Modeling Managers As EPS Maximizers*

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Abstract

Textbook theory assumes that firm managers maximize the net present value of future cash flows. But when you ask them, the people running large public corporations say that they are maximizing something else entirely: earnings per share (EPS). Perhaps this is a mistake. No matter. We take managers at their word and show that EPS maximization provides a single unified explanation for a wide range of corporate policies such as leverage, share issuance and repurchases, M&A payment method, cash accumulation, and capital budgeting.

Keywords: Earnings Per Share, Corporate Policies, Earnings Yield, Value vs. Growth, Leverage, Equity Issuance, Share Repurchases, M&A Payment Method, Accretion, Dilution, Cash Holdings

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1 Introduction

Textbook corporate-finance theory assumes that firm managers maximize the net present value of future cash flows. If a policy increases this net present value (NPV), they do it. If it does not, they do not.

The trouble is that, if managers are NPV maximizers, then many important financing decisions are completely irrelevant in simple models. For example, Modigliani and Miller (1958) shows that there is no optimal choice of leverage in a frictionless information-symmetric world. So, to explain why managers might prefer one policy over another, researchers must look for complications that might nudge an NPV-maximizing manager in the desired direction.

This "explanation by complication" approach has not been overwhelmingly successful (Myers, 2001; Frank and Goyal, 2009; DeAngelo, 2022; Graham, 2022). "Extant research has explained only a portion of observed capital structure behavior. [...] Many individual fixes have recently been made...but it is still not clear what it all adds up to. (Graham and Leary, 2011)"

On top of this, the complications in researchers' models rarely show up in managers' own testimonies (Graham, 2022). For example, when modeling leverage, researchers tend to focus on interest tax shields (Modigliani and Miller, 1963), agency costs (Jensen and Meckling, 1976), and signaling (Myers and Majluf, 1984). But managers do not mention these factors when you ask them about their capital structure.

We propose a different approach to doing corporate-finance theory. Rather than simply assuming that managers are NPV maximizers, we suggest listening to what managers say they are doing. When asked, the managers of large public corporations typically explain that they are trying to increase their firms' earnings per share (EPS).

"Firms view earnings, especially EPS, as the key metric for an external audience, more so than cash flows. (Graham, Harvey, and Rajgopal, 2005)" EPS is what gets talked about on earnings calls (Matsumoto, Pronk, and Roelofsen, 2011). It is what gets forecasted by analysts (O'brien, 1988) and by managers (Houston, Lev, and Tucker, 2010). Managers even get paid based on whether they hit EPS targets (Bettis, Bizjak, Coles, and Kalpathy, 2010).

Maybe this is a bad thing. While EPS maximization is not always an error, there are clearly times when it does lead to suboptimal outcomes. Researchers have been trying to convince managers to abandon EPS for decades (May, 1968; Pringle, 1973; Stern, 1974). Perhaps one day they will succeed. But, right now, the people running large public corporations are EPS maximizers. "Investors demand a simple metric of performance…[and] the market has selected EPS to fulfill this role. (Almeida, 2019)" Regardless of the underlying reason, this is the reality we live in.

By studying the problem that real-world managers are actually trying to solve, we are able to give a single unified explanation for a wide range of corporate policies. EPS maximization accounts for (a) how much leverage firms use, (b) when they decide to issue and repurchase shares, (c) whether firms pay for an M&A target by issuing equity, (d) which firms accumulate cash, and (e) how firms make capital-budgeting decisions more generally.

Going forward, when a researcher wants to predict how a manager will actually behave (and not how she ought to behave), the researcher should model her as an EPS maximizer (and not an NPV maximizer). That should be the starting point of the model. This is the central premise of our paper.

1.1 Paper Outline

We begin in section 2 by documenting how managers describe themselves as EPS maximizers. This is a consistent finding across decades of survey research. For example, "despite the efforts of academics to demonstrate that EPS dilution should be irrelevant…[this] was the most cited reason for companies' reluctance to issue equity. (Graham and Harvey, 2002)" EPS maximization also regularly appears in corporate filings and shareholder communications.

For better or for worse, the people running large public companies are EPS maximizers. We focus on these firms because they represent the bulk of all enterprise value, and they are the ones most studied by empirical researchers. We recognize that other kinds of firms may have different objectives, and that is fine. When modeling those other kinds of firms, researchers should use whatever objective their managers are trying to optimize.

In section 3, we give a first example of how it is easier to explain the decisions that managers make when you use the right objective function. We study a manager who is choosing how much leverage to use, $\ell \stackrel{\text{def}}{=} \textit{LoanAmt} \,/\, \textit{PurchasePrice} \in [0, 1)$, when buying a company that has expected cash flows $\mathrm{E}[\textit{NOI}_1]$ next year. After borrowing $\textit{LoanAmt}(\ell)$ at interest rate $i(\ell)$, she finances the rest of the purchase by issuing *#Shares* of equity each worth *PricePerShare*.

We specifically set up our model so that Modigliani and Miller (1958) holds. There are no frictions, information asymmetries, or taxes. Investors correctly price all future payouts. In this setting, textbook theory says that there is no best choice of leverage. Nevertheless, we prove that there is a unique leverage ratio that maximizes

$$\textit{EPS}(\ell) \stackrel{\text{def}}{=} \underbrace{\big(\,\mathrm{E}[\textit{NOI}_1] - i(\ell) \cdot \textit{LoanAmt}(\ell)\,\big)}_{\mathrm{E}[\textit{Earnings}_1(\ell)]} \,/\, \#\textit{Shares}(\ell) \tag{1}$$

The manager takes the fair interest rate and her equity's price per share as given. She then jointly decides how much to borrow and how many equity shares to issue at these prices. A manager cannot increase her EPS relative to past values through reverse stock splits. After a reverse split, a company must revise previously reported EPS values to reflect the new share count.

Our model allows us to fully characterize the difference between NPV and EPS. An EPS-maximizing manager (a) fails to risk adjust her expected earnings and (b) disregards changes in the value of her long-term assets and liabilities. She also (c) ignores the value of her default option. When EPS maximization leads to bad outcomes, some combination of these three factors is at fault.

But it is not always an error to maximize EPS. Modigliani and Miller (1958) holds in our model, so every leverage ratio is equally good from a welfare perspective. EPS maximization is a selection criteria telling you which of these many options a manager will choose.

To understand which leverage ratio an EPS-maximizing manager will choose, consider a tiny increase in leverage from ℓ to $(\ell+\epsilon)$. We show that a manager will decide whether this increase is a good idea by comparing her initial earnings

yield, $EY(\ell) \stackrel{\text{def}}{=} \mathrm{E}[Earnings_1(\ell)] \,/\, ValueOfEquity(\ell)$, to her new interest rate when borrowing slightly more, $i(\ell + \epsilon)$

$$\begin{aligned} EY(\ell) > i(\ell+\epsilon) \quad &\Rightarrow \quad \text{increase leverage, equity is expensive} \\ EY(\ell) < i(\ell+\epsilon) \quad &\Rightarrow \quad \text{decrease leverage, equity is cheap} \end{aligned} \tag{2}$$

Suppose that the ϵ increase in leverage increases the firm's EPS. This will occur if her original earnings yield was higher than the new interest rate. Debt will look cheap relative to her existing equity. By contrast, if the manager's new interest rate is higher, she will view debt as expensive and reject the proposed leverage increase. If anything, she would like to borrow less. Because she is constantly comparing it to an interest rate, an EPS-maximizing manager will wind up thinking about her earnings yield as the cost of equity capital.

Our model splits the world into two kinds of firms. First there are growth firms. These are companies with earnings yield below the riskfree rate, $EY(0) < r_f$, and therefore extremely high P/E ratios. These firms view borrowing (even at the riskfree rate) as expensive and so will have zero leverage. There are also value firms. These firms have higher earnings yield, $EY(0) > r_f$, and thus lower P/E ratios. We show that a value firm who is just barely above this threshold will use a substantial amount of debt.

In section 4, we study several more applications of EPS maximization: When do firms issue and repurchase shares? Will the acquirer in an M&A deal pay target shareholders by issuing equity? Why do firms accumulate cash? And how do they perform capital budgeting more generally? In all applications, our model implies that an EPS-maximizing manager will make different decisions for value and growth firms. This is not baked into the model. It follows directly from asking WW(EMM)D? What would an EPS-maximizing manager do?

Finally, in section 5, we provide empirical evidence to support our main theoretical predictions. Consistent with our theory, we find large qualitative differences in how value and growth firms finance themselves. In each case, the sign of the effect lines up with the direction implied by our theory. In all cases, the magnitudes are economically large and statistically significant.

1.2 Related Work

Our paper connects to much of modern corporate finance. To start with, there is a large survey literature documenting that managers describe themselves as EPS maximizers (Graham, 1947; Petty, Scott, and Bird, 1975; Gitman and Maxwell, 1987; Graham, Harvey, and Rajgopal, 2005; Baker, Singleton, and Veit, 2011; Dichev, Graham, Harvey, and Rajgopal, 2013). We are asking academic researchers to listen to what managers say in these surveys. This connects our paper to work that uses surveys to identify agents' goals rather than to estimate their beliefs (Chinco, Hartzmark, and Sussman, 2022).

Earlier work shows that EPS is correlated with capital-structure decisions (Lintner, 1963; Ellis, 1965; Frank and Weygandt, 1970; Taub, 1975; Hovakimian, Opler, and Titman, 2001; Ronen, 2008; Axelson, Jenkinson, Strömberg, and Weisbach, 2013; Huang, Marquardt, and Zhang, 2014; Malenko, Grundfest, and Shen, 2023; Acharya and Plantin, 2019; Pennacchi and Santos, 2021). EPS is also related to share repurchases in the data (Hertzel and Jain, 1991; D'Mello and Shroff, 2000; Grullon and Michaely, 2004; Hribar, Jenkins, and Johnson, 2006; Oded and Michel, 2008; Almeida, Fos, and Kronlund, 2016; Asness, Hazelkorn, and Richardson, 2018). CEO compensation is often directly linked to EPS targets (Bens, Nagar, Skinner, and Wong, 2003; De Angelis and Grinstein, 2015; Bennett, Bettis, Gopalan, and Milbourn, 2017; Martin, Seo, Yang, Kim, and Martel, 2022). EPS accretion/dilution predicts M&A outcomes (Shleifer and Vishny, 2003; Garvey, Milbourn, and Xie, 2013; Dasgupta, Harford, and Ma, 2023). We show that, by treating EPS maximization as the core problem that managers are trying to solve, it is possible to give a single unified explanation for all these phenomena.

Many important decisions are irrelevant to an NPV-maximizing manager in an idealized model (Modigliani and Miller, 1958). So, to explain corporate policies, the existing literature tells researchers to look for realistic complications (Tirole, 2010). Unfortunately, the resulting models have had little empirical success (Gebhardt, Lee, and Swaminathan, 2001; Lemmon, Roberts, and Zender, 2008; Frank and Goyal, 2009; DeAngelo, 2022; Gormsen and Huber, 2022; Hommel, Landier, and Thesmar, 2023). Practitioner rules of thumb often do better. This motivates our search for a new approach.

2 In Their Own Words

Our paper is based on a simple observation. When you ask the managers of large public corporations how they make decisions, they do not talk about trying to maximize the net present value (NPV) of discounted cash flows (DCFs). Instead, these people say that they make decisions with an eye towards increasing their EPS. We now document this important fact. The rest of the paper then shows that, by modeling the right managerial objective function, it is possible to give a single unified explanation for a wide range of empirical patterns in how firms finance themselves.

2.1 Survey Evidence

As far back as Lintner (1956), academic researchers have been using surveys to probe the motives behind managers' decisions. Collectively, this literature paints a clear picture: managers maximize EPS rather than the net present value of future cash flows. For CFOs of large public corporations, EPS is the single most critical performance metric (Graham, Harvey, and Rajgopal, 2005; Dichev, Graham, Harvey, and Rajgopal, 2013).

Table 1 summarizes how financial executives report making decisions. Different papers focus on different kinds of decisions that managers have to make. Panel (a) includes papers that ask about a managers' broad goals and objectives. Panel (b) includes papers that ask about how a manager chooses her capital structure. Panel (c) includes papers that ask managers about repurchasing and issuing shares. Panel (d) includes papers that ask managers about why they hold cash. And Panel (e) includes papers that ask managers about their thought process with regards to capital budgeting.

The first thing you notice about Table 1 is that there are many more check marks in column (2) than in column (1). Regardless of which corporate policy you study, when you ask the people running large public corporations how they make decisions, they are more likely to talk about increasing EPS than about maximizing NPV or DCFs. Mukhlynina and Nyborg (2020) even suggests that "multiples are so popular in practice…that it would be useful to have more research into their performance and how best to use them in practice."

Participants in study…	Are you making decisions based on… NPV/DCF? say "Yes" (1)	EPS? say "Yes" (2)	EPS? not asked (3)
(a) Broad objectives			
Graham (1947)		✓	
Petty et al. (1975)		✓	
Graham et al. (2005)		✓	
Dichev et al. (2013)		✓	
(b) Capital structure			
Pinegar and Wilbricht (1989)		✓	
Graham and Harvey (2001)	✓	✓	
Bancel and Mittoo (2004)	✓	✓	
Brounen et al. (2006)	✓		⊗
(c) Repurchases/issuance			
Baker et al. (1981)		✓	
Tsetsekos et al. (1991)		✓	
Badrinath et al. (2000)		✓	
Graham and Harvey (2001)		✓	
Brav et al. (2005)		✓	
Brounen et al. (2006)		✓	
Caster et al. (2006)		✓	
(d) Cash holdings			
Lins et al. (2010)	✓		⊗
(e) Capital budgeting			
Schall et al. (1978)	✓	✓	
Gitman and Maxwell (1987)	✓	✓	
Graham and Harvey (2001)	✓	✓	
Mukherjee et al. (2004)	✓	✓	
Baker et al. (2011)	✓	✓	

Table 1. Column (1): managers reported using either NPV and/or DCF reasoning. Column (2): managers said they maximized EPS. Column (3): managers were not given opportunity to talk about EPS maximization. Panel (a): papers about managers' broad objectives. Panel (b): papers about how managers chose their capital structure. Panel (c): papers about share repurchases and issuance. Panel (d): papers about cash holdings. Panel (e): papers about capital budgeting.

Panel (a) shows that managers point to EPS maximization as their overarching objective. Panel (b) shows that, across multiple surveys, managers consistently say that they make debt-vs-equity decisions based on EPS. The managers surveyed in Graham and Harvey (2001) point out that, "if funds are obtained by issuing debt, the number of shares remains constant and so EPS can increase."

Panels (c) and (d) report similar findings for share buybacks/issuance and cash holdings. EPS is the main consideration when making all these decisions. For instance, Brav, Graham, Harvey, and Michaely (2005) specifically reports that "managers favor repurchases…to increase earnings per share." Finally, panel (e) shows that managers do capital budgeting with an eye on EPS. Managers are unwilling to take on projects that will reduce their EPS.

For the most part, whenever participants say they are maximizing NPV, these participants also report following the principle of EPS maximization. There are only a couple of surveys that offer no evidence of EPS maximization. And, in these cases, the lack of evidence is likely due to the fact that participants were given no opportunity to express this view (column 3).

We would have liked to include more papers in Table 1. However, our sample is limited by the poor design of many surveys. Many surveys ask questions that are unable to discriminate between EPS and NPV maximization. For example, managers often give "maximizing shareholder value" as their objective. But this objective is consistent with both EPS and NPV maximization. As Figure 1 shows, many managers treat EPS as a measure of shareholder value.

Academic researchers have a strong bias against EPS maximization. This makes it all the more surprising that managers so consistently cop to being EPS maximizers. There is a huge experimenter demand effect working in the opposite direction (Schwarz, 1999). Put yourself in the shoes of a CFO. Your favorite business school professor has just called to interview you about how you make decisions. It would be rude to tell him that all his in-class NPV calculations are irrelevant to your day-to-day decision making. Yet, in spite of a strong motivation to reinterpret your choices through the lens of NPV maximization, you are much more likely to report higher EPS as your goal.

		% that mention…	
	#	EPS	NPV/DCF
	(1)	(2)	(3)
2001–2022	1,694,415	21.2%	1.8%
2001–2005	358,385	18.9%	1.3%
2006–2010	463,869	20.9%	1.5%
2011–2015	377,502	22.2%	2.0%
2016–2020	349,907	22.8%	2.4%
2021–2022	144,752	21.0%	1.8%

Table 2. Summary of 8-K filings for all firms from January 1st 2001 through December 31st 2022. Data come from EDGAR. #: total number of 8-K filings. EPS: percent of 8-K filings that include either "earnings per" or "EPS". NPV or DCF: percent of 8-K filings that include at least one of the following terms: "NPV", "present discounted value", "DCF", "discounted value", "discounted cash flows", or "economic value added".

2.2 Corporate Filings

Suppose a public company has a shareholder vote, its CEO leaves, or the firm takes out a large loan. In these sorts of situations, the Securities and Exchange Commission (SEC) requires the company to file a Current Report on Form 8-K within four business days. The information contained in this 8-K filing allows investors to revise previously filed quarterly reports on Form 10-Q and/or Annual Reports on Form 10-K.

Earlier research has shown that EPS is the standard metric that companies use when evaluating the economic impact of corporate events in 8-K filings (Amel-Zadeh and Meeks, 2019). We perform our own analysis and confirm this finding. Companies are 12× more likely to talk about EPS than either NPV or DCFs combined.

Table 2 summarizes the content of 1,694,415 filings from 2001 to 2022. Column (1) reports the total number of 8-K filings in EDGAR during the sample period. The first row of column (2) then shows that 21.2% of all filings include either "earnings per" or "EPS". We do not require "share" because in some cases

the earnings are reported using slightly different jargon, such as "earnings per partnership unit". Requiring "share" reduces the value in the first from of column (2) to 18.9%. Column (3) gives the percent of all 8-K filings that include at least one of the following terms: "NPV", "present discounted value", "DCF", "discounted value", "discounted cash flows", or "economic value added" (an alternative to EPS promoted by Stern, Stewart, and Chew, 1995; Stern, Shiely, and Ross, 2002).

Not every corporate event involves a financing decision. For example, many 8-K filings report the outcome of a shareholder vote. This is why EPS only gets mentioned in 21.2% of all 8-K filings. However, whenever there is a corporate event that is related to financing decisions, the associated 8-K filing almost always mentions EPS. By contrast, terms related to NPV and/or DCFs are only included in around 1.8% of all 8-K filings. Moreover, we have looked at examples of the filings that include "NPV" or "DCF". These terms usually were being applied to particular assets on the firm's balance sheet.

Humana Inc's January 9th 2023 8-K is representative of the broader pattern (Humana Inc, 2023). The company had to make this filing because it increased its expected membership growth. If there were ever a time for a firm to use NPV logic, it is here. An increase in expected membership growth directly translates into one of the key parameters in the standard Gordon-growth DCF model.

Yet the 8-K filing contains no discussion of future cash flows or how Humana planned on discounting them. Here is how the company interpreted the effects of this increase:

> "The Company intends to reiterate its commitment to grow 2023 Adjusted earnings per common share ("Adjusted EPS") within its targeted long-term range of 11–15 percent from its expected 2022 Adjusted EPS of approximately $25.00. As communicated on the Company's third quarter 2022 earnings call on November 2, 2022, it expects the consensus estimate of approximately $27.90 to be in line with its initial Adjusted EPS guidance."

When submitting this official legally-binding form to the SEC, Humana chose to focus almost exclusively on EPS.

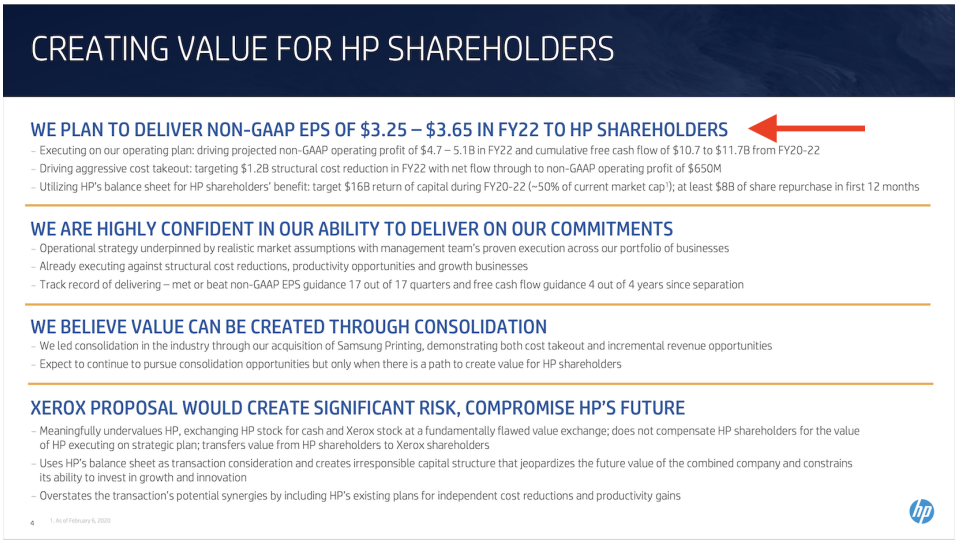


Figure 1. First slide from a February 2020 presentation made by HP's CEO to the company's shareholders in opposition to Xerox's proposed takeover. [link]

2.3 Shareholder Communications

The managers of large public corporations are not trying to hide the fact that they are EPS maximizers like in Stein (1989). They talk about EPS in academic surveys. Their corporate filings use EPS as the key performance metric, and they put EPS front and center when directly addressing their shareholders.

For example, in early 2020, Xerox announced a plan to acquire Hewlett-Packard Co. HP's management team strongly opposed the takeover because Xerox's was trying to acquire HP at a P/E ratio of only 7. Like good EPS-maximizing managers, they were thinking about their earnings yield as a cost of equity capital. And, on that basis, Xerox was making a lowball offer for HP's earnings stream in order to juice its own EPS.

In response, HP's CEO made a presentation to shareholders explaining why they should refuse Xerox's offer. Figure 1 shows the first slide from the CEO's presentation. The title is "Creating Value for HP Shareholders", and the first bullet point is "We plan to deliver non-GAAP EPS of $3.25-$3.65 in FY22 to HP shareholders." While HP's CEO talked a lot about the company's future operating profits, he never once mentioned the net present value of these cash flows.

2.4 Reverse Splits

If the people running large public corporations are laser focused on increasing their EPS, then you might expect them to spend a lot of time pushing for reverse splits. For example, suppose a firm has $\mathrm{E}[Earnings_1] = \$100$ and $\#Shares = 100$ to begin with, giving it an $EPS = \$1$. Following a 1-for-2 reverse split, the company would have $\#Shares = 50$ and an $EPS = \$2$.

There is a simple reason why EPS-maximizing managers are not clamoring for reverse splits. After a reverse split, a firm has to retroactively update its previously reported EPS values. In the above example, when the manager announced the new $2 EPS to her shareholders, they would be wholly unimpressed given that the manager also has to tell them that her previous EPS was $2 too.

When GE did a 1-for-8 reverse stock split on July 30, 2021, it posted answers to shareholder FAQs (General Electric Co, 2021), one of which was: "How did the reverse stock split affect the FY'20, 1Q'21, and 2Q'21 EPS and the FY'21 Outlook and how will it impact the future calculation of net earnings or loss per share?"

> "We have adjusted our net earnings or loss per share for FY'20, 1Q'21, and 2Q'21 to reflect the reverse stock split. We have also updated our EPS from March '21 Outlook to reflect the change in share count. This adjustment simply reflects the reduced share count from the reverse stock split and does not otherwise change our previous Outlook.
>
> Additionally, in financial statements issued after the reverse stock split becomes effective, per share net earnings or loss and other per share of common stock amounts for periods ending before the effective date of the reverse stock split will be adjusted to give retroactive effect to the reverse stock split."

This is why EPS-maximizing managers are not in charge of companies whose entire market cap is packed into a single equity share. EPS is not a manipulation-proof measure. But reverse splits are not one of the ways to manipulate it. The same can be said of the many other contracts written on a per share basis. Can you manipulate the strike price on a single-stock option via a reverse split?

3 Capital Structure

How do the managers of large public corporations decide how much to borrow? The textbook approach assumes that they try to maximize the net present value of their future equity payouts. This objective renders leverage irrelevant in simple frictionless models (Modigliani and Miller, 1958). So to explain why a manager prefer one leverage ratio over another, a researcher has to introduce some market friction or information asymmetry.

By contrast, we propose that managers choose their leverage ratio with an eye towards increasing their EPS. We characterize how this objective differs from NPV maximization and show that a unique EPS-maximizing leverage ratio exists even in our frictionless information-symmetric benchmark. We explain why it is natural for an EPS-maximizing manager to think about her earnings yield as the cost of equity capital. And we show how this logic suggests that value and growth firms will finance themselves in radically different ways.

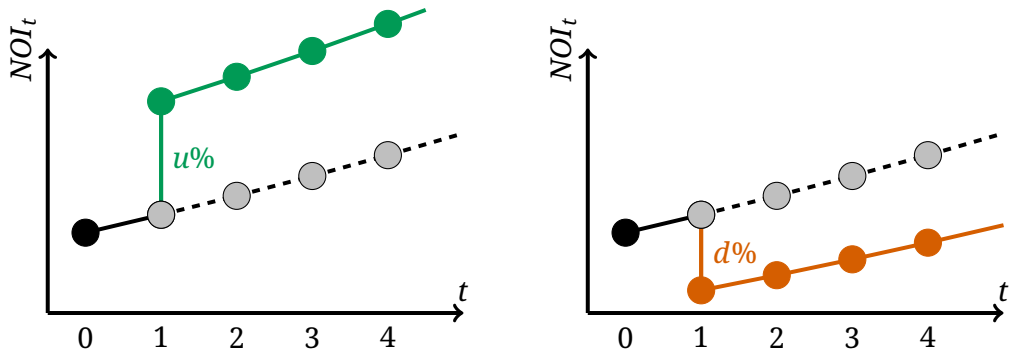
3.1 Economic Framework

We study a manager who is buying a public company today in year $t = 0$. In year $t = 1$, she will collect its cash flows and then sell its assets. Our goal is to predict how much leverage she will use when buying the firm. Let NOI_t denote the firm's net operating income in year t.

Cash Flows. As shown in Figure 2, there is uncertainty about whether the firm's cash flows will be high or low in year $t = 1$. If the up state gets realized in year $t = 1$, the firm's cash flows will be $u > 0\%$ higher than expected; whereas, if the down state gets realized, the firm's cash flows will be $d \in (0\%, 100\%)$ lower than expected

$$NOI_1 = \begin{cases} (1+u) \cdot \mathrm{E}[NOI_1] & \text{in the up state} \\ (1-d) \cdot \mathrm{E}[NOI_1] & \text{in the down state} \end{cases} \tag{3}$$

We use $NOI_u \stackrel{\text{def}}{=} (1+u) \cdot \mathrm{E}[NOI_1]$ and $NOI_d \stackrel{\text{def}}{=} (1-d) \cdot \mathrm{E}[NOI_1]$ to denote the possible realizations of NOI_1 in year $t = 1$.



(a) Up state **(b)** Down state

Figure 2. Left panel: Realized cash flows if up state is realized in year $t = 1$. Right panel: Realized cash flows if down state is realized. **(Black dots)** NOI_0 in year $t = 0$ prior to purchase; same in both panels. **(Gray dots)** $\mathrm{E}[NOI_t]$ in years $t = 1, 2, 3, 4$; same in both panels. **(Green dots)** Realized NOI_t in years $t = 1, 2, 3, 4$ following positive shock, $NOI_1 = (1 + \boldsymbol{u}) \cdot \mathrm{E}[NOI_1]$. **(Red dots)** Realized NOI_t in years $t = 1, 2, 3, 4$ following negative shock, $NOI_1 = (1 - \boldsymbol{d}) \cdot \mathrm{E}[NOI_1]$.

Let p_u and $p_d = 1 - p_u$ denote the probabilities of the up and down state in year $t = 1$. The firm has expected cash flows in year $t = 1$ of $\mathrm{E}_0[NOI_1] = p_u \cdot NOI_u + p_d \cdot NOI_d$. This expected value is $g \geq 0\%$ higher than its cash flow in the current year

$$\mathrm{E}[NOI_1] = (1 + g) \cdot NOI_0 \tag{4}$$

Once the up or down state has been realized in year $t = 1$, the firm's expected cash flows grow at a constant rate of g per year

$$\mathrm{E}[NOI_t] = (1 + g) \cdot NOI_{t-1} \qquad \text{for all } t \geq 2 \tag{5}$$

If the up state is realized in year $t = 1$, then the firm's expected cash flows in year $t = 2$ will be $\mathrm{E}[NOI_{2|u}] = (1 + g) \cdot NOI_u$. By contrast, had the down state been realized, then the firm's cash flows in year $t = 2$ would have been $\mathrm{E}[NOI_{2|d}] = (1 + g) \cdot NOI_d$. Hence, we have

$$\frac{\mathrm{E}[NOI_{t|u}]}{\mathrm{E}[NOI_{t|d}]} = \frac{1 + u}{1 - d} > 1 \tag{6}$$

Firm Value. Given the setup so far, the firm's assets in year t are worth

$$ValueOfAssets_t = \frac{\mathrm{E}_t[NOI_{t+1}]}{r-g} \tag{7}$$

where $r > g$ denotes the discount rate on the firm's cash flows. Because year $t = 1$ cash flows are unknown at time $t = 0$, the future value of the firm's assets will also be a random variable, $ValueOfAssets_1 \in \{ValueOfAssets_u, ValueOfAssets_d\}$.

When the manager in our model buys the firm at time $t = 0$, she pays $PurchasePrice \stackrel{\text{def}}{=} ValueOfAssets_0$ for the firm's assets. The previous owners of the firm get to keep, NOI_0, which represents the firm's cash flows in year $t = 0$. In year $t = 1$, the manager collects NOI_1 and then sells the firm's assets for $SalePrice_1 \stackrel{\text{def}}{=} ValueOfAssets_1$. The total value that the manager gets from owning the firm in year $t = 1$ is given by $ValueOfFirm_1 \stackrel{\text{def}}{=} NOI_1 + ValueOfAssets_1$. We use $ValueOfFirm_u$ and $ValueOfFirm_d$ to denote the two possible realizations.

Correct Prices. Investors correctly price all future payouts in our model. We use q_u to denote the price in year $t = 0$ of an asset pays out \$1 in year $t = 1$ iff the up state is realized. Similarly, we use q_d to denote the analogous down-state price. Let $r_f > 0\%$ denote the prevailing riskfree rate. While $p_u + p_d = 1$, the price of a \$1 riskfree bond is given by $q_u + q_d = \frac{\$1}{1+r_f} < \$1$.

Our binomial setup allows us to solve for these state prices in closed form

$$q_u = \frac{PurchasePrice - \left(\frac{ValueOfFirm_d}{1+r_f}\right)}{ValueOfFirm_u - ValueOfFirm_d} \qquad q_d = \frac{\left(\frac{ValueOfFirm_u}{1+r_f}\right) - PurchasePrice}{ValueOfFirm_u - ValueOfFirm_d} \tag{8}$$

We use $\tilde{\mathrm{E}}[X_1] \stackrel{\text{def}}{=} q_u \cdot X_u + q_d \cdot X_d$ to denote the risk-neutral expectation of an arbitrary random variable, $X_1 \in \{X_u, X_d\}$. By contrast, $\mathrm{E}[X_1] \stackrel{\text{def}}{=} p_u \cdot X_u + p_d \cdot X_d$ represents its expectation under the physical measure.

In our paper, the manager maximizes EPS even though investors correctly price all assets. In the real world, it is likely that investors also have a preference for higher EPS. Think back to the HP example from subsection 2.3. Our results would be even stronger in such a model.

3.2 Leverage Decision

We are studying a manager who must decide how much to borrow when purchasing a firm. We now outline the implications of her leverage decision. Given how much she borrows, what interest rate will she have to pay? How many shares will she have to issue?

Debt Financing. Let $\ell \in [0, 1)$ denote the manager's leverage ratio as a fraction of the total purchase price

$$LoanAmt(\ell) \stackrel{\text{def}}{=} \ell \cdot PurchasePrice \tag{9}$$

In exchange for getting *LoanAmt* at time $t = 0$, the manager promises to pay the lender at time $t = 1$ principal plus interest, $(1 + i) \cdot LoanAmt$, where $i \geq r_f$ denotes the fair interest rate on the loan.

The present value of the manager's promised debt payments in year $t = 1$ is

$$\begin{aligned} ValueOfDebt = q_u \cdot \{(1 + i) \cdot LoanAmt\} \\ + q_d \cdot \min\{(1 + i) \cdot LoanAmt, ValueOfFirm_d\} \end{aligned} \tag{10}$$

If the up state gets realized in year $t = 1$, the manager will always make her promised debt payment, $(1 + i) \cdot LoanAmt$. However, if the down state gets realized in year $t = 1$, the manager may choose to default and receive \$0. She will do this whenever her promised debt payment exceeds the value of her firm, $(1 + i) \cdot LoanAmt > ValueOfFirm_d$.

Suppose the manager took out a \$1 loan in year $t = 0$. In this hypothetical scenario, the manager's firm would be guaranteed to be worth more than her promised debt payments in the down state given how small the loan is, $ValueOfFirm_d > (1 + i) \cdot \$1$. The lender would anticipate this and be willing to lend at the riskfree rate. The same logic holds any leverage ratio up to

$$\ell_{\max r_f} \stackrel{\text{def}}{=} \frac{1}{1 + r_f} \cdot \left(\frac{ValueOfFirm_d}{PurchasePrice} \right) \tag{11}$$

The manager will be able to borrow at $i(\ell) = r_f$ for any $\ell \in [0, \ell_{\max r_f}]$.

If the manager takes out a large enough loan, her promised debt payments may exceed her firm's value in the down state, $ValueOfFirm_d < (1+i) \cdot LoanAmt$. In this situation, a \$0 payout would be preferable to paying $(1+i) \cdot LoanAmt - ValueOfFirm_d$ out of pocket. The lender recognizes that, if the manager uses a leverage ratio $\ell > \ell_{\max r_f}$, then she will default if the down state occurs in year $t = 1$. And, as a result, the lender quotes a higher interest rate on any loan where $\ell > \ell_{\max r_f}$

$$i(\ell) = \frac{(\$1 - q_u) \cdot LoanAmt(\ell) - q_d \cdot ValueOfFirm_d}{q_u \cdot LoanAmt(\ell)} > r_f \tag{12}$$

We use $DefaultSavings_1 \in \{DefaultSavings_u, DefaultSavings_d\}$ to denote how much money the manager can save by defaulting at time $t = 1$. Since the manager never defaults in the up state, we have $DefaultSavings_u = \$0$. Whereas, the default savings in the down state will depend on the size of the loan

$$DefaultSavings_d = \max\{(1+i) \cdot LoanAmt - ValueOfFirm_d, \$0\} \tag{13}$$

Equity Financing. After borrowing *LoanAmt*, the manager finances the rest of the purchase price by issuing *#Shares*

$$\begin{aligned} EquityFunding &\stackrel{\text{def}}{=} PurchasePrice - LoanAmt \\ &= \#Shares \cdot PricePerShare \end{aligned} \tag{14}$$

We use *EquityFunding* to denote the total amount of capital raised by the manager via public equity markets.

Shareholders get any remaining firm value left over after paying off the debt in year $t = 1$. The present value of these future equity payouts is given by

$$\begin{aligned} ValueOfEquity = q_u \cdot \{&ValueOfFirm_u - (1+i) \cdot LoanAmt\} \\ &+ q_d \cdot \max\{ValueOfFirm_d - (1+i) \cdot LoanAmt, \$0\} \end{aligned} \tag{15}$$

The owner of each equity share is entitled to $1/\#Shares$ of this time $t = 1$ payout. Just like the lender, shareholders price their portion of the payout correctly.

Choice Variable. The manager in our model takes as given the interest rate, $i(\ell)$, and her share price in equity markets, *PricePerShare*. Then, with this information in hand, she decides how much to borrow, $LoanAmt(\ell)$, and how many shares to issue, *#Shares*, at these prices. Her total amount of debt and equity financing must be enough to cover the purchase price of the firm, $LoanAmt + PricePerShare \cdot \#Shares \geq PurchasePrice$.

Notice that there is really only one choice variable here. *LoanAmt* and *#Shares* are two sides of the same coin. The manager cannot separately choose how much to borrow and how many shares to issue. This observation stems from twos facts. First, investors price all assets correctly. They are willing to pay $PricePerShare = ValueOfEquity \,/\, \#Shares$ for each share issued at time $t = 0$.

Second, the manager cannot increase her EPS by changing the size of each share. Following a reverse split, a company is required to retroactively update previously reported EPS values to reflect its new share count. Hence, once the market has set *PricePerShare*, the manager takes this price as given. Without loss of generality, we will normalize things so that $PricePerShare = \$1$.

3.3 NPV Maximization

In this subsection, we look at one possible approach to the manager's leverage decision: NPV maximization. Textbook theory assumes that she will choose the ratio that maximizes the present value of her future equity payouts net of costs

$$NPV \stackrel{\text{def}}{=} ValueOfEquity - EquityFunding \tag{16}$$

Unfortunately, Modigliani and Miller (1958) tells us that there can be no NPV-maximizing choice of leverage in our idealized benchmark model since it lacks frictions, information asymmetries, and taxes.

Proposition 3.3 (Modigliani and Miller, 1958)**.** *Assume that (a) the cash-flow distribution is fixed, (b) prices are correct, and (c) there are no frictions, information asymmetries, or taxes. In this idealized benchmark, the present value of future equity payouts is equal to the upfront cost of purchasing these claims*

$$ValueOfEquity(\ell) = EquityFunding(\ell) \qquad \text{for every } \ell \in [0, 1) \tag{17}$$

Under the textbook NPV-based approach, the manager's leverage decision is ill-posed. Any choice of leverage is just as good as any other. If the manager borrows more, then her equity holders will not have to pay as much at time $t = 0$ for their stake in the firm. But borrowing more will also cause the lender to adjust the terms of the manager's loan, meaning that there will be less firm value left over for equity holders at time $t = 1$. Modigliani and Miller (1958) tells us that these two forces exactly offset one another in an idealized model where there are no frictions, information asymmetries, or taxes.

To make this problem well-posed, you need to introduce two of these missing ingredients. The first ingredient should cause managers to deviate from the idealized benchmark. The second ingredient is there to ensure that the resulting deviation is not infinitely large. For example, tradeoff theory (Taggart, 1977) argues that NPV-maximizing managers lever up to exploit an interest tax shield but do not use infinite leverage due to bankruptcy costs. It is a similar workflow to using the limits-to-arbitrage paradigm in behavioral finance (Shleifer and Vishny, 1997). Both paradigms require introducing pairs of ad hoc features.

3.4 EPS Maximization

Now let's look at a different approach to the manager's leverage decision: EPS maximization. This is what the managers of large public corporations say that they are doing.

How NPV Differs From EPS. Suppose that the manager chooses the leverage ratio that results in the highest EPS. How is this objective different? To answer this question, it will be helpful to look at

$$NPVratio \stackrel{\text{def}}{=} \frac{ValueOfEquity}{EquityFunding} \tag{18}$$

rather than $NPV = ValueOfEquity - EquityFunding$. Both measures have exactly the same economic content since $NPV > 0$ corresponds to $NPVratio > 1$ and vice versa. However, it will be convenient to compare *EPS* with *NPVratio* since both have the same denominator when normalizing $PricePerShare = \$1$.

Proposition 3.4a (How NPV Differs From EPS)**.** *The difference between NPV and EPS is driven by the difference between the present value of all future equity payouts and the firm's expected earnings next year*

$$\begin{aligned} NPVratio - EPS \propto ValueOfEquity - \mathrm{E}[Earnings_1] \quad &(19a) \\ = (\tilde{\mathrm{E}} - \mathrm{E})[NOI_1 - i \cdot LoanAmt] & \\ + \tilde{\mathrm{E}}[ValueOfAssets_1 - LoanAmt] \quad &(19b) \\ + \tilde{\mathrm{E}}[DefaultSavings_1] & \end{aligned}$$

Since all Modigliani and Miller (1958) assumptions hold in our model, any choice of leverage is just as good as every other. EPS maximization is merely a selection criteria in this setting. Even outside of a stylized Modigliani and Miller (1958) world, EPS- and NPV-maximizing choices can coincide.

However, there are situations where maximizing EPS and maximizing NPV do lead to different outcomes. Proposition 3.4a shows how to interpret precisely these situations. The observed difference must be driven by some combination of the following three factors:

(a) EPS-maximizing managers do not risk adjust their firms' cash flows in year $t = 1$. This is the first term in Equation (19b), $(\tilde{\mathrm{E}} - \mathrm{E})[NOI_1 - i \cdot LoanAmt]$.

(b) EPS-maximizing managers do not account for long-term changes in firm value. This is the second term in Equation (19b), $\tilde{\mathrm{E}}[ValueOfAssets_1 - LoanAmt]$, and it explains why people associate EPS maximization with short-term thinking (Dimon and Buffett, 2018; Almeida, 2019; Terry, 2023).

(c) EPS-maximizing managers do not consider the value of their default option. This is the third term in Equation (19b), $\tilde{\mathrm{E}}[DefaultSavings_1]$. Even if the manager knows she will default in the down state, GAAP accounting standards say that her expected earnings should reflect her promised debt payment. Hence, a \$1 increase in interest payments, $i \cdot LoanAmt$, will always decrease expected earnings by \$1. Interest payments are treated as a known expense rather than a random variable.

How Managers Think. Imagine that the manager was initially planning on using some leverage ratio $\ell_0 \in [0, 1)$. Then she asks herself: "Would my EPS go up if I increased this initial ratio a little bit, $\ell_0 \to \ell_\epsilon = (\ell_0 + \epsilon)$?"

On one hand, an ϵ increase in leverage would lower expected earnings next year by increasing the promised debt payment. The manager would have to pay interest on a loan that was $\epsilon \cdot \mathit{PurchasePrice}$ larger. And if her debt was already risky, $\ell_0 > \ell_{\max r_f}$, then adding more leverage would increase her interest rate a little bit. Let $i(\ell_\epsilon) = i(\ell_0) \cdot [1 + \delta(\ell_0)]$ denote the manager's interest rate on the slightly larger loan. We write the elasticity of interest with respect to leverage as $\delta(\ell) \stackrel{\text{def}}{=} \ell \cdot [i'(\ell)/i(\ell)]$ with $\delta(0) = 0$.

On the other hand, using more debt would allow the manager to issue fewer shares since $\mathit{PricePerShare} \cdot \#\mathit{Shares} = (1 - \ell) \cdot \mathit{PurchasePrice}$. Under the normalization that $\mathit{PricePerShare} = \$1$, an ϵ increase in the manager's leverage would reduce her share count by $(\epsilon \cdot \mathit{PurchasePrice})/\$1$. This trade off leads an EPS-maximizing manager to adopt the following reasoning.

Proposition 3.4b (How Managers Think)**.** *Suppose an EPS-maximizing manager increases her leverage by a tiny amount, $\ell_0 \to \ell_\epsilon = (\ell_0 + \epsilon)$, and issues fewer equity shares. This small change will alter her firm's EPS by an amount*

$$\tfrac{\mathrm{d}}{\mathrm{d}\epsilon}\big[\mathit{EPS}(\ell_0 + \epsilon)\big]_{\epsilon=0} = \frac{1}{1-\ell_0} \cdot \{\, \mathit{EY}(\ell_0) - i(\ell_\epsilon) \,\} \tag{20}$$

$\mathit{EY}(\ell_0) = \mathrm{E}[\mathit{Earnings}_1(\ell_0)]$ / $\mathit{ValueOfEquity}(\ell_0)$ is the manager's initial earnings yield. $i(\ell_\epsilon) = i(\ell_0) \cdot [1 + \delta(\ell_0)]$ is her interest rate with slightly higher leverage, and $\delta(\ell) = \ell \cdot [i'(\ell)/i(\ell)]$ is the elasticity of interest with respect to leverage.

If the manager's original earnings yield is higher than her new interest rate, $\mathit{EY}(\ell_0) > i(\ell_\epsilon)$, then the manager will view equity as expensive compared to debt, $\tfrac{\mathrm{d}}{\mathrm{d}\epsilon}\big[\mathit{EPS}(\ell_0 + \epsilon)\big]_{\epsilon=0} > 0$. She will think it is a good idea to increase her leverage. By contrast, if the manager's original earnings yield is lower than her adjusted interest rate, $\mathit{EY}(\ell_0) < i(\ell_\epsilon)$, then she will view equity as the cheaper option, $\tfrac{\mathrm{d}}{\mathrm{d}\epsilon}\big[\mathit{EPS}(\ell_0 + \epsilon)\big]_{\epsilon=0} < 0$. Given the option, she would try to increase her EPS by borrowing even less.

Proposition 3.4b explains why managers often talk about their earnings yield as a cost of equity capital (Graham and Harvey, 2001). EPS-maximizing managers will constantly be thinking to themselves: "A high earnings yield implies that equity financing is more costly. A high earnings yield implies that equity financing is more costly. [...] A high earnings yield implies that equity financing is more costly." Recite this mantra enough times, and you too would start thinking of your earnings yield as a cost of capital.

To be clear: we are not arguing that managers should be conflating these two ideas. A stock's dividend yield is not the same thing as its expected return. Likewise, a company's earnings yield is not the same thing as its cost of equity capital. Proposition 3.4b simply explains why it would be natural for an EPS-maximizing manager to think this way.

Unique EPS-Maximizing Leverage. Next we show that there is a unique EPS-maximizing leverage ratio even in our frictionless information-symmetric model where all Modigliani and Miller (1958) assumptions hold. When the manager's earnings yield is high, she levers up a bit. When her earnings yield is low, she tries to reduce her leverage. Given any initial leverage ratio, $\ell_0 \in [0, 1)$, this process will lead her to the single EPS-maximizing leverage ratio, $\ell_\star$.

Proposition 3.4c (Unique EPS-Maximizing Leverage)**.** *Either $EPS(\ell)$ is maximized at $\ell = 0$, or there is a unique interior choice of $\ell \in (0, 1)$ that satisfies*

$$\tfrac{\mathrm{d}}{\mathrm{d}\epsilon}\big[EPS(\ell + \epsilon)\big]_{\epsilon=0} = 0 \tag{21}$$

Either way, given any initial starting point $\ell_0 \in [0, 1)$, the logic outlined in Proposition 3.4b produces a single EPS-maximizing leverage ratio, $\ell_\star$.

Recall that EPS maximization is not a mistake in our benchmark model. If Modigliani and Miller (1958) holds, then every choice of leverage is just as good as any other. EPS maximization in our benchmark model is best thought of as a selection criteria rather than a behavioral tick.

Also recall that all risky payouts in our model are priced correctly. Thus, while it can sometimes lead managers to make bad choices, the EPS-maximization

paradigm requires neither managers nor markets to be irrational. We think it is likely that investors also care about EPS. However, in this paper, we show that many otherwise puzzling phenomena can be explained using a model where only the manager cares about EPS.

Value vs. Growth. A growth stock is a company with a high price-to-earnings ratio (P/E). People are willing to pay a lot for each $1 of this firm's earnings. A value stock is the opposite of a growth stock. A value stock has a low P/E, making it comparatively cheap to buy $1 of this company's earnings.

It turns out that, in a world where managers are EPS maximizers, these two types of firms will finance themselves in completely different ways. This insight follows naturally from asking "What would an EPS-maximizing manager do?" subject to two practical constraints. Her leverage cannot be negative, $\ell \geq 0$, and her interest rate cannot be less than the riskfree rate, $i \geq r_f$.

Lemma 3.4 (Unlevered Firm)**.** *When $\ell_0 = 0$, an ϵ increase in leverage yields*

$$\frac{\mathrm{d}}{\mathrm{d}\epsilon}\Big[EPS(0+\epsilon)\Big]_{\epsilon=0} = \underbrace{(r-g)}_{\text{cap rate}} - r_f \tag{22}$$

Earnings are the same as cash flows in the absence of debt. So Gordon-growth logic implies that $EY(0) = r - g$ since

$$\frac{1}{EY(0)} = \frac{ValueOfEquity(0)}{\mathrm{E}[Earnings_1(0)]} = \frac{PurchasePrice}{\mathrm{E}[NOI_1]} = \frac{1}{r-g} \tag{23}$$

The difference in the denominator, $r - g$, is often called the cash flow capitalization rate (aka, "cap rate" for short).

So consider a manager who is initially planning on buying a firm using no debt, $\ell_0 = 0$. And, for now, suppose that this firm has a really low cap rate

$$EY(0) = r - g < r_f = i(\epsilon) \tag{24}$$

In this case, Equation (22) tells us that she would like to reduce her leverage. But $\ell_0 = 0$ is as low as she can go. So she does the next best thing and follows through on her initial all-equity plan, $\ell_\star = \ell_0 = 0$.

Now suppose that the exact same manager is buying a different company with a higher cap rate, $EY(0) = r - g > r_f = i(\epsilon)$. In this new scenario, the manager will no longer stick to her initial equity-only plan, $\ell_0 = 0$. Equation (22) indicates that the manager could increase her EPS by borrowing just a little, $\ell_\star > \ell_0 = 0$. She will view the first \$1 of debt as less expensive than the last share of equity that she would initially planning on issuing.

Proposition 3.4d (Value vs. Growth)**.** *Define a growth firm as a company whose cap rate is below the riskfree rate, $r - g < r_f$. Define a value firm as a company whose cap rate is above the riskfree rate, $r - g > r_f$.*

The EPS-maximizing leverage ratio jumps discontinuously at the value-vs-growth boundary

$$\ell_\star \begin{cases} = 0 & \text{if } r - g < r_f \quad \textit{(growth firms)} \\ \geq \ell_{\max r_f} & \text{if } r - g > r_f \quad \textit{(value firms)} \end{cases} \tag{25}$$

At this threshold, a firm's unlevered earnings yield is exactly equal to the lowest possible interest rate on debt.

Proposition 3.4d implies that growth firms use no debt; whereas, value firms never borrow just a little. The discontinuous jump in leverage at $r - g = r_f$ is a consequence of the fact that earnings yield initially increases with leverage, $EY(\epsilon) > EY(0)$, while the cost of debt remains the same, $i(\ell) \cdot [1 + \delta(\ell)] = r_f$ for all $\ell \in [0, \ell_{\max r_f}]$. So if it makes sense to borrow one dollar, $EY(0) > r_f = i(0) \cdot [1 + \delta(0)]$, then it makes even more sense for her to borrow two, $EY(\epsilon) > EY(0) > r_f = i(\epsilon) \cdot [1 + \delta(\epsilon)]$. And the next dollar of debt will look even more attractive, $EY(2 \cdot \epsilon) > EY(\epsilon) > EY(0) > r_f = i(2 \cdot \epsilon) \cdot [1 + \delta(2 \cdot \epsilon)]$. For value firms, this positive feedback loop will continue at least until the manager has exhausted all her riskfree borrowing capacity, $\ell_\star \geq \ell_{\max r_f}$.

The large qualitative difference between the leverage decisions of value and growth firms is a natural consequence of EPS maximization. There is nothing in the setup of our problem that suggests a P/E ratio discontinuity. Instead, the discontinuity in leverage emerges as part of our analysis. It will reappear over and over again in future applications.

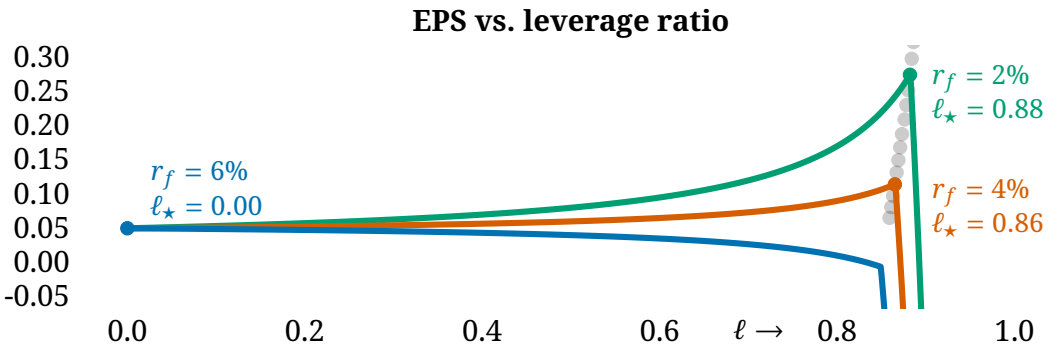


Figure 3. x-axis: leverage ratio, $\ell \in [0, 1)$. y-axis: earnings per share, $EPS(\ell)$. Each line reports results for a different riskfree rate, $r_f \in \{2\%, 4\%, 6\%\}$. All other parameters are the same for all three lines: $\mathrm{E}[NOI_1] = \$5.00$, $u = 27\%$, $d = 18\%$, $r = 10\%$, $g = 5\%$, and $p_u = 40\%$. $\ell_\star$ denotes the EPS-maximizing leverage ratio—i.e., the point on the x-axis where the line for a particular r_f value peaks. The grey dots indicate EPS-maximizing leverage ratios associated with other riskfree rates less than 5% at 25bps increments.

3.5 Numerical Simulations

We conclude this section with a pair of numerical simulations that illustrate how EPS-maximizing managers choose their leverage. This is not a calibration exercise. The parameter values were not chosen to match real-world moments. Our aim is to illustrate the economic intuition behind EPS maximization.

Figure 3 reports $EPS(\ell)$ over the full range of leverage ratios $\ell \in [0, 1)$. There are three lines. Each one is associated with a different riskfree rate, $r_f \in \{2\%, 4\%, 6\%\}$. Everything else is the same for all three lines: $\mathrm{E}[NOI_1] = \$5.00$, $u = 27\%$, $d = 18\%$, $r = 10\%$, $g = 5\%$, and $p_u = 40\%$.

When $\boldsymbol{r_f = 6\%}$, the firm is a growth stock, $r - g = 10\% - 5\% = 5\% < \boldsymbol{6\% = r_f}$. In this scenario, the highest point on the blue line is indicated by the dot all the way on the left-hand side of the figure. The manager maximizes her EPS by doing an all-equity transaction, $\boldsymbol{\ell_\star = 0.00}$.

By contrast, when $\boldsymbol{r_f = 2\%}$ and when $\boldsymbol{r_f = 4\%}$, the firm is a value stock. In both cases, the firm's cap rate, $r - g = 5\%$, is larger than the riskfree rate. So a manager maximizes her EPS by using a substantial amount of leverage, $\boldsymbol{\ell_\star = 0.88}$ and $\boldsymbol{\ell_\star = 0.86}$. Even when $(r - g) - \boldsymbol{r_f} = 5\% - \boldsymbol{4\%} = 1\%$, the EPS-maximizing leverage ratio is already $\boldsymbol{\ell_\star = 86\%}$ of the purchase price.

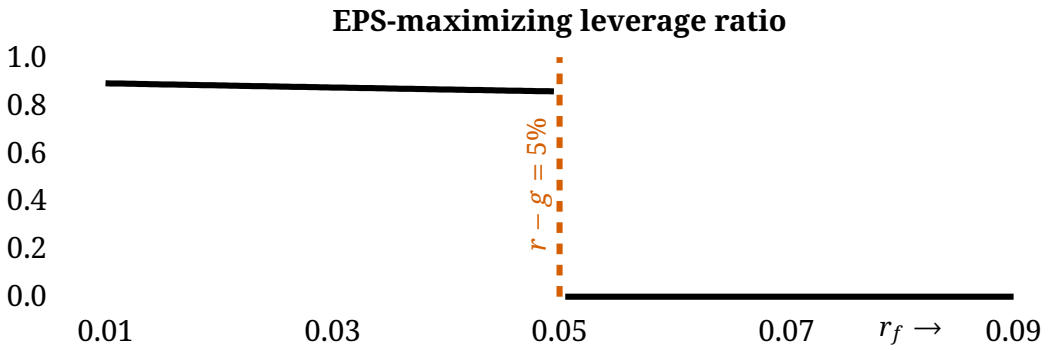


Figure 4. x-axis: riskfree rate, $r_f \in (1\%, 9\%)$. y-axis: EPS-maximizing choice of leverage, $\ell_\star$. Parameter values: $\mathrm{E}[NOI_1] = \$5.00$, $u = 27\%$, $d = 18\%$, $r = 10\%$, $g = 5\%$, and $p_u = 40\%$. The vertical red dashed line is the company's cap rate, $\boldsymbol{r - g = 5\%}$. To the right of this line, the high riskfree rate makes the company a growth firm, so an EPS-maximizing manager will choose $\ell_\star = 0$. To the left of this line, the low riskfree rate makes the company a value firm with $\ell_\star \geq \ell_{\max r_f}$.

Figure 4 offers another way of highlighting how EPS maximization causes value and growth firms to finance themselves in different ways. The thick black line shows the EPS-maximizing choice of leverage as the prevailing riskfree rate increases from $r_f = 1\%$ to $r_f = 9\%$. Just like in Figure 3, the company always has the same cap rate, $\boldsymbol{r - g = 5\%}$, which is denoted by a vertical dashed red line. Its NOIs are discounted at $r = 10\%$ per year, and these cash flows grow at a rate of $g = 5\%$ annually. All parameter values are the same in both figures.

On the left-hand side of the figure, the manager uses a significant amount of debt because the riskfree rate is so low that she is buying a value firm, $r_f < \boldsymbol{r - g = 5\%}$. On the right-hand side, the same manager uses no debt because the riskfree rate is high that she is now buying a growth stock, $r_f > \boldsymbol{r - g = 5\%}$. And there is a large discontinuous jump in the EPS-maximizing leverage as the riskfree rate crosses over the firm's cap rate.

4 More Applications

This section analyzes four more applications of the principle of EPS maximization: When will a firm repurchase shares? When doing an M&A deal, will an acquirer pay target shareholders by issuing equity? Under what conditions will a firm accumulate cash? How do firms budget capital more generally?

4.1 Share Repurchases

Academics and policymakers have debated long and hard about how to explain share repurchases (Gutierrez and Philippon, 2017; Kahle and Stulz, 2021). But there is not much to explain once you recognize that the managers of large public corporations are EPS maximizers. When you ask them why they do not issue more shares, they often express concerns about diluting their EPS (e.g., Graham and Harvey, 2001). Repurchasing shares is the flip side of the same coin. Managers repurchase shares whenever it boosts their EPS.

Previously, we thought about a manager who was in the process of acquiring a company. So it made sense to interpret $\ell_0 \in [0, 1)$ as her initial plan for how much leverage to use. In this section, we assume the acquisition is complete and the manager has been running the company for some time. We now interpret ℓ_0 as the leverage she inherits from running the company in the previous period.

Proposition 4.1 (Share Repurchases)**.** *Suppose a manager inherits an initial leverage ratio from the previous period, $\ell_0 \in [0, 1)$. She will undertake a debt-financed share-repurchase plan that increases her leverage $\ell_0 \longrightarrow \ell_\epsilon = (\ell_0 + \epsilon)$ whenever*

$$EY(\ell_0) > i(\ell_\epsilon) \tag{26}$$

$EY(\ell_0) = \mathrm{E}[Earnings_1(\ell_0)]$ / $ValueOfEquity(\ell_0)$ is the earnings yield for the firm's existing shareholders. $i(\ell_\epsilon)$ is the firm's interest rate after repurchasing shares.

If the manager increases her leverage by ϵ, she will be able to repurchase $(\epsilon \cdot PurchasePrice)/PricePerShare$ shares. But she will also have to pay interest on a larger loan next year. And if the firm's debt was already risky, $\ell_0 > \ell_{\max r_f}$, the manager will also pay a slightly higher interest rate on the larger loan, $i(\ell_\epsilon) = i(\ell_0) \cdot [1 + \delta(\ell_0)] > i(\ell_0)$. These two effects work in opposite directions. Fewer shares outstanding $\Rightarrow$ higher EPS. Higher interest expense $\Rightarrow$ lower EPS. Share repurchases occur when the first effect dominates. When the second effect dominates, the firm issues shares.

We want to emphasize that this logic is the same as the logic in Proposition 3.4b. The only difference is that now we are talking about repurchasing existing shares rather than how many to issue in the first place. There is nothing puzzling

to explain when an EPS-maximizing manager repurchases shares. Nothing has to be added to the benchmark setup to account for this phenomenon.

It is common to hear managers talk about buying back shares because these shares are undervalued. For example, in a recent Bloomberg News article, an analyst wrote that "the stock buyback by Heineken sends a 'strong message that the board views the shares as undervalued.'"[1] Statements like these have a similar flavor to the market-timing story for equity issuance in Baker and Wurgler (2000, 2002). However, there is no arbitrage in our model.

Managers and investors are both aware that "the process of buying back shares, while increasing EPS, leaves the value of an investor's holdings unchanged. (Oded and Michel, 2008)" Nobody thinks that you can make a pizza bigger by paying the chef to slice it differently. Managers do not adopt debt-financed repurchase programs in order to boost the NPV of investors' holdings; they do it to boost EPS. Buybacks do not happen because managers think their equity is undervalued in an absolute sense. They occur when managers think equity looks cheap compared to debt as described in Proposition 3.4b.

EPS-maximizing managers are not trying to hide this motivation from shareholders. Figure 1 shows the first slide from a presentation given by HP's CEO to his shareholders. The title of the slide is "Creating Value For HP Shareholders." The first bullet point promises to deliver "EPS of \$3.25-\$3.65 in FY22" by performing "at least \$8B of share repurchase in first 12 months." Ma (2019, footnote 3) also gives examples of CFOs describing buybacks as a way to exploit "the difference between rates on their debt and the yield on their stock."

This is also how financial economists thought prior to Modigliani and Miller (1958). For example, Ellis (1965) explicitly calculates "the increase in per-share earnings which the management of a hypothetical company obtains by reducing the equity base by repurchasing common stock." The article plainly states that "the increase in earnings per share is the stockholder standard by which investment opportunities can be judged. Projects which improve on the stockholder standard should be undertaken when feasible."

[1] Michael O'Boyle, Swetha Gopinath, and Sarah Jacob. "Heineken Seals \$1 Billion Share Buyback as Femsa Exit Begins." *Bloomberg News.* February 15th, 2023.

4.2 M&A Payment

Next we examine how a manager will pay target shareholders in an M&A deal. The timing here is a little different. When the manager purchased her company at time $t = 0$, she did so using the EPS-maximizing leverage ratio at the time, $\ell_\star$. Then, immediately after she completed this purchase, she realizes that it might make sense for her new company to acquire another firm.

Acquiring the other firm will cost ϵ% of the purchase price of the manager's original company. If the manager decides to finance this acquisition using debt, then she will need to increase her leverage by ϵ. Alternatively, she could issue $\epsilon \cdot PurchasePrice/PricePerShare$ new shares to the shareholders of the target company. Either way, the cost needs to be paid immediately after purchasing the firm in year $t = 0$.

By contrast, the benefit of acquiring the other firm comes in future periods. From year $t = 1$ onward, the acquisition will boost expected NOIs by $(b \cdot \epsilon)$% where $b \in (0, \infty)$. Note that a $b > 1$ acquisition is not the same thing as a positive NPV acquisition. b determines how an acquisition will affect the acquirer's expected NOIs. It does not include any sort of risk adjustment.

Note that this new acquisition would alter the original firm's future cash flows, so Modigliani and Miller (1958) capital-structure irrelevance no longer holds. Nevertheless, EPS maximization generates clear predictions about whether and how the acquisition will get financed.

If Equity Is The Only Option. First, imagine that the manager can only pay for the acquisition by issuing new equity to target shareholders. Under the normalization that $PricePerShare = \$1$, she would have to issue $\epsilon \cdot PurchasePrice/\$1$ new shares. So her new EPS would be

$$\frac{(1 + b \cdot \epsilon) \cdot \mathrm{E}[NOI_1] - i(\ell_\star) \cdot LoanAmt(\ell_\star)}{ValueOfEquity(\ell_\star) + \epsilon \cdot PurchasePrice} \tag{27}$$

Her expected earnings would be higher, which would be good. But these earnings would be spread across a larger number of shares, which would be bad.

Given this framing, we can characterize the manager's decision in situations where the target firm is small relative to the manager's firm, $\epsilon \to 0$. The manager

will use equity financing to acquire the target firm whenever the derivative of Equation (27) with respect to ϵ is positive.

Lemma 4.2a (If Equity Is The Only Option)**.** *If a manager only has access to equity financing, then she will acquire the target company whenever*

$$b > b_{Equity} \stackrel{\text{def}}{=} \frac{EY(\ell_\star)}{r - g} \tag{28}$$

$EY(\ell_\star)$ is the original firm's earnings yield prior to the acquisition.

The manager thinks about her original company's earnings yield, $EY(\ell_\star)$, as her cost of equity capital. So Equation (28) says that, as an EPS-maximizing manager, she will only issue equity to acquire the target company if it would boost her expected NOIs by a multiple of her cost of equity capital.

If Debt Is The Only Option. Next, consider the opposite scenario where the manager only has access to debt markets. If she decides to borrow money to pay for the acquisition, she would have to increase her leverage by ϵ. In that case, her new EPS would be

$$\frac{(1 + b \cdot \epsilon) \cdot \mathrm{E}[NOI_1] - i(\ell_\star + \epsilon) \cdot LoanAmt(\ell_\star + \epsilon)}{\#Shares(\ell_\star)} \tag{29}$$

Her expected earnings may be higher or lower depending on how much the merger boosts her expected NOIs. The manager will now only invest if the derivative of Equation (29) with respect to ϵ is positive.

Lemma 4.2b (If Debt Is The Only Option)**.** *If a manager only has access to debt financing, then she will acquire the target company whenever*

$$b > b_{Debt} \stackrel{\text{def}}{=} \frac{i(\ell_\star) \cdot [1 + \delta(\ell_\star)]}{r - g} \tag{30}$$

$i(\ell_\star) \cdot [1 + \delta(\ell_\star)]$ is the manager's new interest rate after borrowing to pay for the acquisition, and $\delta(\ell) = \ell \cdot [i'(\ell)/i(\ell)]$ is the elasticity of interest with respect to leverage.

$i(\ell_\star) \cdot [1 + \delta(\ell_\star)]$ is the manager's cost of debt capital. Just like before, Equation (30) says that the manager will finance the acquisition by borrowing more money if it boosts her expected NOIs by a multiple of this cost.

If Both Options Are Available. Under what conditions will the manager acquire by giving target shareholders equity? When will she prefer to borrow? The answer will hinge on whether she is in charge of a value or growth firm.

Proposition 4.2 (M&A Payment)**.** *If a manager has access to both equity and debt markets, then she will acquire the target whenever*

$$b > \begin{cases} 1 & \text{if } r - g < r_f \quad \textit{(growth firms)} \\ \frac{EY(\ell_\star)}{r-g} = \frac{i(\ell_\star)\cdot[1+\delta(\ell_\star)]}{r-g} & \text{if } r - g > r_f \quad \textit{(value firms)} \end{cases} \tag{31}$$

If $r - g < r_f$, the manager pays the target company's shareholders by issuing them new shares. If $r - g > r_f$, she pays them using a mix of debt and equity.

A manager has just finished purchasing her own firm using leverage, $\ell_\star$. If her firm is a growth firm where $r - g < r_f$, then $\ell_\star = 0$ and $EY(0) = r - g$. Hence, when in charge of a growth firm, the manager is willing to pay ϵ% of her firm's purchase price so long as the merger will boost her expected NOIs by at least ϵ%. And, whenever someone proposes such an M&A deal, she will pay target shareholders by issuing equity since $EY(0) = r - g < r_f = i(0) \cdot [1 + \delta(0)]$.

By contrast, if the manager is running a value firm, $r - g > r_f$, then $\ell_\star \geq \ell_{\max r_f}$ and $EY(\ell_\star) = i(\ell_\star) \cdot [1 + \delta(\ell_\star)]$ since we are no longer at the zero-lower bound. As a result, the minimum required boost is

$$b_{Equity} = \frac{EY(\ell_\star)}{r - g} = \frac{i(\ell_\star) \cdot [1 + \delta(\ell_\star)]}{r - g} = b_{Debt} \tag{32}$$

And, whenever someone proposes an M&A deal that exceeds this threshold, the manager will pay the target company's shareholders using some combination of debt and equity. She may borrow money and deliver cash. Or the manager might pay target shareholders by issuing new shares. All this follows from taking firm managers at their word when they tell us that they are EPS maximizers.

Dilutive And Acretive Mergers. Market commentators sometimes complain about profitable acquisitions not taking place because they would dilute the acquirer's EPS (Andrade, 1999). We now extend the logic behind Proposition 3.4a to better understand this phenomenon.

The key observation is that EPS-maximizing managers do not do any risk adjustment when thinking about the future benefits of an acquisition. They only care about expected NOIs. As a result, if an acquisition increases cash flows the most in good future states of the world, it is possible for it to increase EPS while simultaneously reducing NPV. The opposite can also be true. There can exist positive-NPV acquisitions that lower the acquirer's EPS.

To formalize this reasoning, suppose an acquisition boosts future NOIs by b_u in the up state and b_d in the down state. If the manager's expected NOIs still go up by b on average, the associate up- and down-state boost profile (b_u, b_d) must satisfy

$$b = b_u \cdot \{\, p_u \cdot (1+u) \,\} + b_d \cdot \{\, p_d \cdot (1-d) \,\} \tag{33}$$

Note that there is an entire continuum of boost profiles, (b_u, b_d), associated with each average boost level, $b \in (0, \infty)$. Corollary 4.2 shows that this range of possibilities is large enough to allow for negative-NPV M&A deals which have $b > 1$ on average. It will also contain positive-NPV M&A deals where $b < 1$.

Corollary 4.2 (Accretion And Dilution)**.** *There are average boost levels $b > 1$ for which it is possible to construct negative-NPV boost profiles, (b_u, b_d). There are average boost levels $b < 1$ associated with positive-NPV boost profiles, (b_u, b_d).*

Here is how EPS dilution and accretion might create problems. A negative-NPV M&A deal with $b > 1$ is accretive. An EPS-maximizing manager of a growth firm will finance an acquisition with an average boost larger than one, $b > 1$. Most of the these $b > 1$ acquisitions will be $NPV > 0$. However, this manager would also be willing to do a $NPV < 0$ acquisition so long as it has $b > 1$. And Corollary 4.2 tells us that such M&A deals can exist. Corollary 4.2 also says that there are $NPV > 0$ acquisitions which the manager would pass up on because they would dilute her EPS, $b < 1$.

4.3 Cash Accumulation

Firms hold more cash than ever before. Bates, Kahle, and Stulz (2009) documents that "the average cash-to-assets ratio for US industrial firms more than [doubled] from 1980 to 2006." And this upward trend has continued in the decade since (Faulkender, Hankins, and Petersen, 2019). Instead of using cash reserves, managers regularly choose to pay for a costly new project by issuing equity and/or levering up.

Why might managers do this? If there is cash burning a hole in their corporate pockets, why would they choose not to use it? How could this not be the cheapest payment option?

Textbook theory assumes that managers are NPV maximizers. In that framework, if you want to explain why a manager does not pay for a costly new project using cash on hand, then you must introduce some market imperfection such as a precautionary-savings motive or tax differential. We now show that, if managers are EPS maximizers rather than NPV maximizers, it is easy to understand why some firms hoard cash.

The setup and timing will be the same as in the previous subsection. The manager has just completed purchasing a company using the EPS-maximizing leverage ratio, $\ell_\star$. Immediately after the paperwork is finalized, she spots a new project. Previously, this project was the acquisition of another firm. But now there is no reason to be so specific. Think about the project as building a new plant, starting a new product line, or enrolling in a new worker training program. Whatever it is, the project still costs e% of the purchase price today and boosts future NOIs by $(b \cdot e)$% starting in year $t = 1$.

Besides lifting the restriction that the manager's project is an M&A deal, the only other new bit has to do with the manager's financing options. In addition to equity and debt markets, we now assume the manager also has enough cash to pay for the project, $Cash \geq e \cdot PurchasePrice$. This cash was not involved in her purchase of the firm. Think about it as a windfall coming right after the ink dries on the first deal. At that very moment, she discovers a briefcase full of cash and spots a costly new project at the same time. We want to know when the manager will use the cash.

The firm earns the riskfree rate of return on any cash holdings. So, in the presence of cash, our formula for EPS in Equation (1) becomes

$$EPS \overset{\text{def}}{=} \frac{\mathrm{E}[NOI_1] + r_f \cdot Cash - i \cdot LoanAmt}{\#Shares} \tag{34}$$

If the manager pays for the new project with cash, her new EPS would be

$$\frac{(1 + b \cdot \epsilon) \cdot \mathrm{E}[NOI_1] + r_f \cdot (Cash - \epsilon \cdot PurchasePrice) - i \cdot LoanAmt}{\#Shares} \tag{35}$$

The logic behind when it is worthwhile to pay cash is the same as before.

Lemma 4.3 (If Cash Is The Only Option)**.** *If a manager only has access to cash holdings, then she will invest in a costly new project whenever*

$$b > b_{Cash} \overset{\text{def}}{=} \frac{r_f}{r - g} \tag{36}$$

There is a cost of capital associated with paying cash, r_f. So a manager will only choose to fund a new project by paying cash if it will boost her future earnings by a multiple of her cost of capital for cash. And when will this be?

Proposition 4.3 (Cash Accumulation)**.** *A growth firm with $r - g < r_f$ will never finance a costly new project out of her cash holdings. A value firm with $r - g > r_f$ will exhaust its cash holdings before using any other financing type.*

For growth firms, the cost of equity capital is lower than the riskfree rate, $EY(0) = r - g < r_f$. So they will finance any new project by issuing equity even when cash is present. Whereas, when buying a value firm, an EPS-maximizing manager will exhaust her riskfree borrowing capacity, $\ell_\star \geq \ell_{\max r_f}$. So cash will always be the cheapest option for a new project, $r_f \leq EY(\ell_\star) = i(\ell_\star) \cdot [1 + \delta(\ell_\star)]$. Only after cash is gone will she turn to equity and debt markets.

We note that, if investors also had a preference for dividend-paying stocks, then it would be cheaper for growth stocks to cater to that preference (Baker and Wurgler, 2004). But, since the current paper already generates a wide range of results by making a single change to managers' problem, we leave that analysis for a future paper.

4.4 Capital Budgeting

Taken together, the analysis in sections 4.2 and 4.3 describes how an EPS-maximizing manager will make capital-budgeting decisions more generally. They study a manager who is considering a project that costs e% of the purchase price for the original firm. The benefit of this project is that it boosts her firm's expected NOIs by $(b \cdot e)$% for some $b \in (0, \infty)$.

Propositions 4.2 and 4.3 specify when an EPS-maximizing manager will undertake a costly new project that has a given boost level. These two propositions also detail how an EPS-maximizing manager will pay for this project when she does pull the trigger. We summarize how these two sets of results combine with one another in Proposition 4.4 below.

Proposition 4.4 (Capital Budgeting)**.** *An EPS-maximizing manager in charge of a growth firm with $r - g < r_f$ will undertake a costly new project whenever $b > 1$. She will finance any such project by issuing equity even if she has cash.*

By contrast, when in charge of a value firm where $r - g > r_f$, the same manager will undertake a costly new project whenever

$$b > \begin{cases} \frac{r_f}{r-g} & \text{if she has cash} \\ \frac{EY(\ell_\star)}{r-g} = \frac{i(\ell_\star)\cdot[1+\delta(\ell_\star)]}{r-g} & \text{if she does not} \end{cases} \tag{37}$$

where $\frac{i(\ell_\star)\cdot[1+\delta(\ell_\star)]}{r-g} = \frac{EY(\ell_\star)}{r-g} \geq \frac{r_f}{r-g} > 1$. She will finance any such project using cash if possible. If not, she will use a mix of debt and equity financing.

Our empirical analysis will directly test specific examples of capital budgeting related to M&A payment and cash accumulation. However, this more general result is useful because it explains a broader pattern in the literature: while the principle of NPV maximization says that capital budgeting should be project specific, firms tend to use the same backwards-looking hurdle rate for all projects (Krüger, Landier, and Thesmar, 2015). We note that this sort of firm-specific rule follows naturally from the principle of EPS maximization. This is exactly how an EPS-maximizing manager would make her decision.

5 Empirical Evidence

How much leverage should a firm use? When should it repurchase shares? How should a firm pay for a new acquisition? Under what conditions does it make sense to accumulate cash? We have just seen how an EPS-maximizing manager would answer each of these questions. This section provides empirical evidence showing that the managers of large public corporations answer these questions in the same way. In every application we look at, the empirical evidence is consistent with our theoretical analysis. Value and growth firms make different constellations of financing decisions. The dividing line between value and growth firms occurs right where our theory says it should.

5.1 Data Description

We start by describing our data. We use `teletype` to denote an empirical analog to some object in our theoretical model. For example, $\texttt{ValueOfAssets}_{n,t}$ represents the empirically observed value of the assets held by the nth firm's assets in year t.

We build our data around the CRSP-Compustat merged database. We take all firm-year observations for active public US companies from 1990 through 2022 subject to the following restrictions. We exclude the financial and utilities industries (GICS sectors: 40 and 55). We require the company to report its accounting data in US dollars (currency code: USD). We keep only firms listed on either the NYSE, Amex, or Nasdaq (exchange codes: 11, 12, and 14). We only keep firm-year observations that can be matched to previous year (match variables: `GVKEY` and `YEAR`). The CRSP-Compustat merged database gives us cash holdings (`Cash` = cash and short-term investments; CHE), total assets (`ValueOfAssets` = total assets; AT), and number of shares (`#Shares` = number of common shares outstanding; CSHO).

We then merge on data from the WRDS Financial Ratios Suite. This database gives us each firm's leverage (`Leverage` = total debt/total assets; debt_assets), effective tax rate (`TaxRate` = effective tax rate; efftax), and book-to-market ratio (`BookToMarket` = book/market; bm). We merge these data onto our primary database by `GVKEY` and `YEAR`, keeping only successful matches.

Next, we add data from I/B/E/S on analysts' expected EPS for each firm. We use analysts' EPS forecasts for the upcoming quarter, and we restrict our sample to include only the final forecast made by each analyst. Let $\texttt{EPS}_{n,t,q}$ denote the average analyst EPS forecast for the nth firm in the qth quarter of year t. To compute the expected earnings yield, we divide this average by the firm's end-of-quarter stock price

$$\texttt{EY}_{n,t,q} \stackrel{\text{def}}{=} \frac{\texttt{EPS}_{n,t,q}}{\texttt{PricePerShare}_{n,t,q}} \tag{38}$$

Then, for each firm-year, we sum the quarterly earnings-yield estimates to create a single annual value, $\texttt{EY}_{n,t} = \sum_{q=1}^{4} \texttt{EY}_{n,t,q}$. We only keep firm-year observations that have at least one analyst forecast each quarter. We merge onto our primary database by `PERMNO`, `CUSIP`, and `YEAR`, keeping only successful matches.

Our data on acquisitions come from the Thomson/Refinitiv SDC database. We start with all completed M&A deals from 1990 through 2020. We then restrict our sample to include deals where the acquirer is a public US company that sought 50%+ ownership of the target. We require the deal to be either a merger, a complete acquisition, or an acquisition of majority interest (form: "Merger", "Acquisition", "Acq. Maj. Int."). We exclude deals that are divestitures, recapitalizations, repurchases, restructuring, secondary buyouts, spin-offs, split-offs, and tender offers (including self-tenders and tender mergers). We aggregate the remaining data up to the acquirer-year level. Each row in the resulting database is a firm that completed at least one acquisition in a given calendar year. Let $\texttt{PaidForAcqWithEquity}_{n,t} \in \{0, 1\}$ denote an indicator variable for whether the nth acquirer use at least 50% equity to pay target shareholders in any acquisition during year t. We merge this data concerning acquirer payment choices onto our primary database by `CUSIP` and `YEAR`. We keep all observations in our primary database regardless of whether they match.

Our final data source is the CRSP US Treasury and Inflation Indexes database. This is where we get data on the annual riskfree rate, which corresponds to the annualized return on 30-day TBills ($\texttt{RiskfreeRate} = \text{T30}$). We report summary statistics for all variables in Appendix B.1.

5.2 Excess Earnings Yield

An EPS-maximizing manager always makes financing decisions by comparing her earnings yield to her new interest rate, $EY \lessgtr i \cdot (1+\delta)$. This logic leads to qualitatively different outcomes for value and growth firms. And our theoretical analysis distinguishes between the two kinds of firms by comparing cap rates to the riskfree rate, $r - g \lessgtr r_f$. If a firm's cap rate is higher, it is a value stock. If the riskfree rate is higher, it is a growth stock.

In an ideal world, we would be able to create empirical analogs to all four terms involved in these two comparisons. Unfortunately, we only have data on one side of each comparison. We observe $\texttt{EY} \sim EY$ but not $\texttt{CapRate} \sim r - g$. Analysts do not separately forecast cap rates for levered firms. WRDS' web interface even states that "non-EPS [measures] may be sparse[ly]" reported. We observe $\texttt{RiskfreeRate} \sim r_f$ but not $\texttt{AdjInterestRate} \sim i \cdot (1+\delta)$. It is much harder to proxy for a firm's adjusted interest rate than for the riskfree rate.

So, given that only one side of each comparison is empirically observable, we split the difference and construct a new variable out of each observable half

$$\texttt{ExcessEY}_{n,t} \stackrel{\text{def}}{=} \texttt{EY}_{n,t} - \texttt{RiskfreeRate}_t \tag{39}$$

We call this variable "excess earnings yield". And we restrict our sample to firm-year observations with non-missing `ExcessEY` values.

What is the difference between a firm's excess earnings yield and its excess cap rate? For a growth firm with no leverage, the answer is "nothing"

$$\text{growth firm, } \ell_\star = 0 \quad \Rightarrow \quad \underbrace{EY(0) - r_f}_{\substack{\text{excess} \\ \text{earnings yield}}} = \underbrace{(r-g) - r_f}_{\substack{\text{excess} \\ \text{cap rate}}} < 0 \tag{40}$$

By contrast, a value firm will use a substantial amount of leverage even if its cap rate is just barely above the riskfree rate. So this firm's excess earnings yield will be larger than its excess cap rate

$$\text{value firm, } \ell_\star > 0 \quad \Rightarrow \quad \underbrace{EY(\ell_\star) - r_f}_{\substack{\text{excess} \\ \text{earnings yield}}} > \underbrace{(r-g) - r_f}_{\substack{\text{excess} \\ \text{cap rate}}} > 0 \tag{41}$$

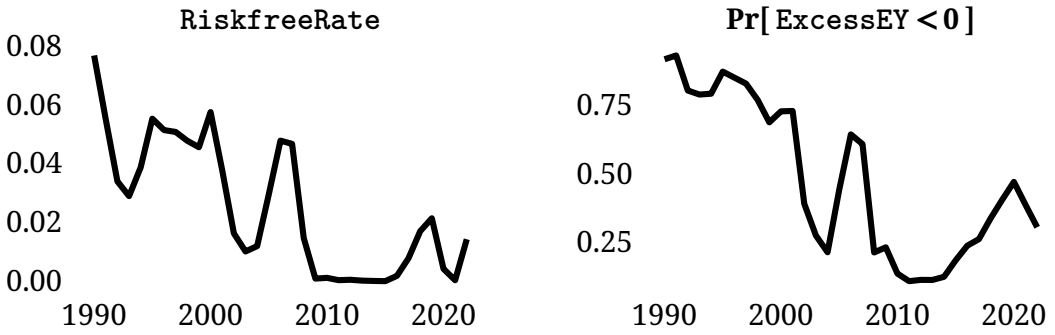


Figure 5. x-axis: time in years from 1990 through 2022. y-axis, left: annualized 30-day TBill rate. y-axis, right: fraction of growth firms where $\texttt{ExcessEY} < 0$.

Even though excess earnings yields will be larger than excess cap rates for value firms, the two variables will always have the same sign. So we can still use ExcessEY to classify a firm as either value or growth. If the nth firm is a value stock in year t, then $\texttt{ExcessEY}_{n,t} > 0$ and vice versa.

The main drawback of using ExcessEY is that it will smooth out the sharp change in financing decisions at the value-vs-growth threshold. Our theory says that leverage will suddenly increase when a firm's excess cap rate moves from zero to slightly positive. As a result, a firm's excess earnings yield will increase much faster than its excess cap rate in this small region of parameter space. Hence, any discontinuous jump at $\texttt{ExcessCapRate} = 0$ in our theory will show up as a steady increase starting at $\texttt{ExcessEY} = 0$ in our empirical analysis.

Finally, because we are not using a cross-sectional sort to define value and growth stocks (Fama and French, 1993), a firm with unchanged fundamentals can transition from growth to value when the riskfree rate drops. Consistent with this logic, Figure 5 shows that 61% of the market was growth stocks in 2007 when the annual riskfree rate was 5%. Five years later, the riskfree rate was down to 5bps, and only 12% of the market was growth. This finding is consistent with the evidence in Lettau, Ludvigson, and Manoel (2018).

While this paper is mainly aimed at corporate-finance researchers, we note that this stylized fact likely has important implications for asset-pricing researchers. There is a large and active literature studying why value and growth firms often appear to be priced differently.

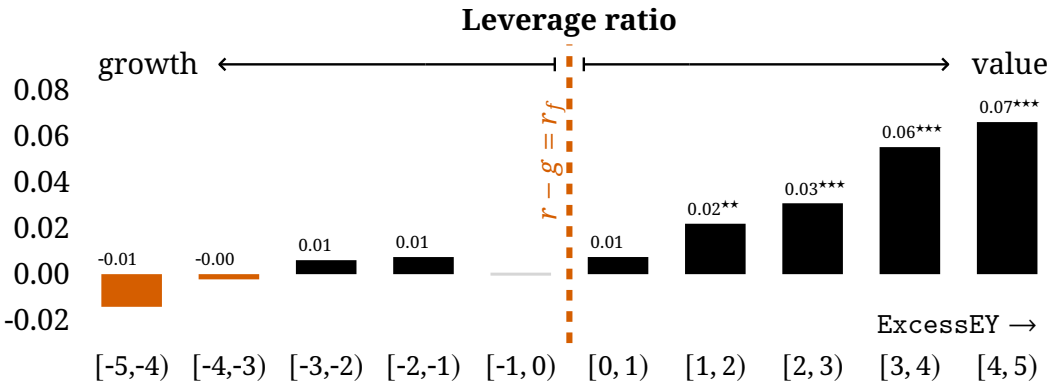


Figure 6. x-axis: excess earnings yield in 1% bins. y-axis: estimated slope coefficients $\hat{\beta}_{[c,c+1)}$ from Equation (42). Number above each bar is the estimated coefficient value. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.Reference group is [-1, 0) and is denoted by thin gray bar at zero. The vertical red dashed line denotes $\texttt{ExcessEY} = 0$. Growth firms are to the left.

5.3 Capital Structure

Proposition 3.4d says that value firms should use substantially more leverage than growth firms. Moreover, Proposition 3.4b implies that value-firm leverage level should be increasing in excess earnings yield. To test these predictions, we regress firm leverage on indicator variables whether a firm's excess earnings yield lies within a particular 1% bin

$$\texttt{Leverage}_{n,t} = \hat{\alpha} + \sum_{\substack{c=-5\% \\ c\neq -1\%}}^{+4\%} \hat{\beta}_{[c,c+1)} \cdot 1_{\{\, c \leq \texttt{ExcessEY}_{n,t} < (c+1) \,\}} + \hat{\varepsilon}_{n,t} \tag{42}$$

The $c \neq -1\%$ in the summation implies that [-1%, 0%) is the reference group. The nine other $\hat{\beta}_{[c,c+1)}$ coefficients are defined relative to the average leverage of firms in this omitted group.

Figure 6 shows that there is no measurable difference in leverage between the most extreme growth bin, [-5%, -4%), and the marginal value/growth bin, [-1%, 0%). However, a further increase in ExcessEY to the most extreme value bin, [4%, 5%), is associated with a 7%pt increase in leverage. This is 1/7 of the sample-average leverage, 49%. See Appendix B for full regression results.

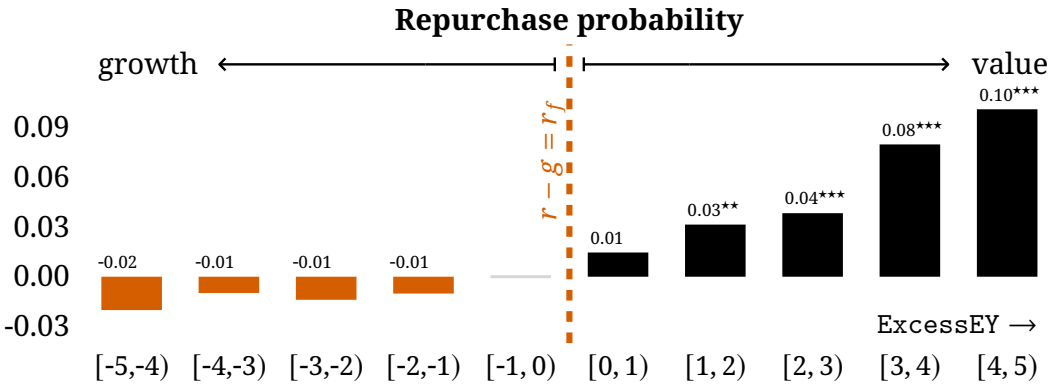


Figure 7. x-axis: excess earnings yield in 1% bins. y-axis: estimated slope coefficients $\hat{\beta}_{[c,c+1)}$ from Equation (45). Number above each bar is the estimated coefficient value. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Reference group is [-1, 0) and is denoted by thin gray bar at zero. The vertical red dashed line denotes $\texttt{ExcessEY} = 0$. Growth firms are to the left.

5.4 Share Repurchases

To test the prediction that repurchases occur following increases in earnings yield (Proposition 4.1), we first compute the annual change in split-adjusted share count

$$\texttt{ShareGrowth}_{n,t} \stackrel{\text{def}}{=} \frac{\#\texttt{Shares}_{n,t} - \#\texttt{Shares}_{n,t-1}}{\#\texttt{Shares}_{n,t-1}} \tag{43}$$

Then, we look for firm-years where the share count dropped by at least 2%pt

$$\texttt{RepurchasedShares}_{n,t} \stackrel{\text{def}}{=} 1_{\{\texttt{ShareGrowth}_{n,t} < 2\%\}} \tag{44}$$

We regress this repurchase indicator on the 1% excess earnings yield bins

$$\texttt{RepurchasedShares}_{n,t} = \hat{\alpha} + \sum_{\substack{c=-5\% \\ c\neq -1\%}}^{+4\%} \hat{\beta}_{[c,c+1)} \cdot 1_{\{\, c \leq \texttt{ExcessEY}_{n,t} < (c+1) \,\}} + \hat{\varepsilon}_{n,t} \tag{45}$$

Consistent with the theory, Figure 7 shows that moving from the marginal value/growth bin, [-1%, 0%), to the most extreme value bin in our sample, [4%, 5%), is associated with a 10%pt increase in the probability of repurchasing shares. This is 2/3 of the sample-average repurchase rate, 15%.

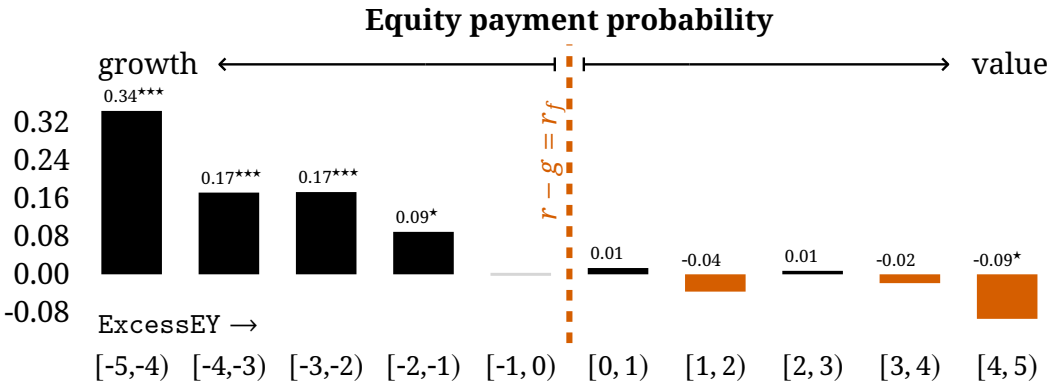


Figure 8. x-axis: excess earnings yield in 1% bins. y-axis: estimated slope coefficients $\hat{\beta}_{[c,c+1)}$ from Equation (46). Number above each bar is the estimated coefficient value. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Reference group is [-1, 0) and is denoted by thin gray bar at zero. The vertical red dashed line denotes $\texttt{ExcessEY} = 0$. Growth firms are to the left.

5.5 M&A Payment

Proposition 4.2 says that when presented with the opportunity to acquire another firm, the manager of a growth firm should be much more likely to pay target shareholders with equity. To test this prediction, we restrict our sample to include only those firms which acquired another firm. Then we regress an equity-payment indicator on the 1% excess earnings yield bins

$$\texttt{PaidForAcqWithEquity}_{n,t} = \hat{\alpha} + \sum_{\substack{c=-5\% \\ c\neq -1\%}}^{+4\%} \hat{\beta}_{[c,c+1)} \cdot 1_{\{\, c \leq \texttt{ExcessEY}_{n,t} < (c+1) \,\}} + \hat{\varepsilon}_{n,t} \quad (46)$$

Recall that $\texttt{PaidForAcqWithEquity}_{n,t} = 1$ if the nth firm paid 50%+ equity for at least one acquisition in year t.

If growth firms are more likely to pay for acquisitions by issuing shares, we should see positive coefficient estimates when $\texttt{ExcessEY} < 0$. And that is what we find in Figure 8. A move from the marginal value/growth bin, $\texttt{ExcessEY} \in$ [-1%, 0%), to the most extreme growth bin in our sample, $\texttt{ExcessEY} \in$ [-5%, -4%), is associated with a 34%pt increase in the equity-payment probability. The average equity-payment probability is only 22%.

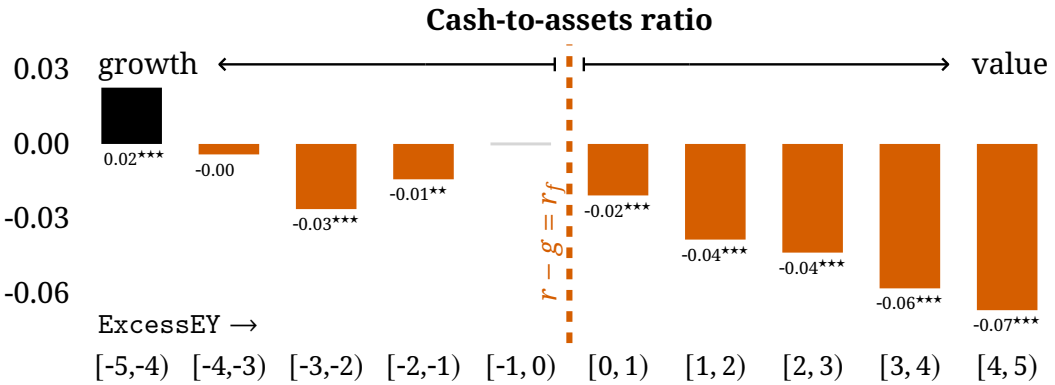


Figure 9. x-axis: excess earnings yield in 1% bins. y-axis: estimated slope coefficients $\hat{\beta}_{[c,c+1)}$ from Equation (48). Number below each bar is the estimated coefficient value. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. Reference group is [-1, 0) and is denoted by thin gray bar at zero. The vertical red dashed line denotes $\texttt{ExcessEY} = 0$. Growth firms are to the left.

5.6 Cash Accumulation

Finally, Proposition 4.3 says that, even when given the chance to use cash to pay for a costly new project, the manager of a growth firm will still opt to issue shares of equity. We normalize each firm's total cash holdings by its total assets

$$\texttt{CashToAssets}_{n,t} \stackrel{\text{def}}{=} \frac{\texttt{Cash}_{n,t}}{\texttt{ValueOfAssets}_{n,t}} \tag{47}$$

We then regress this cash-to-assets ratio on the 1% excess earnings yield bins

$$\texttt{CashToAssets}_{n,t} = \hat{\alpha} + \sum_{\substack{c=-5\% \\ c\neq -1\%}}^{+4\%} \hat{\beta}_{[c,c+1)} \cdot 1_{\{\, c \leq \texttt{ExcessEY}_{n,t} < (c+1) \,\}} + \hat{\varepsilon}_{n,t} \tag{48}$$

If value firms are more likely to finance new investments using existing cash holdings, we should see smaller coefficient estimates when $\texttt{ExcessEY} > 0$. And Figure 9 shows that value firms to the right of the dashed red line carry much less cash. A move from the marginal value/growth bin, $\texttt{ExcessEY} \in$ [-1%, 0%), to the most extreme value bin in our sample, $\texttt{ExcessEY} \in [4\%, 5\%)$, is associated with a 7%pt reduction in a firm's cash-to-assets ratio. This is nearly half of the sample-average cash-to-assets ratio, 16%.

6 Conclusion

Academic researchers have spent decades trying to convince the people running large public corporations to stop making decisions based on EPS. In his MBA corporate-finance textbook, Welch (2011) calls "EPS a meaningless measure". Almeida (2019) argues that "it [is] time to get rid of EPS." And Stewart Stern has even created an entire consulting company aimed at popularizing an alternative to EPS called "economic value added (EVA)" (Stern, Stewart, and Chew, 1995; Stern, Shiely, and Ross, 2002).

We are not arguing that managers should be EPS maximizers. There are clearly situations where it leads to bad outcomes (May, 1968; Pringle, 1973; Stern, 1974). In principle, EPS-maximizing managers could be leaving a lot of money on the table. From a normative perspective, it would be great if some silver-tongued scholar finally did talk managers into becoming NPV maximizers.

But things are different from a positive perspective. If you are trying to explain the decisions that real-world managers actually make, then you should not be modeling managers as NPV maximizers. For better or for worse, that is simply not the problem they are solving. The people in charge of large public companies are EPS maximizers.

How do we know? Easy. It is what managers tell us they are doing. Surveys of financial executives regularly find that "firms view earnings, especially EPS, as the key metric for an external audience, more so than cash flows. (Graham, Harvey, and Rajgopal, 2005)" Moreover, if you really think that most managers are not trying to maximize EPS, then why are academic researchers spending so much time trying to get them to stop?

This paper shows that, regardless of whether it is a good idea, the principle of EPS maximization gives a single unified explanation for a wide range of corporate decisions. Going forward, when researchers want to explain the choices that a manager will actually make, they should model her as an EPS maximizer. That should be the starting point. A model where the manager is an NPV maximizer will only be good at explaining the choices that academic researchers would like her to make.

A Proofs

Proof. **(Equation 8)** *The no-arbitrage state prices, q_u and q_d, come from solving the following system of equations*

$$\$1/(1+r_f) = q_u \cdot 1 + q_d \cdot 1 \tag{49a}$$

$$PurchasePrice = q_u \cdot ValueOfFirm_u + q_d \cdot ValueOfFirm_d \tag{49b}$$

□

Proof. **(Proposition 3.3)** *The fair interest rate $i(\ell)$ equates the present value of the manager's debt payments in year $t = 1$ to the initial loan amount*

$$ValueOfDebt(\ell) = LoanAmt(\ell) \qquad \text{for all } \ell \in [0, 1) \tag{50}$$

The manager finances the remainder of the purchase price, $PurchasePrice - LoanAmt(\ell)$, by issuing #Shares each worth PricePerShare. These equity holders get all remaining firm value in year $t = 1$ after paying off the debt. Hence we have

$$ValueOfEquity(\ell) = EquityFunding(\ell) \tag{51}$$

□

Proof. **(Proposition 3.4a)** *Under the normalization that PricePerShare = \$1, we have EquityFunding = #Shares · \$1 and thus*

$$NPVratio - EPS = \frac{ValueOfEquity}{EquityFunding} - \frac{\mathrm{E}[Earnings_1]}{EquityFunding/\$1} \tag{52a}$$

$$\propto ValueOfEquity - \mathrm{E}[Earnings_1] \tag{52b}$$

Equation (15) gives ValueOfEquity as a state-price weighted average. We can write out $\mathrm{E}[Earnings_1]$ as a probability weighted average

$$\begin{aligned} \mathrm{E}[Earnings_1] = {} & p_u \cdot (NOI_u - i \cdot LoanAmt) \\ & + \; p_d \cdot (NOI_d - i \cdot LoanAmt) \end{aligned} \tag{53}$$

If the firm's debt is riskless, then there are two terms separating ValueOfEquity and $\mathrm{E}[Earnings_1]$

$$\begin{aligned} &ValueOfEquity - \mathrm{E}[Earnings_1] \\ &\qquad = (q_u - p_u) \cdot (NOI_u - r_f \cdot LoanAmt) \\ &\qquad\quad + (q_d - p_d) \cdot (NOI_d - r_f \cdot LoanAmt) \\ &\qquad\qquad + q_u \cdot (ValueOfAssets_u - LoanAmt) \\ &\qquad\qquad\quad + q_d \cdot (ValueOfAssets_d - LoanAmt) \end{aligned} \tag{54a}$$

$$\begin{aligned} &= (\tilde{\mathrm{E}} - \mathrm{E})[NOI_1 - r_f \cdot LoanAmt] \\ &\qquad + \tilde{\mathrm{E}}[ValueOfAssets_1 - LoanAmt] \end{aligned} \tag{54b}$$

However, if the firm's debt is risky, then $i > r_f$ *and there is an extra term to consider*

$$\begin{aligned} &ValueOfEquity - \mathrm{E}[Earnings_1] \\ &\quad = (\tilde{\mathrm{E}} - \mathrm{E})[NOI_1 - i \cdot LoanAmt] \\ &\qquad + \tilde{\mathrm{E}}[ValueOfAssets_1 - LoanAmt] \\ &\qquad\quad - q_d \cdot [(NOI_d + ValueOfAssets_d) - (1 + i) \cdot LoanAmt] \end{aligned} \tag{55a}$$

To complete the proof, observe that this extra term is the present value of the manager's savings from being able to default in the down state

$$\begin{aligned} &\tilde{\mathrm{E}}[DefaultSavings_1] \\ &\qquad = q_d \cdot \max\{(1 + i) \cdot LoanAmt - (NOI_d + ValueOfAssets_d), \$0\} \end{aligned} \tag{56}$$

□

Proof. **(Proposition 3.4b)** *The manager is initially planning on buying the company using leverage level,* $\ell_0 \in [0, 1)$*. Then, she considers how her EPS would change if she made a small change to this initial leverage* $\ell_0 \to \ell_\epsilon = (\ell_0 + \epsilon)$ *and used the money to issue* $\epsilon \cdot PurchasePrice$ *fewer shares.*

This infinitesimal change would give her the new EPS value below

$$EPS(\ell_0 + \epsilon) = \frac{\mathrm{E}[NOI_1] - i(\ell_0 + \epsilon) \cdot LoanAmt(\ell_0 + \epsilon)}{\#Shares(\ell_0) - \epsilon \cdot PurchasePrice} \tag{57a}$$

$$= \frac{\mathrm{E}[NOI_1] - i(\ell_0 + \epsilon) \cdot [(\ell_0 + \epsilon) \cdot PurchasePrice]}{ValueOfEquity(\ell_0) - \epsilon \cdot PurchasePrice} \tag{57b}$$

The EPS-maximizing leverage will zero out $\frac{\mathrm{d}}{\mathrm{d}\epsilon}\Big[EPS(\ell_0 + \epsilon)\Big]_{\epsilon=0}$*, which equals*

$$= \frac{-[i'(\ell_0) \cdot \ell_0 + i(\ell_0)] \cdot PurchasePrice \cdot ValueOfEquity(\ell_0)}{ValueOfEquity(\ell_0)^2} + \frac{\mathrm{E}[Earnings_1(\ell_0)] \cdot PurchasePrice}{ValueOfEquity(\ell_0)^2} \tag{58a}$$

$$= \frac{1}{1 - \ell_0} \cdot \left(\frac{\mathrm{E}[Earnings_1(\ell_0)] \cdot ValueOfEquity(\ell_0)}{ValueOfEquity(\ell_0)^2} - \frac{i(\ell_0) \cdot [1 + \delta(\ell_0)] \cdot ValueOfEquity(\ell_0)^2}{ValueOfEquity(\ell_0)^2} \right) \tag{58b}$$

$$= \frac{1}{1 - \ell_0} \cdot \left(\frac{\mathrm{E}[Earnings_1(\ell_0)]}{ValueOfEquity(\ell_0)} - i(\ell_0) \cdot [1 + \delta(\ell_0)] \right) \tag{58c}$$

$$= \frac{1}{1 - \ell_0} \cdot \big(EY(\ell_0) - i(\ell_0) \cdot [1 + \delta(\ell_0)] \big) \tag{58d}$$

where $\delta(\ell) = \ell \cdot [i'(\ell)/i(\ell)]$ *is the elasticity of interest rates to leverage.* □

Proof. **(Proposition 3.4c)**

(Case #1) *Suppose the manager is buying a company where* $r - g < r_f$*. In this case, the first-order condition in Equation* (20) *is always negative*

$$\frac{\mathrm{d}}{\mathrm{d}\epsilon}\Big[EPS(\ell + \epsilon)\Big]_{\epsilon=0} < 0 \qquad \textit{for all } \ell \in (0, 1) \tag{59}$$

Meaning that EPS peaks at $\ell = 0$*.*

(Case #2) *Suppose the manager is buying a company where,* $r - g > r_f$*. Now, the first-order condition in Equation* (20) *will change sign exactly once. It will be*

positive when leverage is low and negative when leverage is high

$$\frac{\mathrm{d}}{\mathrm{d}\epsilon}\Big[EPS(\ell+\epsilon)\Big]_{\epsilon=0}\begin{cases} >0 & \text{if } \ell < \frac{1}{1+r_f}\cdot\left(\frac{ValueOfFirm_d}{PurchasePrice}\right) \\ <0 & \text{if } \ell > \frac{1}{1+r_f}\cdot\left(\frac{ValueOfFirm_d}{PurchasePrice}\right)\end{cases} \tag{60}$$

There is now a single interior $\ell \in (0,1)$ that maximizes EPS. □

Proof. **(Lemma 3.4)** *We need to show two things.*

(Thing #1) *That $EY(0) = r - g$. Equation (1) tells us that unlevered earnings are the same as expected NOIs*

$$\begin{aligned} \mathrm{E}[Earnings_1(0)] &= \mathrm{E}[NOI_1] - i(0)\cdot LoanAmt(0) && \text{(61a)} \\ &= \mathrm{E}[NOI_1] - r_f\cdot\$0 && \text{(61b)} \end{aligned}$$

So Gordon-growth logic implies that

$$\begin{aligned} EY(0) &= \frac{\mathrm{E}[Earnings_1(0)]}{ValueOfEquity(0)} && \text{(62a)} \\ &= \frac{\mathrm{E}[NOI_1]}{PurchasePrice} = r - g && \text{(62b)} \end{aligned}$$

(Thing #2) *That $i(0)\cdot[1+\delta(0)] = r_f$. Equation (11) implies that, if $ValueOfFirm_d > \$1\cdot(1+r_f)$, the first \$1 borrowed will be riskless.* □

Proof. **(Proposition 3.4d)**

(Case #1) *Suppose the manager is buying a growth firm where $r - g < r_f$. In this case, the proof of Lemma 3.4 indicates says EPS is maximized at $\ell_\star = 0$.*

(Case #2) *Now suppose the manager is buying a value firm where $r - g > r_f$. In this case, the proof of Lemma 3.4 says EPS is maximized at $\ell_\star = \frac{1}{1+r_f}\cdot(\frac{ValueOfFirm_d}{PurchasePrice})$.*

(Existence Of Gap) *If $ValueOfFirm_d > 0$, there will be a gap between the EPS-maximizing leverage of Case #1 and that of Case #2.* □

Proof. **(Proposition 4.1)** *Suppose a manager's initial plan is to purchase a company using $\ell_0 \in [0,1)$. Proposition 3.4b says that she will scrap her initial plan in favor of a slightly higher leverage level whenever*

$$\frac{\mathrm{d}}{\mathrm{d}\epsilon}\Big[EPS(\ell_0+\epsilon)\Big]_{\epsilon=0} = \frac{1}{1-\ell_0}\cdot\Big(EY(\ell_0) - i(\ell_0)\cdot[1+\delta(\ell_0)]\Big) > 0 \tag{63}$$

When this derivative term is positive, the manager can increase her EPS by borrowing $\epsilon \cdot PurchasePrice$ and issuing $(\epsilon \cdot PurchasePrice)/PurchasePrice$ fewer shares. This same logic holds if the manager has been running her firm for some time and $\ell_0 \in [0,1)$ is the leverage she chose in the previous period. □

Proof. **(Lemma 4.2a)** *In the limit as $\epsilon \to 0$, the difference between the manager's new EPS in Equation (27) and her original EPS is*

$$\begin{aligned}
\frac{\mathrm{d}}{\mathrm{d}\epsilon}[EPS_\epsilon]_{\epsilon=0} &= \frac{(b\cdot \mathrm{E}[NOI_1])\cdot ValueOfEquity}{ValueOfEquity^2} \\
&\quad - \frac{\mathrm{E}[Earnings_1]\cdot PurchasePrice}{ValueOfEquity^2} && \text{(64a)}\\
&= b\cdot\left(\frac{\mathrm{E}[NOI_1]}{ValueOfEquity}\right) - \frac{1}{1-\ell_0}\cdot\left(\frac{\mathrm{E}[Earnings_1]}{ValueOfEquity}\right) && \text{(64b)}\\
&= \frac{b}{1-\ell_0}\cdot\left(\frac{\mathrm{E}[NOI_1]}{PurchasePrice}\right) - \frac{1}{1-\ell_0}\cdot\left(\frac{\mathrm{E}[Earnings_1]}{ValueOfEquity}\right) && \text{(64c)}
\end{aligned}$$

If the manager can only use equity, she will execute the M&A deal whenever $\frac{\mathrm{d}}{\mathrm{d}\epsilon}[EPS_\epsilon]_{\epsilon=0} > 0$. Setting this condition equal to zero and solving for b gives

$$\begin{aligned}
b_{Equity} &= \frac{1}{r-g}\cdot\left(\frac{\mathrm{E}[Earnings_1]}{ValueOfEquity}\right) && \text{(65a)}\\
&= \frac{EY}{r-g} && \text{(65b)}
\end{aligned}$$

The manager is willing to pay by issuing equity if the synergies exceed b_{Equity}. □

Proof. **(Lemma 4.2b)** *In the limit as $\epsilon \to 0$, the difference between the manager's new EPS in Equation (29) and her original EPS is*

$$\frac{\mathrm{d}}{\mathrm{d}\epsilon}[EPS_\epsilon(\ell_\star)]_{\epsilon=0} = \frac{b \cdot \mathrm{E}[NOI_1] - i(\ell_\star) \cdot [1 + \delta(\ell_\star)] \cdot PurchasePrice}{\#Shares(\ell_\star)} \tag{66}$$

where $\ell_\star$ is the EPS-maximizing leverage prior to the M&A deal.

If the manager can only use debt, she will do the M&A deal if $\frac{\mathrm{d}}{\mathrm{d}\epsilon}[EPS_\epsilon]_{\epsilon=0} > 0$. Setting this condition equal to zero and solving for b gives

$$b_{Debt} = i(\ell_\star) \cdot [1 + \delta(\ell_\star)] \cdot \left(\frac{PurchasePrice}{\mathrm{E}[NOI_1]}\right) \tag{67a}$$

$$= \frac{i(\ell_\star) \cdot [1 + \delta(\ell_\star)]}{r - g} \tag{67b}$$

The manager is willing to pay by borrowing money if the synergies exceed b_{Debt}. □

Proof. **(Proposition 4.2)**

(Case #1) *Suppose the acquirer is a growth firm, $r - g < r_f$. In this case, the manager's EPS-maximizing leverage prior to acquisition is $\ell_\star = 0$. We know from the proof of Lemma 3.4 that*

$$EY(0) = r - g < r_f \tag{68a}$$

$$i(0) \cdot [1 + \delta(0)] = r_f \tag{68b}$$

So, for a growth firm, we can conclude that

$$b_{Equity} = \frac{EY(0)}{r - g} = \frac{r - g}{r - g} = 1 < \frac{r_f}{r - g} = \frac{i(0) \cdot [1 + \delta(0)]}{r - g} = b_{Debt} \tag{69}$$

Moreover, since r_f is the lowest possible cost of debt financing, we can infer that whenever $b \geq b_{Equity}$ a growth firm will pay for the acquisition by issuing new shares to the target company's shareholders.

(Case #2) *Now suppose the acquirer is a value firm, $r - g > r_f$. In this case, the manager's EPS-maximizing leverage prior to acquisition will be $\ell_\star \geq \ell_{\max r_f}$.*

Proposition 3.4b tells us that

$$EY(\ell_\star) = i(\ell_\star) \cdot [1 + \delta(\ell_\star)] \tag{70}$$

So, for a value firm, we can conclude that

$$b_{Equity} = \frac{EY(\ell_\star)}{r - g} = \frac{i(\ell_\star) \cdot [1 + \delta(\ell_\star)]}{r - g} = b_{Debt} \tag{71}$$

Thus, we can infer that whenever $b \geq b_{Equity} = b_{Debt}$, a value firm likely to pay for an acquisition using some combination of borrowing and new share issuance. □

Proof. **(Corollary 4.2)** *The restriction linking an M&A deal's average boost level, $b \in (0, \infty)$, to the collection of viable up- and down-state boost profiles, (b_u, b_d), follows from noting that $NOI_u = (1 + u) \cdot \mathrm{E}[NOI_1]$ and $NOI_d = (1 - d) \cdot \mathrm{E}[NOI_1]$*

$$b \cdot \mathrm{E}[NOI_1] = b_u \cdot (p_u \cdot NOI_u) + b_d \cdot (p_d \cdot NOI_d) \tag{72a}$$

$$b \cdot \mathrm{E}[NOI_1] = b_u \cdot \{p_u \cdot (1 + u) \cdot \mathrm{E}[NOI_1]\} + b_d \cdot \{p_d \cdot (1 - d) \cdot \mathrm{E}[NOI_1]\} \tag{72b}$$

$$b = b_u \cdot \{p_u \cdot (1 + u)\} + b_d \cdot \{p_d \cdot (1 - d)\} \tag{72c}$$

So, if we fix the average boost associated with an acquisition, then we get

$$b_u = \left(\frac{1}{p_u} \cdot \frac{1}{1 + u}\right) \cdot b - \left(\frac{p_d}{p_u} \cdot \frac{1 - d}{1 + u}\right) \cdot b_d \tag{73}$$

We now turn to the net present value of an acquisition. The acquisition costs

$$Cost/e = PurchasePrice \tag{74}$$

in year $t = 0$. The present value of the benefit is

$$Benefit/e = q_u \cdot \left\{b_u \cdot ValueOfFirm_u\right\} + q_d \cdot \left\{b_d \cdot ValueOfFirm_d\right\} \tag{75a}$$

$$\begin{aligned} &= PurchasePrice - q_u \cdot \left\{(1 - b_u) \cdot ValueOfFirm_u\right\} \\ &\qquad - q_d \cdot \left\{(1 - b_d) \cdot ValueOfFirm_d\right\} \end{aligned} \tag{75b}$$

Thus, an acquisition will have a positive net present value whenever

$$\begin{aligned}(Benefit - Cost)/\epsilon = q_u \cdot \left\{(b_u - 1) \cdot ValueOfFirm_u\right\} \\ + \; q_d \cdot \left\{(b_d - 1) \cdot ValueOfFirm_d\right\} > 0\end{aligned} \tag{76}$$

Note that $(p_u, p_d) \neq (q_u, q_d)$ *in our model since* $r_f > 0$*. So there will always be a wedge between state prices and physical probabilities. Hence, there will exist a non-zero range of average boost values less than unity,* $b < 1$*, for which* $(Benefit - Cost)/\epsilon > 0$*. There will also exist a non-zero range of average boost values greater than unity,* $b > 1$*, for which* $(Benefit - Cost)/\epsilon < 0$*.* □

Proof. **(Lemma 4.3)** *In the limit as* $\epsilon \to 0$*, the difference between the manager's new EPS in Equation (35) and her original EPS is*

$$\tfrac{\mathrm{d}}{\mathrm{d}\epsilon}[EPS_\epsilon]_{\epsilon=0} = \frac{b \cdot \mathrm{E}[NOI_1] - r_f \cdot PurchasePrice}{\#Shares} \tag{77}$$

If the manager can only pay cash, she will invest if $\tfrac{\mathrm{d}}{\mathrm{d}\epsilon}[EPS_\epsilon]_{\epsilon=0} > 0$*. Setting this condition equal to zero and solving for b gives*

$$b_{Cash} = r_f \cdot \frac{PurchasePrice}{\mathrm{E}[NOI_1]} = \frac{r_f}{r - g} \tag{78}$$

□

Proof. **(Proposition 4.3)**

(Case #1) *First consider a growth firm,* $r - g < r_f$*. In the absence of any cash holdings, Proposition 4.2 tells us that equity markets are the cheapest financing option for this firm*

$$b_{Equity} = \frac{EY(0)}{r - g} \tag{79a}$$

$$= \frac{r - g}{r - g} = 1 < \frac{r_f}{r - g} \tag{79b}$$

$$= \frac{i(0) \cdot [1 + \delta(0)]}{r - g} = b_{Debt} \tag{79c}$$

However, Lemma 4.3 tells us that, for a growth firm, the cost of debt financing is the same as the cost of cash

$$b_{Cash} = \frac{r_f}{r-g} = \frac{i(0)\cdot[1+\delta(0)]}{r-g} = b_{Debt} \tag{80}$$

The manager can borrow the first \$1 *at the riskfree rate. And, if she uses* \$1 *of her cash, then she will no longer earn the riskfree rate on that money. Hence, for a growth-firm manager, equity financing remains the cheapest financing option.*

(Case #2) *Now consider a value firm,* $r-g > r_f$*. In this case, the manager's EPS-maximizing leverage prior to investing in the costly new project will be* $\ell_\star \geq \ell_{\max r_f}$*, and this leverage level will set*

$$EY(\ell_\star) = i(\ell_\star)\cdot[1+\delta(\ell_\star)] > r_f \tag{81}$$

Hence, Lemma 4.3 now tells us that, for a value firm, the cost of cash is now cheaper than either existing financing option

$$b_{Cash} = \frac{r_f}{r-g} < \underbrace{\frac{EY(\ell_\star)}{r-g}}_{b_{Equity}} = \underbrace{\frac{i(\ell_\star)\cdot[1+\delta(\ell_\star)]}{r-g}}_{b_{Debt}} \tag{82}$$

If the manager uses \$1 *of her cash holdings, then she will no longer earn the riskfree rate on this dollar. But that is a small price to pay relative to issuing* \$1 *or new equity or borrowing* \$1 *from her lender. Hence, the manager of a value firm will pay cash whenever possible. Only once cash reserves are exhausted will she resort to capital markets.* □

Proof. **(Proposition 4.4)** *This proposition combines the results found in Propositions 4.2 and 4.3, and states them in terms of a manager's decision about whether/how to finance an arbitrary costly new project. Please see the associated proofs for all derivations.* □

B Regressions

As the title suggests, this paper is mainly about how researchers model the choices that managers make. It is primarily a theory paper. The empirical analysis plays a supporting role. For this reason, we report our regression results in Section 5 as Figures. This appendix contains the data work and regression tables that underpin those figures.

B.1 Summary Statistics

Our primary dataset contains 15079 firm-year observations covering the period 1990 through 2022. We describe where these data come from and how we restrict our sample in the main text (Sections 5.1 and 5.2). Table B1 reports summary statistics for the firm-year observations in our sample.

B.2 Capital Structure

Table B2 reports the results of four different regressions of the form described in Equation (42). Column (1) reports the results of this exact regression specification. The coefficient estimates correspond to the ones found in Figure 6. Column (2) reports results of a similar specification, only now with year fixed effects. Column (3) adds three more control variables to the specification with year fixed effects. `BookToMarket` is the ratio of book-equity value to market cap, `ROA` is the return on assets (units: 1/yr), and `TaxRate` represents a firm's income tax liability as a fraction of its pretax income.

Columns (1), (2), and (3) all show the same basic pattern. A firm with a negative excess earnings yield, $\texttt{ExcessEY} < 0$, will tend to use the same amount of leverage no matter how negative its `ExcessEY` is. However, when a firm's excess earnings yield is positive, $\texttt{ExcessEY} > 0$, the firm will tend to lever up as `ExcessEY` increases.

This pattern is there in the baseline regression results. It is there when we control for year-specific effects. And it is there when we add additional controls. The point estimates are also really big, economically speaking. A very value-y firm-year observation where $\texttt{ExcessEY} \in [+4\%, +5\%)$ has a leverage that is 7%pt higher on average than an otherwise similar observation right

at the value-growth boundary with ExcessEY $\in$ [-1%, 0%). This is 1/7 of the sample-average leverage across all firm-year observations, 49%. By contrast, there is no statistically measurable difference between the leverage of a very growth-y firm-year observation where ExcessEY $\in$ [-5%, -4%) and that of a marginal firm with ExcessEY $\in$ [-1%, 0%).

Column (4) even shows that the pattern persists when we restrict our sample to include only the 929 firm-year observations in our sample that face no tax burden, TaxRate = 0. Given the interest tax shield, the existence of such firms is hard to rationalize in a model where managers are NPV maximizers as Strebulaev and Yang (2013) points out. Trade-off theory cannot explain why firm managers with no tax shield would take on debt. However, these firms are not puzzling when viewed through the principle of EPS maximization. They behave exactly like any other EPS-maximizing firm would behave.

B.3 Share Repurchases

Table B3 reports the results of three different regressions. The left-hand-side variable in all three regressions is RepurchasedShares, which is an indicator variable for whether a firm repurchased shares in a given year. Column (1) reports the results of the specification in Equation (45). The coefficient estimates correspond to the ones found in Figure 7. Column (2) adds year fixed effects to the specification, and column (3) adds three more control variables: BookToMarket, ROA, and TaxRate.

Again, all three columns show the same basic pattern. Firms with negative excess earnings yield, ExcessEY < 0, are less likely to repurchase shares, and it does not matter much how negative the excess earnings yield is. Firms with positive excess earnings yield, ExcessEY > 0, are much more likely to repurchase shares. Moreover, the effect is stronger the more positive is their excess earnings yield.

This pattern is there in the baseline regression results (column 1). It is there when we control for year-specific effects (column 2). And it is there when we add additional controls (column 3). In addition to being statistically significant, the pattern is also economically massive. A move from ExcessEY $\in$ [-1%, 0%) to

ExcessEY $\in$ [+4%, +5%) is associated with a 10%pt increase in the probability of repurchasing shares. This is 2/3 of the average repurchase probability across all firm-year observations, 15%. By contrast, there is no statistically measurable difference between the repurchase probability of a very growth-y firm-year observation where ExcessEY $\in$ [-5%, -4%) and that of a marginal firm-year observation with ExcessEY $\in$ [-1%, 0%).

B.4 M&A Payment

Table B4 reports the results of three different regressions. This table is different from the previous two in that it only includes the 1150 firm-year observations where a firm made at least one acquisition during that year. The left-hand-side variable is PaidForAcqWithEquity, which is an indicator variable for whether a firm paid $\geq$ 50% equity for at least one acquisition. Column (1) reports the results of the specification in Equation (46). The coefficient estimates correspond to the ones found in Figure 8. Column (2) adds year fixed effects to the specification, and column (3) adds three more control variables: BookToMarket, ROA, and TaxRate.

Just like before, all three columns in Table B4 display the same basic pattern. Firms with negative excess earnings yield, ExcessEY $<$ 0, are growth firms. The EPS-maximizing managers of these firms view equity as cheap since their P/E ratios are so high. When one of these firms does an acquisition, they should be more likely to pay using equity. By contrast, firms with positive excess earnings yield, ExcessEY $>$ 0, are value firms that are more likely to finance an acquisition using debt.

This pattern is there in the baseline regression results (column 1). It is there when we control for year-specific effects (column 2). And it is there when we add additional controls (column 3). What's more, the effect is also large. A move from being on the value/growth margin, ExcessEY $\in$ [-1%, 0%), to being an extreme growth firm, ExcessEY $\in$ [-5%, -4%), is associated with a 34%pt increase in the probability that an acquirer pays in equity. The average equity payment probability is only 22%.

B.5 Cash Accumulation

Table B5 reports the results of three different regressions. The left-hand-side variable is `CashToAssets`, which represents the ratio of a firm's cash and short-term investments to its total assets. Column (1) reports the results of the specification in Equation (48). The coefficient estimates correspond to the ones found in Figure 9. Column (2) adds year fixed effects to the specification, and column (3) adds `BookToMarket`, `ROA`, and `TaxRate` as controls.

Yet again, all three columns in Table B5 display the same basic pattern. Firms with negative excess earnings yield, $\texttt{ExcessEY} < 0$, are growth firms. Even when the manager of a growth firm has cash on hand, she will still view equity markets as the cheaper financing option since her P/E ratio is so high. Therefore, she will refrain from spending any cash holdings, leading to a high cash-to-assets ratio. By contrast, the manager of a value firm with a positive excess earnings yield, $\texttt{ExcessEY} > 0$, will view cash as the cheapest financing option. She will use any existing cash holdings before dipping into debt or equity markets. So a value-firm manager should maintain a low cash-to-assets ratio.

This pattern is there in the baseline regression results (column 1). It is there when we control for year-specific effects (column 2). And it is there when we add additional controls (column 3). Moreover, the effect is economically large. A move from being a firm-year observation on the value/growth margin, $\texttt{ExcessEY} \in [\text{-}1\%, 0\%)$, to being an extremely value-y firm-year observation, $\texttt{ExcessEY} \in [+4\%, +5\%)$, is associated with a 7%pt reduction in a firm's cash-to-assets ratio. This is nearly half of the average cash-to-assets ratio across our entire sample, 16%.

	#	Avg	Sd	Q10	Q50	Q90
	(1)	(2)	(3)	(4)	(5)	(6)
EY	15079	0.03	0.02	0.00	0.03	0.05
ExcessEY	15079	0.01	0.03	−0.03	0.01	0.04
Leverage	15079	0.49	0.25	0.20	0.49	0.76
$\log_2$(TotalAssets/\$1)	15076	9.74	2.28	6.81	9.70	12.72
BookToMarket	14830	0.49	0.39	0.13	0.41	0.93
ROA	15071	0.14	0.12	0.03	0.14	0.26
ROE	14703	0.14	1.37	−0.06	0.11	0.27
TaxRate	13477	0.31	0.17	0.06	0.34	0.42
TaxRate = 0	13477	0.07				
ShareGrowth	15076	0.08	0.32	−0.03	0.01	0.19
RepurchasedShares	15076	0.15				
IsAcquirer	15079	0.08				
PaidForAcqWithEquity	1150	0.22				
CashToAssets	15071	0.16	0.18	0.01	0.09	0.44

Table B1. Sample period: 1990-2022. EY: earnings yield (1/yr). ExcessEY: earnings yield in excess of 30-day TBill rate (1/yr). Leverage: total debt to total assets. $\log_2$(TotalAssets/\$1): log of total assets. BookToMarket: ratio of book equity to market cap. ROA: return on assets (1/yr). ROE: return on book equity (1/yr). TaxRate: income tax liability as a fraction of pretax income. TaxRate = 0: an indicator for firm-year observations with zero tax liability. ShareGrowth: percent change in shares outstanding relative to the previous year (1/yr). RepurchasedShares: indicator for ≥ 2%pt decrease in shares. IsAcquirer: indicator for firms-year observations with at least one acquisition. PaidForAcqWithEquity: an indicator for firm-years with at least one acquisition paid for using equity (missing when no acquisition). CashToAssets: ratio of cash plus short-term investments to total assets.

Dependent Variable:	Leverage			
	Full Sample			No Taxes
	(1)	(2)	(3)	(4)
Intercept	0.47***			
	(72.40)			
growth ↑				
$-5\% \leq$ ExcessEY $< -4\%$	−0.01	−0.02*	0.00	−0.02
	(1.31)	(1.84)	(0.28)	(0.62)
$-4\% \leq$ ExcessEY $< -3\%$	0.00	0.00	0.02*	0.00
	(0.23)	(0.37)	(1.16)	(0.06)
$-3\% \leq$ ExcessEY $< -2\%$	0.01	0.01	0.02*	−0.01
	(0.63)	(0.70)	(1.72)	(0.21)
$-2\% \leq$ ExcessEY $< -1\%$	0.01	0.01	0.01*	−0.02
	(0.79)	(0.82)	(1.65)	(0.74)
$0\% \leq$ ExcessEY $< +1\%$	0.01	0.01	0.01	0.03
	(0.85)	(1.16)	(1.30)	(0.95)
$+1\% \leq$ ExcessEY $< +2\%$	0.02***	0.02***	0.02***	0.01
	(2.54)	(2.92)	(2.97)	(0.71)
$+2\% \leq$ ExcessEY $< +3\%$	0.03***	0.03***	0.03***	0.04
	(3.62)	(3.95)	(3.68)	(1.47)
$+3\% \leq$ ExcessEY $< +4\%$	0.06***	0.06***	0.05***	0.06**
	(6.48)	(6.60)	(7.35)	(2.17)
$+4\% \leq$ ExcessEY $< +5\%$	0.07***	0.07***	0.07***	0.08***
	(7.76)	(8.56)	(10.02)	(2.79)
value ↓				
BookToMarket			−0.03***	−0.01
			(5.33)	(0.68)
ROA			−0.24***	0.14
			(11.74)	(1.41)
TaxRate			0.12***	
			(11.41)	
Year FE	*N*	*Y*	*Y*	*Y*
# Obs	15079	15079	13276	929
Adj. R^2	1.0%	1.1%	3.0%	1.7%

Table B2. Leverage: total debt divided by total assets. $c\% \leq$ ExcessEY $< (c+1)\%$: indicator for whether excess earnings yield lies within 1% bin. Reference bin is [-1%, 0%). BookToMarket: ratio of book-equity value to market cap. ROA: return on assets (units: 1/yr). TaxRate: income tax liability as a fraction of pretax income. Column (1) gives coefficient estimates in Figure 6. Column (4) only includes firm-year observations where TaxRate = 0. Numbers in parentheses are *t* stats. *, **, and ***: statistical significance at 10%, 5%, and 1% levels.

Dependent Variable:	RepurchasedShares		
	(1)	(2)	(3)
Intercept	0.12***		
	(12.68)		
growth ↑			
−5% ≤ ExcessEY < −4%	−0.02	−0.03**	−0.03*
	(1.29)	(1.96)	(1.70)
−4% ≤ ExcessEY < −3%	−0.01	−0.02	−0.02
	(0.68)	(1.31)	(1.28)
−3% ≤ ExcessEY < −2%	−0.01	−0.01	−0.02
	(1.00)	(1.04)	(1.23)
−2% ≤ ExcessEY < −1%	−0.01	−0.02	−0.02
	(0.75)	(1.15)	(1.22)
0% ≤ ExcessEY < +1%	0.01	0.01	0.01
	(1.15)	(0.70)	(0.69)
+1% ≤ ExcessEY < +2%	0.03**	0.03**	0.02
	(2.53)	(2.27)	(1.46)
+2% ≤ ExcessEY < +3%	0.04***	0.03***	0.02*
	(3.13)	(2.58)	(1.66)
+3% ≤ ExcessEY < +4%	0.08***	0.07***	0.06***
	(6.51)	(6.12)	(4.64)
+4% ≤ ExcessEY < +5%	0.10***	0.09***	0.08***
	(8.23)	(7.55)	(6.01)
↓ value			
BookToMarket			0.03***
			(3.59)
ROA			0.34***
			(9.11)
TaxRate			0.05***
			(2.60)
Year FE	*N*	*Y*	*Y*
# Obs	15076	15076	13273
Adj. R^2	1.2%	1.2%	1.5%

Table B3. RepurchasedShares: indicator for ≥ 2%pt year-over-year drop in shares outstanding. $c\% \leq$ ExcessEY $< (c+1)\%$: indicator for whether excess earnings yield lies within 1% bin. Reference bin is [-1%, 0%). BookToMarket: ratio of book-equity value to market cap. ROA: return on assets (units: 1/yr). TaxRate: income tax liability as a fraction of pretax income. Column (1) gives coefficient estimates in Figure 7. Numbers in parentheses are *t* stats. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Dependent Variable:		PaidForAcqWithEquity		
		(1)	(2)	(3)
	Intercept	0.18*** (4.79)		
growth	−5% ≤ ExcessEY < −4%	0.34*** (5.72)	0.20*** (3.36)	0.20*** (3.16)
	−4% ≤ ExcessEY < −3%	0.17*** (3.03)	0.07 (1.33)	0.06 (1.09)
	−3% ≤ ExcessEY < −2%	0.17*** (3.18)	0.11** (2.09)	0.14** (2.42)
	−2% ≤ ExcessEY < −1%	0.09* (1.68)	0.06 (1.25)	0.06 (1.18)
	0% ≤ ExcessEY < +1%	0.01 (0.26)	0.04 (0.80)	0.04 (0.86)
	+1% ≤ ExcessEY < +2%	−0.04 (0.74)	0.02 (0.41)	0.03 (0.61)
	+2% ≤ ExcessEY < +3%	0.01 (0.15)	0.06 (1.31)	0.07 (1.32)
value	+3% ≤ ExcessEY < +4%	−0.02 (0.37)	0.05 (0.98)	0.05 (1.04)
	+4% ≤ ExcessEY < +5%	−0.09* (1.76)	−0.03 (0.53)	−0.02 (0.33)
	BookToMarket			−0.07 (1.38)
	ROA			−0.07 (0.43)
	TaxRate			−0.01 (0.18)
	Year FE	*N*	*Y*	*Y*
	# Obs	1150	1150	1051
	Adj. R^2	0.9%	1.0%	0.9%

Table B4. Sample: firm-years with ≥ 1 acquisition. PaidForAcqWithEquity: indicator for firm-years that paid ≥ 50% equity for ≥ 1 target. c% ≤ ExcessEY < (c+1)%: indicator for whether excess earnings yield lies in 1% bin. Reference bin is [-1%, 0%). BookToMarket: ratio of book equity to market cap. ROA: return on assets (units: 1/yr). TaxRate: income tax liability as a fraction of pretax income. Column (1) gives coefficient estimates in Figure 8. Numbers in parentheses are t stats. *, **, and ***: statistical significance at 10%, 5%, and 1% levels.

Dependent Variable:		CashToAssets		
		(1)	(2)	(3)
	Intercept	0.19***		
		(40.84)		
growth	−5% ≤ ExcessEY < −4%	0.02***	0.05***	0.02**
		(2.84)	(6.61)	(2.43)
	−4% ≤ ExcessEY < −3%	0.00	0.02***	0.00
		(0.57)	(2.74)	(0.11)
	−3% ≤ ExcessEY < −2%	−0.03***	0.00	−0.01
		(3.68)	(0.60)	(1.07)
	−2% ≤ ExcessEY < −1%	−0.02**	0.00	0.00
		(2.04)	(0.09)	(0.10)
	0% ≤ ExcessEY < +1%	−0.02***	−0.03***	−0.02***
		(3.20)	(4.52)	(2.76)
	+1% ≤ ExcessEY < +2%	−0.04***	−0.05***	−0.04***
		(6.06)	(8.80)	(6.64)
	+2% ≤ ExcessEY < +3%	−0.04***	−0.06***	−0.05***
		(6.99)	(10.86)	(8.70)
value	+3% ≤ ExcessEY < +4%	−0.06***	−0.08***	−0.07***
		(9.27)	(13.98)	(11.86)
	+4% ≤ ExcessEY < +5%	−0.07***	−0.09***	−0.08***
		(10.66)	(15.69)	(13.27)
	BookToMarket			−0.08***
				(21.09)
	ROA			0.00
				(0.04)
	TaxRate			−0.07***
				(8.14)
	Year FE	*N*	*Y*	*Y*
	# Obs	15071	15071	13268
	Adj. R^2	1.8%	5.6%	7.3%

Table B5. CashToAssets: cash and short-term investments divided by total assets. $c\% \leq$ ExcessEY $< (c+1)\%$: indicator for whether excess earnings yield lies within 1% bin. Reference bin is [-1%, 0%). BookToMarket: ratio of book-equity value to market cap. ROA: return on assets (units: 1/yr). TaxRate: income tax liability as a fraction of pretax income. Column (1) gives coefficient estimates in Figure 9. Numbers in parentheses are *t* stats. ⋆, ⋆⋆, and ⋆⋆⋆: statistical significance at the 10%, 5%, and 1% levels.

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