rebal = Rebal^+$		Leverage-decreasing $Rebal = Rebal^-$	
	Full sample	$Age \geq 5$	Full Sample	$Age \geq 5$
Regressor	(1)	(2)	(3)	(4)
A: $Prof$ = **Value-weighted operating profitability since listing year**				
$Prof$ (γ_0)	-0.682**	-1.715**	-0.684**	-1.711**
	(0.02)	(0.04)	(0.02)	(0.04)
Recap x Prof (γ_1)	-0.15	1.261**	-0.306**	-0.006
	(0.12)	(0.31)	(0.08)	(0.20)
Recap	-0.035**	-0.063**	-0.080**	-0.075**
	(0.01)	(0.02)	(0.00)	(0.01)
Firm controls	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes
Adj. R^2	0.28	0.30	0.28	0.30
Recapitalizations	977	518	1,595	673
Total obs.	66,431	36,982	66,431	36,982
$\gamma_0 + \gamma_1$	-0.832	-0.454	-0.99	-1.717
Wald	0.000	0.141	0.000	0.000
B: $Prof$ = **Change in retained earnings since listing year over assets**				
$Prof$ (γ_0)	-0.027**	-0.035**	-0.028**	-0.035**
	(0.00)	(0.00)	(0.00)	(0.00)
Recap x Prof (γ_1)	-0.009	0.012	-0.003	-0.002
	(0.01)	(0.01)	(0.00)	(0.01)
Recap	-0.045**	-0.028**	-0.080**	-0.073**
	(0.01)	(0.01)	(0.00)	(0.01)
Firm controls	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes
Adj. R^2	0.27	0.28	0.27	0.28
Recapitalizations	977	518	1,595	673
Total obs.	66,431	36,982	66,431	36,982
$\gamma_0 + \gamma_1$	-0.036	-0.023	-0.038	-0.052
Wald	0.002	0.040	0.000	0.000