Capital Budgeting For EPS Maximizers*

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Abstract

To increase a company's earnings, a project must generate enough income next year to pay for its own financing. Hence, a manager who wants to maximize her EPS (earnings per share) should only invest in accretive projects that have income yields above the firm's cheapest financing option. This is the max EPS analog to the positive-NPV (net present value) rule. Maximizing EPS ≠ minimizing investment. EPS maximizers use real investment to arbitrage between asset and capital markets. This framework rationalizes the pervasive use of IRRs (internal rates of return) and payback periods. An IRR is a multi-year average income yield. Managers assess how accretive a project will be by comparing its IRR to a hurdle rate. A payback period expresses the project's income yield as a multiple. Empirically, a simple max EPS model explains M&A payment method and investment-cash flow sensitivity. It also predicts which firms have higher proportions of convertible debt and capitalized interest expense.

Keywords: Earnings Per Share (EPS), Capital Budgeting, Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, M&A Payment Method, Investment-Cash Flow Sensitivity, Convertible Bonds, Capitalized Interest

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1 Introduction

International Business Machines (NYSE:IBM) has a long and storied history. The company first went public in 1915, and innovation has been key to its success over the past 110 years. The firm was selling vacuum-tube mainframe computers when it joined the S&P 500 back in 1957. IBM would not be in business today if it were still trying to hock those same wares.

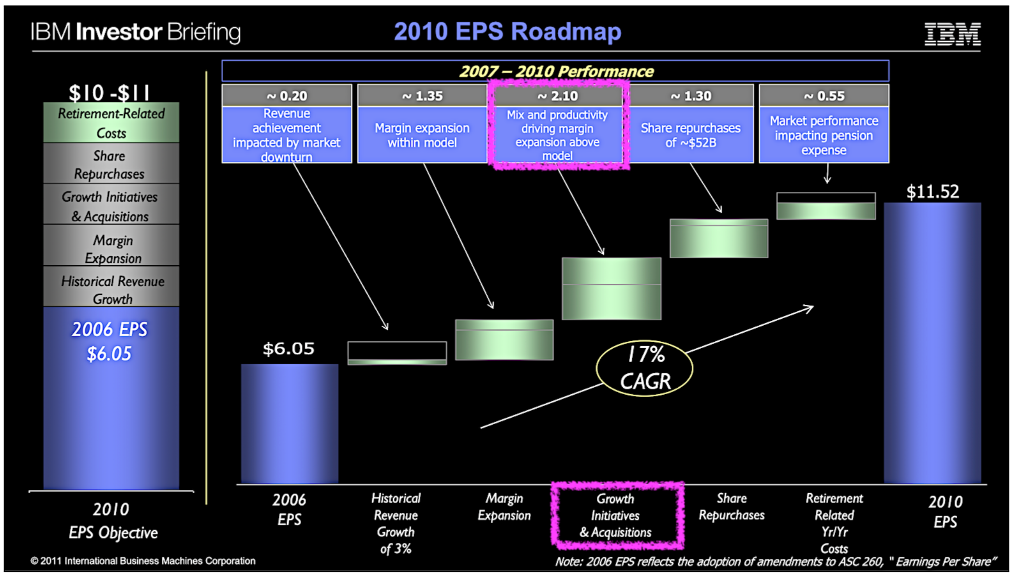
Big Blue runs the world's largest industrial research program and regularly funds moonshot projects. IBM researchers helped develop the universal barcode (Weightman, 2015), the magnetic swipe card (Svigals, 2012), and SQL (Chamberlin, 2012). In the early 2010s, IBM used cheap debt financing to pump over $1b into the Watson AI Group,[1] which first gained notoriety in 2011 for engineering a computer program that won 'Jeopardy!'.[2]

IBM also relies on M&A activity to keep its business current. For example, in 1995, IBM paid more than $3.5b in cash for Lotus Development Corp.[3] In 2002, it doled out another $3.5b for PwC's business-consulting division, issuing new equity worth $800m in the process.[4] 2008 saw IBM complete its purchase of Cognos, a business intelligence platform, in a $4.9b all-cash deal.[5] And, in 2019, the company combined $14b in cash with a $20b loan to buy Red Hat.[6]

The conventional wisdom among academics is that maximizing short-term EPS (earnings per share) leads to significant underinvestment. CEOs sometimes pause funding on long-term projects in quarters where they are at risk of missing an earnings target (Graham, Harvey, and Rajgopal, 2005). Extrapolating from these instances, researchers have come to believe that "chasing EPS with changes in real investments leads to long-term underperformance" (Almeida, 2019) with welfare consequences on par with inflation (Terry, 2023).

[1] Spencer Ante. "IBM Set to Expand Watson's Reach." *Wall Street Journal.* Jan 9 2014.
[2] John Markoff. "Computer Wins on 'Jeopardy!': Trivial, It's Not." *New York Times.* Feb 16 2011.
[3] L. Zuckerman. "IBM Wins Lotus as Offer Is Raised Above $3.5b." *New York Times.* Jun 12 1995.
[4] W. Bulkeley and K. Dunham. "IBM Boosts Consulting Service With $3.5b PwC Deal." *Wall Street Journal.* Jul 31 2002.
[5] C. Fournier and M. Miller. "IBM to Buy Cognos for $4.9b." *Bloomberg.* Nov 12 2007.
[6] L. Baker and G. Roumeliotis. "IBM to acquire Red Hat for $34b." *Reuters.* Oct 28 2018.

Figure 1. May 2011 shareholder presentation touting the success of IBM's 2010 EPS roadmap. Roughly \$2.10/sh of the company's \$5.47/sh EPS gain came from "Growth Initiatives & Acquisitions". Only \$1.30 came from "Share Repurchases".



Given all this, you might be surprised to learn that IBM's senior management has consistently named EPS growth as their main objective. For example, in his letter to shareholders at the end of 2006 (IBM, 2006), CEO Samuel Palmisano laid out an explicit road map for achieving earnings of \$10/sh by 2010. This was a wildly optimistic target given the company's earnings of \$6.05/sh at the time. Nevertheless, by the end of 2010, IBM's earnings had risen to \$11.52/sh, surpassing the CEO's own goal by over +\$1.50/sh.

Mr. Palmisano invested his way to 17%/yr EPS growth. Figure 1 shows that "Growth Initiatives & Acquisitions" were responsible for \$2.10/sh of IBM's \$5.47/sh gain. There may have been quarters where the company temporarily reduced funding to a few projects to avoid missing an earnings target. But it would be wrong to conclude from those special events that Mr. Palmisano consistently cut real investment in his pursuit of EPS growth. People go on diets to look good in their wedding photos, but getting married does not make you eat less in general.

In this paper, we characterize how EPS-maximizing managers make capital-budgeting decisions. EPS growth might be a second-best proxy for value creation, or maybe it is just a mistake. Either way, "EPS and EPS targets seem to be the way the financial world works. (Almeida, 2019)" We acknowledge this reality and ask: What does an EPS accretive project look like? And how should an EPS maximizer finance one? We show that the simplest possible max EPS framework accounts for both project selection and financing.

In Section 2, we model a CEO who maximizes the following quantity

$$\text{EPS} \overset{\text{def}}{=} \frac{\mathbb{E}[\text{NOI}_1] - \bar{\imath} \cdot \text{Debt} + \text{rf} \cdot \text{Cash}}{\#\text{Shares}} \tag{1}$$

$\mathbb{E}[\text{NOI}_1]$ is her company's expected net operating income next year. $\bar{\imath}$ is the interest rate on her firm's existing debt, and $\bar{\imath} \cdot \text{Debt}$ is the firm's interest expense next year. Cash reserves allow the CEO to collect riskfree interest of $\text{rf} \cdot \text{Cash}$. The manager's company currently has #Shares outstanding.

One way for the CEO to increase her firm's EPS is by strategically refinancing its existing assets, and we explore that possibility in Ben-David and Chinco (2025b). In this paper, we look at how she can increase her EPS by acquiring new assets. The manager is thinking about investing in a project with upfront $\text{Cost} > \$0$. If she invests, then her firm's expected income will increase by $\mathbb{E}[\Delta\text{NOI}_1] = \text{IY} \times \text{Cost}$ next year where $\text{IY} \overset{\text{def}}{=} \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} > 0\%$ denotes the project's "income yield". The higher the income yield is, the more of a project's upfront cost gets repaid over the next twelve months.

If the manager greenlights the project, then she must finance the upfront cost. There are three ways she can do this: issuing equity, selling bonds, or spending cash. To sell a single share of equity, a CEO must promise the buyer a single share's worth of earnings. Hence, the earnings cost of \$1 of equity is $\text{EY} \times \$1$ where $\text{EY} \overset{\text{def}}{=} \frac{\text{EPS}}{\text{Price}}$ is the firm's forward earnings yield. Borrowing an additional \$1 will lower the firm's earnings next year by the interest paid on this marginal dollar, $\text{i} \times \$1$, which may be different than the interest rate on her existing debt, $\text{i} \geq \bar{\imath}$. The earnings cost of spending \$1 of cash reserves is the foregone riskfree interest it would have otherwise generated, $\text{rf} \times \$1$.

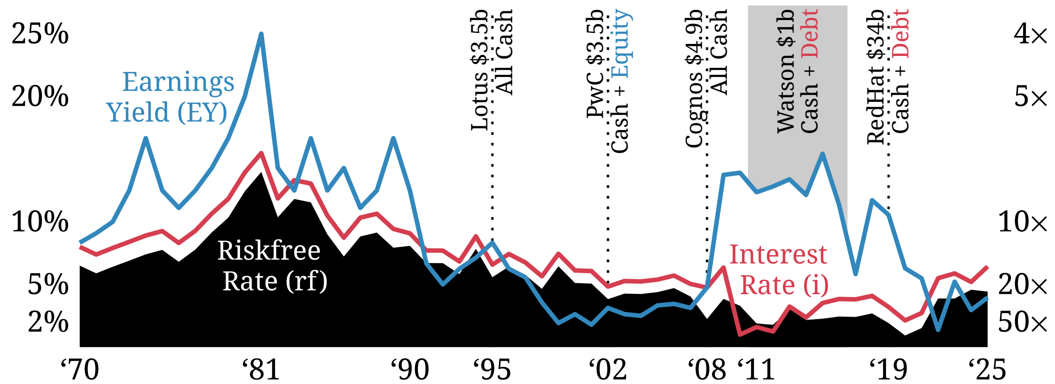


Figure 2. Annual data from 1970 to 2025 showing IBM's investment decisions and its three costs of capital. **Blue line** is IBM's forward earnings yield, EY. **Red line** is the interest rate IBM would have to pay to borrow an extra $1 from bond markets, i. Black ribbon is the 10-year Treasury rate, rf. Vertical dotted lines ⁞⁞ indicate M&A deals. Shaded bar indicates a multi-year R&D project.

To be accretive, a project's income yield must be higher than a firm's cheapest funding source

$$\text{IY} > \text{FY} \stackrel{\text{def}}{=} \min\left\{ \underset{\text{Issue equity}}{\text{EY}}, \underset{\text{Sell bonds}}{\text{i}}, \underset{\text{Use cash}}{\text{rf}} \right\} \tag{2}$$

EPS maximizers invest in accretive projects and avoid dilutive ones that have income yields below than the firm's financing yield, FY. Suppose a project costs $100k and will boost income by $5,000 next year, IY = 5%. If the manager's cheapest financing option only requires sacrificing FY × $100k = $3,000 in earnings, FY = 3%, then investing will increase her EPS by $\left(\frac{+\$2{,}000}{\#\text{Shares}}\right)$. Whereas, if she has to forfeit FY × $100k = $6,000 in earnings next year, FY = 6%, then investing would dilute her EPS by $\left(\frac{-\$1{,}000}{\#\text{Shares}}\right)$.

The "min" operator in Equation (2) leads to subtle context-dependent predictions. EPS-maximizing managers ask themselves: "What is the least amount of earnings I have to sacrifice to pay the project's upfront cost?" What matters is a company's minimum financing yield, FY = min{EY, i, rf}, not its average cost of capital or a project-specific value like in textbook models.

To illustrate, Figure 2 plots IBM's forward earnings yield, EY, the company's marginal interest rate, i, and the prevailing 10-year Treasury rate, rf, each year since 1970. Big Blue found ways to buy assets with high income yields using the source of capital that required paying the lowest financing yield. In effect, the company was capturing the income-vs-financing yield spread, $\mathrm{IY} - \mathrm{FY}$, by arbitraging between asset and capital markets.

IBM financed its \$3.5b purchase of Lotus in 1995 with cash. The 10-year Treasury rate was sitting at $\mathrm{rf} \approx 6.5\%$, so paying cash meant that IBM would miss out on collecting $6.5\% \times \$3.5\mathrm{b} \approx \$230\mathrm{m}$ in riskfree interest in 1996. This might sound like a lot, but \$230m was cheaper than IBM's other options. With a forward earnings yield of $\mathrm{EY} \approx 9\%$, the company would have had to commit $9\% \times \$3.5\mathrm{b} \approx \$320\mathrm{m}$ to new shareholders to raise \$3.5b from equity markets. Alternatively, IBM's bond yield was $\mathrm{i} \approx 8\%$. If the company had borrowed \$3.5b, it would have had to pay $8\% \times \$3.5\mathrm{b} \approx \$280\mathrm{m}$ in interest the following year.

By November 2007, IBM's forward earnings yield and marginal interest rate had both fallen to $\mathrm{EY} \approx \mathrm{i} \approx 5\% < 6.5\%$. In other words, twelve years later, it was cheaper for Big Blue to issue equity and/or sell bonds than it was to spend cash in 1995. Nevertheless, IBM paid \$4.9b cash for Cognos. Treasuries had fallen to $\mathrm{rf} \approx 2\%$ as the deal closed in early 2008, putting the opportunity cost of spending cash at just $2\% \times \$4.9\mathrm{b} \approx \$100\mathrm{m}$. The earnings drag would have been $2.5\times$ higher, $5\% \times \$4.9\mathrm{b} \approx \$250\mathrm{m}$, if IBM had gone with external financing.

In July 2019, the 10-year Treasury rate was back to $\mathrm{rf} \approx 2\%$. At this price point, IBM would have liked to pay \$34b cash for Red Hat, but the company only had ~\$14b in reserve at the time. So, to cover the remaining \$20b, IBM turned to its next cheapest option: debt. The firm's marginal interest rate was $\mathrm{i} \approx 3.5\%$, meaning that acquiring Red Hat had a total earnings drag of $2\% \times \$14\mathrm{b} + 3.5\% \times \$20\mathrm{b} \approx \$1\mathrm{b}$. Given IBM's forward earnings yield of $\mathrm{EY} \approx 10.5\%$ at the time, an all-equity deal would have cost $3.5\times$ more, $10.5\% \times \$34\mathrm{b} \approx 3.5\mathrm{b}$.

IBM also used debt financing to pay for new ventures like the Watson AI Group. However, in the early 2010s, bonds were not a second-best option. IBM's stock price plummeted in 2008 during the Great Financial Crisis. But, unlike everyone else, IBM's earnings remained relatively stable. So, in 2010 and 2012, even though equity markets were pricing IBM at $\mathrm{EY} \approx 10\%$, bond markets were willing to lend to the company at a discount to Treasuries, $\mathrm{i} \approx 1\% < 2\% \approx \mathrm{rf}$.[7]

[7] S. Gandel. "The Top 10 of Everything 2010: IBM Sells 1% Bonds." *Time Magazine.* Dec 9 2010.

Under normal circumstances, equity markets are not IBM's cheapest source of capital. However, there was nothing normal about the pricing of technology stocks during the late 1990s and early 2000s. In the DotCom era, IBM saw its price-to-earnings (PE) ratio rise to nearly 30×, giving the firm a forward earnings yield of $\text{EY} = 1/30\times \approx 3\%$. With Treasuries trading at $\text{rf} \approx 4\%$, Big Blue used equity financing for their \$3.5b deal for PwC's business consulting division.

In Section 3, we compare the EPS-maximizing capital-budgeting rule with the most common alternatives methods in Graham and Harvey (2001). We start by examining the textbook positive-NPV (net present value) rule. This analysis points out several reasons why EPS maximizers do not minimize real investment. First and foremost, their short-termism affects both benefits and costs. While long-term project benefits are not accretive to EPS, long-term financing costs are not dilutive, either. When overlooking future costs makes short-term financing seem especially cheap, the end result is EPS-driven overinvestment. We have already mentioned one plausible example of this. Spurred on by favorable credit conditions in the early 2010s, IBM funneled over \$1b into a new research group organized around a game-show-winning chatbot.[8] In addition, EPS maximizers focus on a project's expected income boost next year. They do not risk adjust or discount this short-term benefit.

From a max NPV perspective, it is puzzling that so many managers calculate IRRs (internal rates of return) and payback periods. However, these alternative metrics fit neatly into the max EPS paradigm. A manager can assess how accretive a project will be by comparing its IRR to the firm's hurdle rate. This is a natural way to quote the income-vs-financing yield spread, $\text{IY} - \text{FY}$. Likewise, a project's payback period is a way of quoting a project's income yield, $\mathbb{E}[\text{Payback Period}] = 1/\text{IY}$. EPS maximizers like investing in projects that have short payback periods for the same reasons that they like acquiring M&A targets that have low PE ratios, $\text{PE} = 1/\text{EY}$.

In Section 4, we explore several different applications of the EPS-maximizing capital-budgeting rule. This one rule manifests in different ways, depending on whether a company's earnings yield is above or below the riskfree rate, $\text{EY} \lessgtr \text{rf}$.

[8] Steve Lohr. "What Ever Happened to IBM's Watson?" *New York Times.* Jul 17 2021.

We start by looking at how acquirers pay target shareholders. Textbooks say that choice is due to asymmetric information. M&A deals get paid in stock when the acquirer thinks target shareholders are overvaluing her shares.

By contrast, in our model what matters is whether equity markets are the acquirer's cheapest source of capital, not whether they are overvaluing the acquirer's shares in an absolute sense (Baker, Stein, and Wurgler, 2003). EPS maximizers act like "cross-market arbitrageurs" (Ma, 2019) even in the absence of any true pricing errors. Acquirers pay target shareholders in stock when their PE ratio is sufficiently high, $\mathrm{PE} = 1/\mathrm{EY} > 1/\mathrm{rf}$. IBM paid cash for Lotus because in 1995 the Treasury rate was lower than the firm's earnings yield, $\mathrm{rf} \approx 6.5\% < 9\% \approx \mathrm{EY}$. Had the company's PE ratio been $20\times$ rather than $1/9\% \approx 11\times$, it would have paid in stock, $\mathrm{EY} = 1/20\times = 5\% < 6.5\%$.

EPS maximization accounts for the conflicting results on investment-cash flow sensitivities (Fazzari, Hubbard, and Petersen, 1988; Kaplan and Zingales, 1997). To an EPS maximizer, the cost of spending cash reserves is the foregone riskfree interest the money would have generated over the next year. Sometimes, a CEO will feel this cost is low. Other times, she will feel it is high. It all depends on her firm's other financing options at the time, $\mathrm{rf} \stackrel{?}{=} \min\{\mathrm{EY}, \mathrm{i}, \mathrm{rf}\}$.

IBM paid cash for Cognos in 2008 because the company's earnings yield and marginal interest rate were both above Treasuries, $\mathrm{rf} \approx 2\%$. By the early 2010s, IBM could sell bonds at $\mathrm{i} \approx 1\%$, which is why the Watson AI Group was largely financed with cheap debt even though the riskfree rate was still $\mathrm{rf} \approx 2\%$. In 2002, the company paid PwC partly with stock even though $\mathrm{EY} \approx 3\%$. Why? Because Treasuries were trading at $\mathrm{rf} \approx 4\%$, not 2%, making cash look expensive.

Public companies use special kinds of debt to fund long-term projects that will take several years to complete. When a project is expected to generate a little bit of income during its initial build phase, companies issue convertible notes. For projects that will generate no income while under construction, GAAP (ASC 835-20) allows firms to capitalize the interest expense incurred before the project becomes operational. Our model predicts that, when a growth stock with a sky-high PE ratio ($\mathrm{EY} < \mathrm{rf}$; $\mathrm{PE} > 1/\mathrm{rf}$) opts for debt financing, the new issuance will involve these sorts of exotic features.

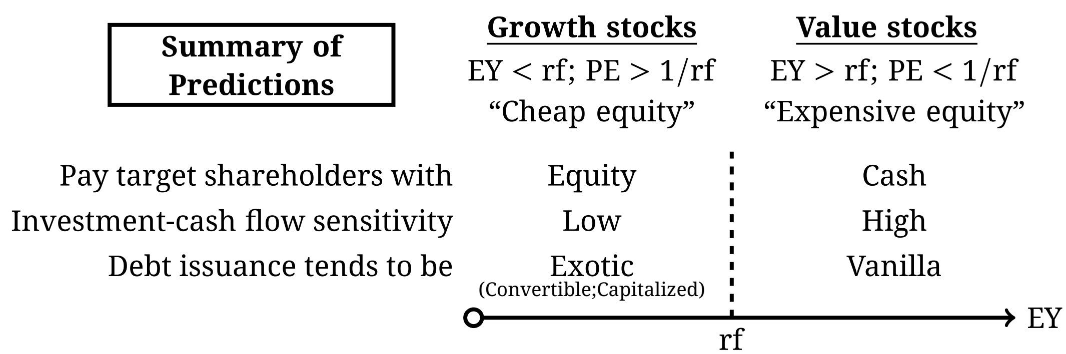


Figure 3. An EPS maximizer with an earnings yield below the riskfree rate, EY < rf, will see equity as cheap and make one set of capital-budgeting decisions. If the CEO's earnings yield were to rise above the riskfree rate, EY > rf, she would now see equity as expensive and make a different set of choices.

In Section 5, we provide empirical support for these predictions. Acquirers tend to pay target shareholders in stock when issuing equity allows them to sacrifice the least earnings. Firms have higher investment-cash flow sensitivities in situations where spending cash has the lowest earnings cost. When growth stocks (EY < rf; PE > 1/rf) issue debt, the bonds tend to contain features like convertibility and involve capitalized interest expense.

There is more to being a good CEO than asking: "What will it do for my EPS?" Large public companies are run by smart people who have risen to the top of their profession. It would be unreasonable to expect a simple model to account for every decision they make. That being said, it is surprising how much we are able to explain! Our simple max EPS model has far more empirical bite than a similarly barebones max NPV model (Modigliani and Miller, 1958, 1961). We are able to match important empirical patterns in the data even before layering further complications onto our model.

More importantly, EPS maximization reflects the economics of real-world capital budgeting. Managers have developed their own jargon for talking about changes in EPS. "Accretive" projects increase a firm's EPS. "Dilutive" projects decrease a firm's EPS. No one has felt it necessary to coin analogous terms for the positive-NPV rule. Our model may be a stick-figure caricature of reality, but it is a drawing that any S&P 500 CEO will instantly recognize.

1.1 Related Work

It is common for CEOs to have EPS goals built into their compensation contracts (Bens, Nagar, Skinner, and Wong, 2003; Edmans and Gabaix, 2016; Bennett, Bettis, Gopalan, and Milbourn, 2017). While not the focus of this paper, EPS growth and earnings targets also impact equity prices (Andrade, 1999; Bartov, Givoly, and Hayn, 2002; Chang, Hartzmark, Solomon, and Soltes, 2017; Johnson, Kim, and So, 2020; Ben-David and Chinco, 2025a).

Public companies use share repurchase programs to increase their EPS (Baker, Gallagher, and Morgan, 1981; Hribar, Jenkins, and Johnson, 2006; Cheng, Harford, and Zhang, 2015). Many academic researchers feel that EPS-fixated CEOs suffer from "buyback derangement syndrome. (Asness, Hazelkorn, and Richardson, 2018)" They spend too much time on buyback programs and not enough time growing their underlying business (Admati, 2017).

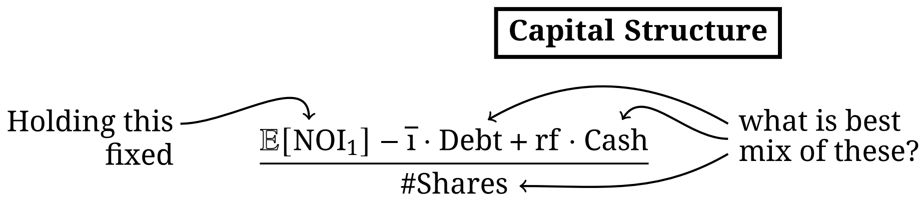
The academic consensus is that EPS-maximizing CEOs are myopic and therefore tend to underinvest. Stein (1989) and Aghion and Stein (2008) offer theoretical models. The empirical evidence comes from narrow circumstances where it is possible to cleanly identify that an EPS-maximizing manager has cut spending (Bushee, 1998; Roychowdhury, 2006; Bhojraj, Hribar, Picconi, and McInnis, 2009; Almeida, Fos, and Kronlund, 2016; Gutierrez and Philippon, 2017; Ladika and Sautner, 2020; Bird, Ertan, Karolyi, and Ruchti, 2022; Terry, 2023).

Accretion and dilution concerns play a central role in M&A activity, affecting both whether a deal takes place (Shleifer and Vishny, 2003; Dong, Hirshleifer, Richardson, and Teoh, 2006; Dasgupta, Harford, and Ma, 2024) as well as how it gets financed (Martin, 1996; Harford, 1999; Faccio and Masulis, 2005; Harford, Klasa, and Walcott, 2009; Gorbenko and Malenko, 2018).

Public companies adjust their investment and financing decisions to exploit high share prices and favorable credit conditions (Baker and Wurgler, 2002; Baker et al., 2003; DeAngelo, DeAngelo, and Stulz, 2010). Beginning with Fazzari et al. (1988), we have seen decades of research looking into why some firms opt to invest out of internal cash reserves (Kaplan and Zingales, 1997; Almeida, Campello, and Weisbach, 2004; Faulkender and Wang, 2006; Denis and Sibilkov, 2010; Acharya, Almeida, and Campello, 2007).

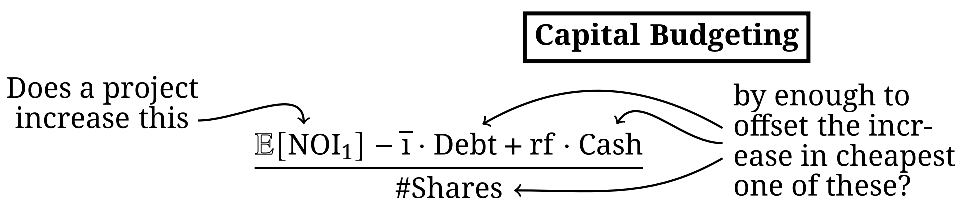
2 Capital-Budgeting Rule

This section develops the theoretical framework for how EPS-maximizing managers evaluate capital investments. One way for a CEO to increase her firm's earnings per share (EPS) is by refinancing its existing assets



We explore this possibility in Ben-David and Chinco (2025b). In this paper, we assume that the CEO has already optimized her firm's capital structure.

But, as we saw with IBM's 2010 EPS roadmap in Figure 1, there is more to EPS maximization than cutting costs and repurchasing shares. A CEO can also increase her EPS by acquiring new income-generating assets at the right price



The funding cost will lower the firm's expected earnings next year. But, if the new assets are expected to generate more income over the next twelve months than it takes to finance the purchase, then the investment will be accretive.

2.1 Project Description

We study an EPS-maximizing manager who learns about a potential project idea immediately after optimizing her firm's existing capital stack. The project has an upfront price tag of $\text{Cost} > \$0$. If the manager decides to invest, then her company's net operating income (NOI) over the next twelve months will rise by $\mathbb{E}[\Delta\text{NOI}_1] = \text{IY} \times \text{Cost}$, giving the project an income yield of

$$\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} \tag{3}$$

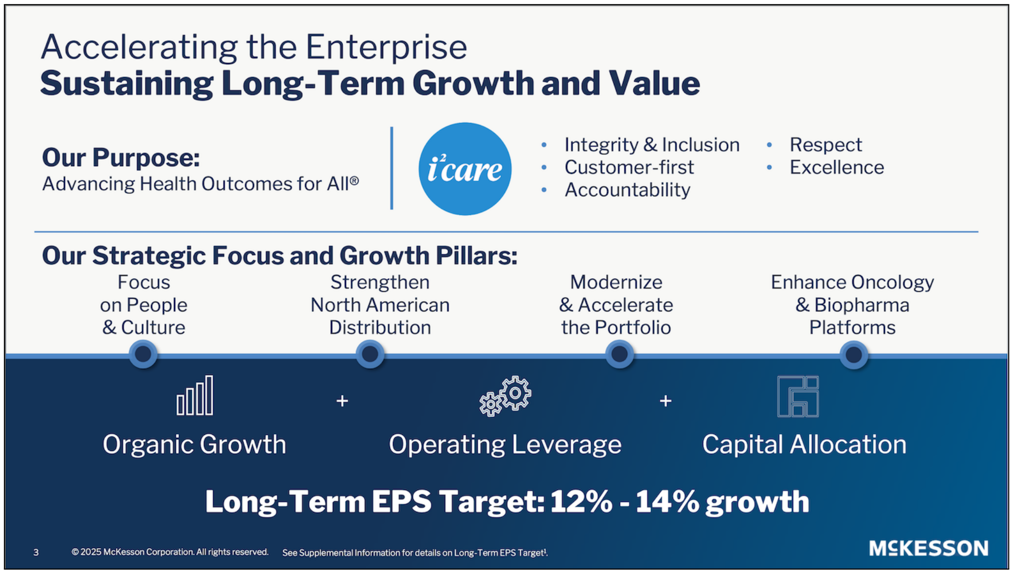
The project's income yield, IY, plays a pivotal role in how EPS-maximizing managers make capital-budgeting decisions. This quantity tells you how much of a project's upfront cost will get repaid over the next year. It is different from the company's earnings yield, EY. The project's income yield is a benefit. If the manager invests, then her expected NOIs next year will increase by IY×Cost. The firm's earnings yield is a cost of capital. To finance the project by issuing equity, the manager would have to promise EY × Cost in earnings to new shareholders.

Figures 4-6 give examples of how real-world CEOs describe their investments to their shareholders. McKesson (NYSE:MCK) is an S&P 500 company that distributes pharmaceuticals. Figure 4 depicts two slides from the firm's annual presentation to shareholders in May 2025. McKesson's senior management was aiming for long-term EPS growth in the range of 12%-14%. That was management's stated goal, and they planned on achieving this goal by making targeted investments in oncology and biopharma during 2026.

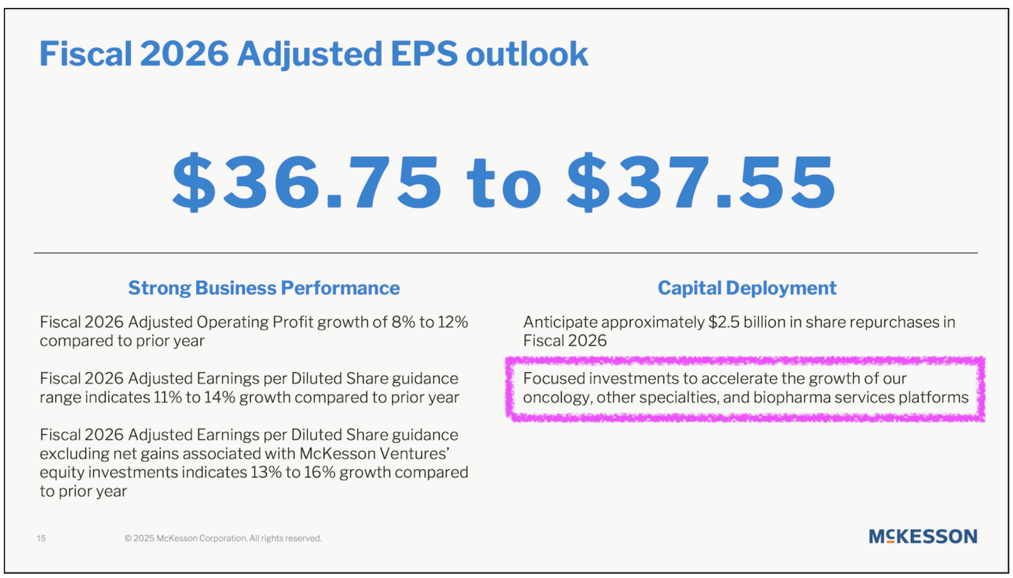
Figure 5 contains a pair of slides from Intel's (Nasdaq:INTC) annual shareholder presentation in May 2019. The top slide shows that Intel executives were hoping to report EPS of ~\$4.35/sh for 2019. The bottom slide explains how the company planned on getting to this goal by investing in "next gen products", like 7nm-scale semiconductors.

Sometimes a company is less specific about the details. For example, the two slides in Figure 6 are taken from an AT&T (NYSE:T) shareholder presentation in January 2020. The top slide advertises how senior management met all their 2019 goals, including ~\$23b in capital investments. The bottom slide simply says the company intended to "continue top-tier capital investment." Management was not cutting investment to pursue EPS growth.

The manager in our model has already chosen how to finance her existing assets prior to learning about the new project. Learning about the project does not change the manager's share price or the earnings yield that her firm's shareholders are asking for. When the manager calls up lenders to inquire about new loan terms, they continue to quote her the same interest-rate schedule based on her company's existing assets. These simplifying assumptions can be relaxed once the basic framework has been established.



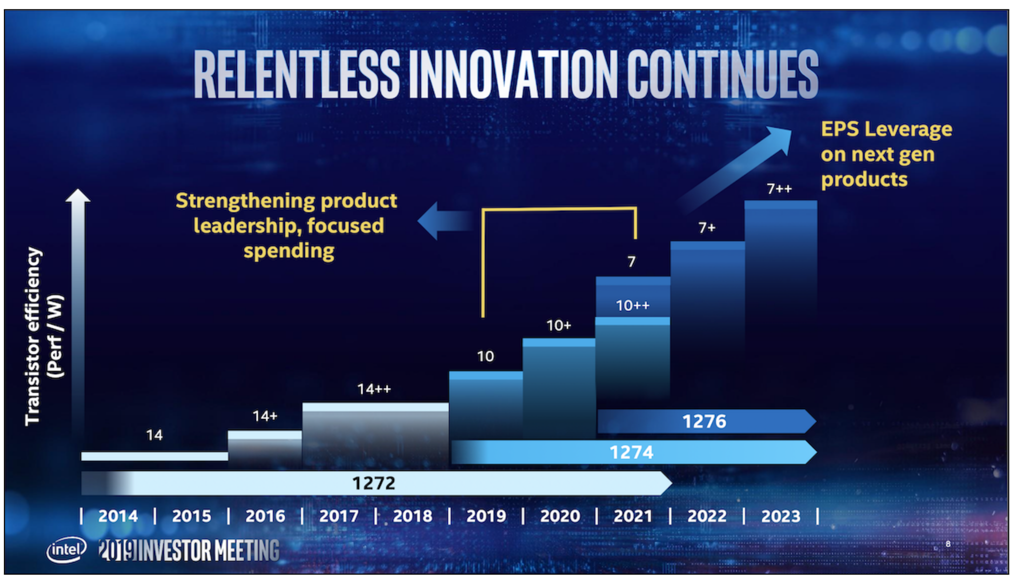
(a) Growth Target



(b) Goals for 2026

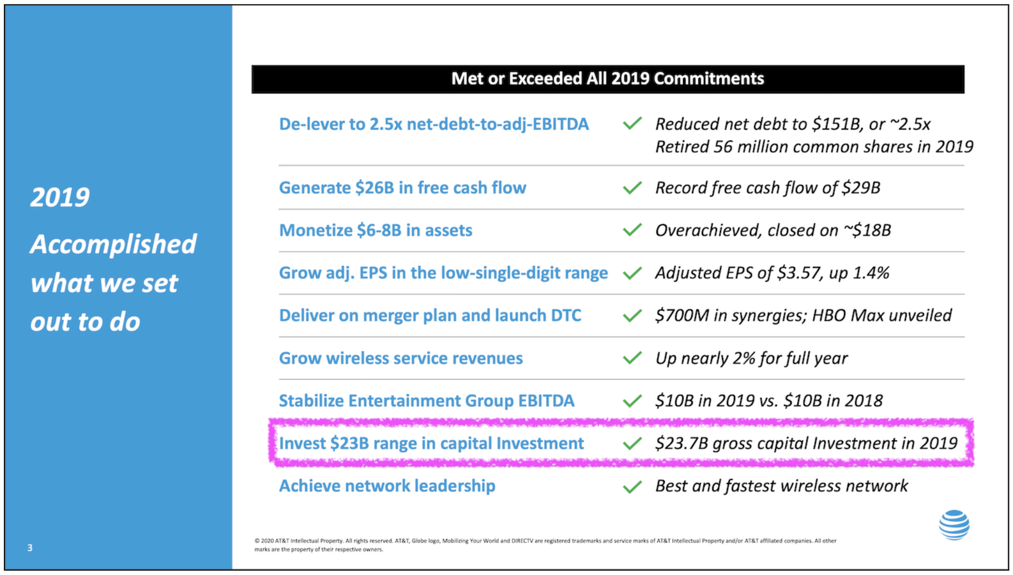
Figure 4. McKesson (NYSE:MCK) shareholder presentation on May 8 2025. **Panel (a)** Corporate executives were aiming for 12%-14% long-term EPS growth. **Panel (b)** The firm intended to achieve this goal by making focused investments during 2026 to improve its oncology and biopharma platforms.

(a) Guidance for 2019

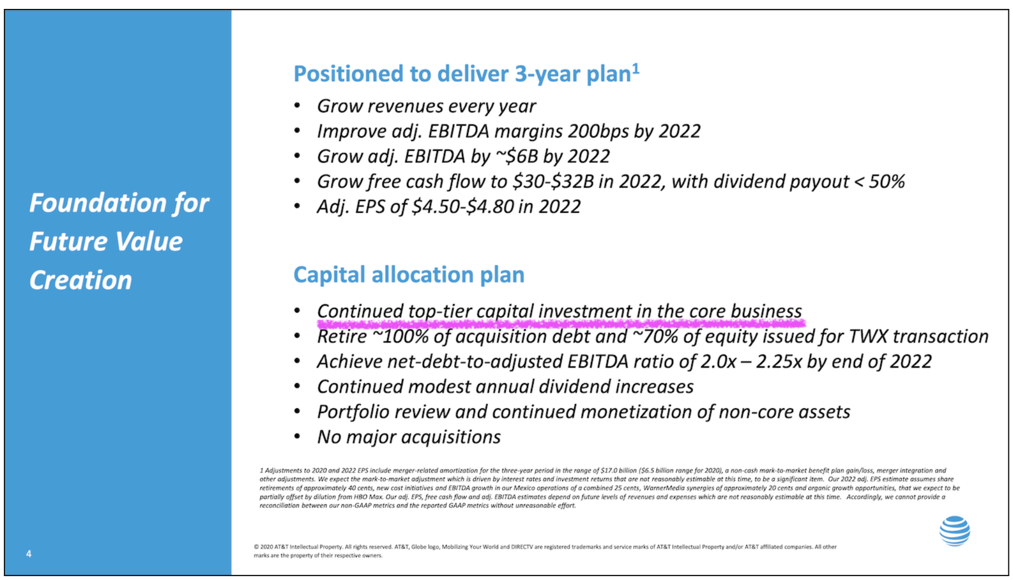


(b) Transistor Investment

Figure 5. Intel (Nasdaq:INTC) shareholder presentation on May 7 2019. **Panel (a)** Corporate executives were aiming to report earnings of ~$4.35/sh in 2019. **Panel (b)** The company planned on leveraging its investments in new semiconductor technology to achieve its EPS targets going forward.



(a) Achieved 2019 Goals



(b) Goals for 2020-'22

Figure 6. AT&T (NYSE:T) shareholder presentation on Jan 29 2020. **Panel (a)** Senior management met each of its goals for 2019, one of which was spending "~$23b on capital investment." **Panel (b)** Going forward, the team said it would "continue top-tier capital investment" without naming specific projects.

2.2 Is It Accretive?

The EPS-maximizing manager in our model has access to three different financing options. She can fund a new investment by issuing equity, selling bonds, or spending cash. The key to understanding whether a project is accretive lies in understanding how accessing each of these financing options will impact the manager's earnings next year:

(#1) Issuing Equity.

To sell a share of equity, the manager must promise the new owner a single share's worth of earnings next year. The shareholder is giving the firm \$Price of capital in exchange for \$EPS of earnings. That is the arrangement. Thus, the earnings cost of \$1 of equity is $\mathrm{EY} \times \$1$ where $\mathrm{EY} = \frac{\mathrm{EPS}}{\mathrm{Price}}$ is the firm's earnings yield. The manager can purchase $\$1 \times \left(\frac{1}{\mathrm{EY}}\right)$ dollars of capital from equity markets with \$1 of expected earnings.

(#2) Selling Bonds.

The earnings cost of borrowing an additional \$1 is the interest payment the firm must make next year, $\mathrm{i} \times \$1$. We use i to denote the manager's marginal interest rate; whereas, $\bar{\mathrm{i}}$ denotes the average interest rate on the firm's existing debt. This means that bond markets are willing to lend $\$1 \times \left(\frac{1}{\mathrm{i}}\right)$ dollars of capital in exchange for \$1 of expected earnings.

(#3) Spending Cash.

The earnings cost of spending \$1 of cash is the foregone riskfree interest payment this money would have otherwise generated next year, $\mathrm{rf} \times \$1$. EPS-maximizing managers think about cash like negative riskfree debt or, equivalently, like making a riskfree loan. Thus, spending $\$1 \times \left(\frac{1}{\mathrm{rf}}\right)$ of cash will lower a company's expected earnings next year by \$1.

To make things concrete, consider a project with Cost = \$100k. If the manager invests, the project will increase her firm's expected net operating income next year by $\mathbb{E}[\Delta\mathrm{NOI}_1] = \$5{,}000$. Hence, the project has an income yield of $\mathrm{IY} = \left(\frac{\$5{,}000}{\$100\mathrm{k}}\right) = 5\%$. Investing in this project will only be accretive to a firm that can finance its \$100k price tag at an earnings cost of \$4,999 or less.

If none of the manager's three financing options allow her to raise \$100k by giving up less than \$5,000 in earnings next year, then our EPS maximizer will turn the IY = 5% project down. However, if any of her three options offer good enough terms, then she will greenlight the project and finance the cost using her cheapest available source of capital, whatever that happens to be.

Proposition 1. *Define a firm's "financing yield" as its minimum cost of capital*

$$\text{FY} \stackrel{\text{def}}{=} \min\left\{ \underset{\substack{\text{Issue}\\ \text{equity}}}{\text{EY}} , \underset{\substack{\text{Sell}\\ \text{bonds}}}{\text{i}} , \underset{\substack{\text{Use}\\ \text{cash}}}{\text{rf}} \right\} \tag{4}$$

An EPS-maximizing manager invests in accretive projects that have an income yield higher than her firm's financing yield

$$\text{IY} > \text{FY} \tag{5}$$

While it might sound obvious that a firm should rely on its cheapest source of capital, this is not how things work in textbook corporate-finance theory. These models focus on a company's average cost of capital or use a risk-adjusted project-specific discount rate. By contrast, an EPS maximizer does not make any risk adjustments. She simply takes her three costs of capital as given, chooses the smallest one, and optimizes from there.

Let's plug in some numbers to make sense of what this result entails. To start with, suppose that our EPS-maximizing CEO is evaluating her IY = 5% project in a world where the riskfree rate is rf = 4%. Further suppose that she is running a company with an earnings yield of $\text{EY}^G = 3\% < 4\% = \text{rf}$. In this scenario, we would call her firm a "growth stock" because a low earnings yield implies a high price-to-earnings ratio, $\text{PE}^G = 1/\text{EY}^G = 1/3\% \approx 33\times$.

Under normal conditions, a company must issue corporate bonds with a coupon rate above Treasuries, $\text{i} \geq \text{rf} = 4\%$. Hence, the EPS-maximizing CEO of this growth stock would view debt financing as expensive even on the cheapest possible terms, $\text{FY} = \text{EY}^G = 3\% < 4\% = \text{rf} \leq \text{i}$. Each \$1 of expected earnings allows the CEO to buy $\$1 \times \left(\frac{1}{3\%}\right) \approx \$33$ of equity capital. The same dollar can buy her at most $\$1 \times \left(\frac{1}{4\%}\right) = \$25$ of capital from bond markets.

If the manager were to issue new shares worth \$100k, she would have to promise the owners of these new shares $3\% \times \$100\text{k} = \$3{,}000$ in expected earnings next year. This is \$2,000 less than the project's \$5,000 expected income, meaning that buying the assets would accrete $(\frac{+\$2{,}000}{\#\text{Shares}})$ to her firm's EPS. If the CEO had instead taken out a riskfree loan, $\text{rf} = 4\%$, she would have had to pay $4\% \times \$100\text{k} = \$4{,}000$ in interest to service this debt next year.

If debt were the manager's only financing option when running a $\text{EY}^G = 3\%$ growth stock, then she would still invest in a $\text{IY} = 5\%$ project. But, in that case, $\text{FY} = \text{rf} = 4\%$, so her EPS would only rise by $(\frac{+\$1{,}000}{\#\text{Shares}})$, not $(\frac{+\$2{,}000}{\#\text{Shares}})$. As an EPS maximizer, she prefers to save \$1,000 in earnings by issuing equity.

Now think about an alternative scenario where the same EPS-maximizing manager is running a firm with an earnings yield twice as high, $\text{EY}^V = 6\% > 4\% = \text{rf}$. Such a company would be a "value stock" because a high earnings yield implies a low PE ratio, $\text{PE}^V = 1/6\% \approx 17\times$. When running a value stock, the manager will continue to follow the same capital-budgeting rule in Proposition 1; but, this rule will manifest in a qualitatively different set of choices.

An EPS maximizer with $\text{EY}^V = 6\%$ will reason that equity markets are only offering $\$1 \times (\frac{1}{6\%}) \approx \$17$ of capital in exchange for \$1 of earnings. So, if issuing shares were her only financing option, she would say "No" to a $\text{IY} = 5\%$ project. Why pay $6\% \times \$100\text{k} = \$6{,}000$ for a project that is only expected to boost her firm's income by $\mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$? Financing the project with equity would dilute her EPS by $(\frac{-\$1{,}000}{\#\text{Shares}})$.

That being said, the EPS-maximizing manager of this $\text{EY}^V = 6\%$ value stock would be happy to give the thumbs up if she had \$100k in cash reserves or could borrow at the $\text{rf} = 4\%$ riskfree rate. Both options would allow her to buy $\$1 \times (\frac{1}{4\%}) = \$25$ of capital with \$1 of earnings, meaning that she could finance the project's upfront cost for just $4\% \times \$100\text{k} = \$4{,}000$ in earnings next year. In that case, a project that was expected to generate $\mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$ in income would add $(\frac{+\$1{,}000}{\#\text{Shares}})$ to the manager's EPS.

What if the $\text{EY}^V = 6\%$ value stock did not have any cash and had already exhausted its riskfree borrowing capacity? In this scenario, an EPS-maximizing manager might still choose to greenlight a project with an income yield of IY =

5%, depending on her credit spread. If bond markets only wanted +50bps over the riskfree rate, she would be happy to sacrifice $(4\% + 50\text{bps}) \times \$100\text{k} = \$4{,}500$ in expected earnings to boost income by $\mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$. Such a project would increase her EPS by $\left(\frac{+\$500}{\#\text{Shares}}\right)$.

However, if she faced a spread of +150bps, the exact same project would now be dilutive, $(4\% + 150\text{bps}) \times \$100\text{k} = \$5{,}500$. In a world where she faced a $\text{i} = 5.5\%$ marginal interest rate, starting a project with a $\text{IY} = 5\%$ income yield would lower her EPS by $\left(\frac{-\$500}{\#\text{Shares}}\right)$. The project has not become riskier. The only thing that has changed is the firm's funding cost.

3 Alternative Approaches

This section compares the EPS-maximizing capital-budgeting rule with the most common alternative approaches according to Graham and Harvey (2001). We start by looking at the textbook positive-NPV (net present value) method. This is what academics view as the theoretically correct thing to do. Then, we consider investing in projects that meet an IRR (internal rate of return) hurdle. Researchers view this as a heuristic approach to the positive-NPV rule, which can sometimes give misleading answers. We also analyze a project's payback period, which textbooks openly look down on.

3.1 Positive NPV

Corporate-finance textbooks say to follow the positive-NPV rule. Berk and DeMarzo (2007) tells readers that, "when making an investment decision, select the option with the highest NPV." Welch (2008) explains how "it is the appropriate decision benchmark—and no other rule can beat it." According to Ross, Westerfield, and Jordan (2009), "the capital-budgeting process can be viewed as a search for investments with positive net present values (NPVs)."

To understand what this capital-budgeting rule entails, imagine a project with an upfront price tag of $\text{Cost} > \$0$ that will generate income of ΔNOI_1 next year, ΔNOI_2 the year after, ΔNOI_3 in three years, and so on. Let $\{\Delta\text{NOI}_t\}_{t\geq 1} = \{\Delta\text{NOI}_1, \Delta\text{NOI}_2, \Delta\text{NOI}_3, \ldots\}$ denote the entire sequence of future project benefits. To determine whether she should greenlight this project, a manager needs some way of comparing the upfront cost with this uncertain stream of future benefits spread out across multiple years.

The positive-NPV rule says to start by computing the present value of the project's future NOI stream

$$\mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq 1}] \overset{\text{def}}{=} \sum_{t=1}^{\infty} \frac{\mathbb{E}[\Delta\mathrm{NOI}_t]}{(1+\mathrm{r})^t} \tag{6}$$

where $\mathrm{r} > 0\%$ is the project's annual discount rate. The project has a positive net present value (NPV) if the output of this present-value calculation exceeds the upfront cost

$$\mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq 1}] - \mathrm{Cost} > \$0 \tag{7}$$

Applying the positive-NPV rule requires detailed knowledge about a project's entire NOI stream as well as how each payoff should be priced. The approach assumes that a CEO knows the correct discount rate to use, $\mathrm{r} > 0\%$. The manager must have a clear view about the present value of \$1 of project income received t years from now, $\$1/(1+\mathrm{r})^t$.

An EPS maximizer's world view is much simpler. She focuses on how a project will impact her firm's net operating income *next year* *on average*. An EPS-maximizing manager does not need to predict a project's entire future income stream, nor does she need to know how this additional future income should be discounted. An EPS maximizer simply chooses the cheapest source of financing given her current earnings yield, her marginal interest rate, and the prevailing riskfree rate.

To be accretive, a project must increase a firm's expected earnings next year by more than enough to cover its own short-term financing

$$\mathbb{E}[\Delta\mathrm{NOI}_1] > \mathrm{FY} \times \mathrm{Cost} \tag{8}$$

If a project's income yield is higher than the firm's financing yield, $\mathrm{IY} > \mathrm{FY} = \min\{\mathrm{EY}, \mathrm{i}, \mathrm{rf}\}$, then an EPS maximizer will give it the thumbs up. If the project's income yield does not clear this hurdle, then she will say: "No."

Proposition 2. *Consider a project with upfront* $\text{Cost} > \$0$ *that will increase a firm's net operating income by* $\{\Delta\text{NOI}_t\}_{t\geq1}$ *each year going forward. There are three reasons why an EPS maximizer and an NPV maximizer might disagree about whether to invest in this project*

$$\left\{\frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} - \text{FY}\right\} - \left\{\frac{\mathbb{PV}_\text{r}[\{\Delta\text{NOI}_t\}_{t\geq1}]}{\text{Cost}} - 1\right\} \propto (\mathbb{E} - \mathbb{PV}_\text{r})[\Delta\text{NOI}_1] - \mathbb{PV}_\text{r}[\{\Delta\text{NOI}_t\}_{t\geq2}] + (1 - \text{FY}) \times \text{Cost} \tag{9}$$

When the left-hand side of Equation (9) is positive, EPS maximizers find a project more appealing. For example, when thinking about the $\text{IY} = 5\%$ project with a \$100k price tag, for the $\text{EY}^G = 3\%$ growth stock we had $\left\{\frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} - \text{FY}^G\right\} = \left\{\frac{\$5{,}000}{\$100\text{k}} - 3\%\right\} = +2\%\text{pt}$. If this project was negative-NPV and only generated \$96k in present value, then we would have $\left\{\frac{\mathbb{PV}_\text{r}[\{\Delta\text{NOI}_t\}_{t\geq1}]}{\text{Cost}} - 1\right\} = \left\{\frac{\$96\text{k}}{\$100\text{k}} - 1\right\} = -4\%\text{pt}$, making the entire left-hand side equal to $\{+2\%\text{pt}\} - \{-4\%\text{pt}\} = +6\%\text{pt}$.

When the left-hand side of Equation (9) is negative, NPV maximizers are more excited about the project. In the absence of other financing options, the $\text{EY}^V = 6\%$ value stock would view a $\text{IY} = 5\%$ project as dilutive, $\left\{\frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} - \text{FY}^V\right\} = \left\{\frac{\$5{,}000}{\$100\text{k}} - 6\%\right\} = -1\%\text{pt}$. If the project was positive NPV, generating \$102k in present value, then we would have $\left\{\frac{\mathbb{PV}_\text{r}[\{\Delta\text{NOI}_t\}_{t\geq1}]}{\text{Cost}} - 1\right\} = \left\{\frac{\$102\text{k}}{\$100\text{k}} - 1\right\} = +2\%\text{pt}$, making the left-hand side $\{-1\%\text{pt}\} - \{+2\%\text{pt}\} = -3\%\text{pt}$.

Negative terms on the right-hand side of Equation (9) cause EPS maximizers to underinvest. There is only one of these:

- $\mathbb{PV}_\text{r}[\{\Delta\text{NOI}_t\}_{t\geq2}]$

  When a CEO greenlights a project, the investment will often generate income next year, $t = 1$, as well as in subsequent years, $t \geq 2$. An NPV maximizer appreciates this fact and capitalizes these subsequent gains into the sale price of her firm's assets in year 1. By contrast, an EPS maximizer only cares about the expected NOI boost in year 1. She does not factor in the income that the project will generate from year 2 onward. And, as a result, she will be less likely to invest.

However, the other two terms in Equation (9) are both positive and make EPS maximizers more likely to invest, potentially flipping the effect:

+ $(1 - \text{FY}) \times \text{Cost}$

  This term embodies the fact that EPS maximizers ignore long-term financing costs. Their short-termism implies that they only count the portion of a project's funding requirements that must be paid next year. As a result, when short-term financing becomes especially cheap, it is possible to get EPS-driven overinvestment.

+ $(\mathbb{E} - \mathbb{PV}_{\text{r}})[\Delta \text{NOI}_1]$

  This term captures the fact that EPS maximizers do not risk-adjust or discount a project's expected benefit, making the project appear more attractive. Even in the absence of risk, a sure-fire \$1 next year is only worth $\$1/(1 + \text{rf})$ today. Risky projects that deliver most of their gains in good states next year will also seem more attractive to EPS maximizers.

The EPS-maximizing capital-budgeting rule makes no assumptions about how assets are priced. While researchers view EPS maximization as a mistake, the approach has empirical bite even if there are no pricing errors. Appendix B shows how no-arbitrage state prices would work in our setup. The analysis also highlights yet another reason why EPS maximizers are sometimes more eager to invest: they do not suffer from "debt overhang" (Myers, 1977).

Suppose the $\text{EY}^V = 6\%$ value stock has already used up its cash reserves and riskfree borrowing capacity. Bond markets recognize that any new debt will be risky, so they charge the company a +200bps spread, $\text{i}^V = 6\%$. Textbook theory predicts that this will make the firm less likely to invest. When its manager calculates a new project's NPV, she will only count the present value of payoffs coming in good states where it is not optimal to default.

Our max EPS model also says that this value stock will invest less, but for a very different reason—namely, it is harder to find projects with a sufficiently high income yield. To be accretive at $\text{FY} = \text{EY}^V = 6\%$, a \$100k project would need to generate \$6,001 in income next year. By contrast, \$3,001 of extra income would be enough for a $\text{FY} = \text{EY}^G = 3\%$ growth stock.

3.2 IRR Hurdle

How does the EPS-maximizing approach compare to using an IRR (internal rate of return) hurdle? This was the single most common capital-budgeting method in Graham and Harvey (2001). When deciding whether to start a project, 75.7% of the CFOs that Graham and Harvey (2001) surveyed said they looked at whether the IRR was above some pre-specified hurdle rate.

The IRR-hurdle rule also uses the $\mathbb{PV}_{\mathrm{r}}[\cdot]$ operator, but in a very different way. The approach does not assume a manager already knows the correct discount rate, $\mathrm{r} > 0\%$. Rather, it solves for this value. The IRR is the discount rate that equates the present value of a project's future NOI stream with its upfront cost

$$\mathbb{PV}_{\mathrm{IRR}}[\{\Delta\mathrm{NOI}_t\}_{t\geq 1}] = \mathrm{Cost} \tag{10}$$

The idea is to calculate a "'sort-of average rate of return' that is implicit in future cash flows (Welch, 2008)" and then compare this quantity to a predetermined hurdle rate

$$\mathrm{IRR} - \mathrm{HR} \;>\; 0\%\mathrm{pt} \tag{11}$$

The IRR-hurdle rule thinks in terms of future growth rates, not present values. To illustrate, consider a one-period project that is expected to deliver a total payoff of $\mathbb{E}[\mathrm{Payoff}_1] = \mathrm{Cost} + \mathbb{E}[\Delta\mathrm{NOI}_1]$ next year and nothing after that. In other words, the project will generate income that repays its cost plus a little extra. Imagine that a CEO finances the upfront cost by issuing bonds, $\mathrm{HR} = \mathrm{i}$. Equation (10) tells us that the project's IRR must satisfy $\mathbb{E}[\mathrm{Payoff}_1] = (1 + \mathrm{IRR}) \times \mathrm{Cost}$. Hence, we can recast the IRR-hurdle rule in Equation (11) in terms of the project's future payoff and the debt payments required to fund it

$$\mathrm{IRR} - \mathrm{i} = (1 + \mathrm{IRR}) - (1 + \mathrm{i}) \tag{12a}$$

$$\propto \{(1 + \mathrm{IRR}) - (1 + \mathrm{i})\} \times \mathrm{Cost} \tag{12b}$$

$$= \underbrace{\mathbb{E}[\mathrm{Payoff}_1]}_{\substack{\text{Future}\\\text{payoff}}} - \underbrace{(1 + \mathrm{i}) \times \mathrm{Cost}}_{\substack{\text{Promised}\\\text{debt svc}}} \tag{12c}$$

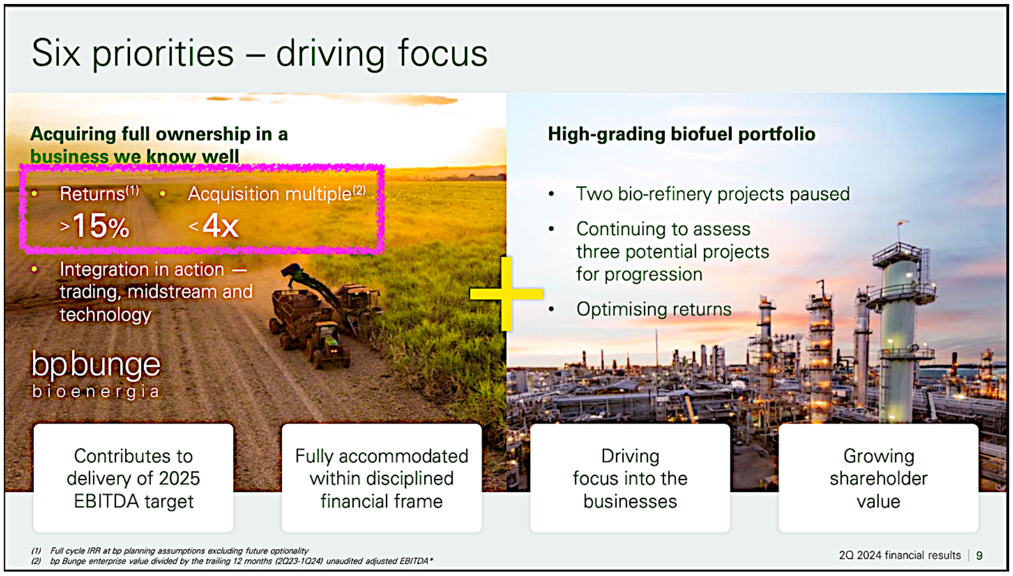


Figure 7. BP (NYSE:BP) presentation to shareholders on Jul 15 2024, which justifies buying out Bunge's (NYSE:BNG) 50% stake in BP Bunge Bioenergia.

Notice that, for a one-period project, the logic behind using an IRR hurdle is exactly the same as that of the EPS-maximizing capital-budgeting rule.

Proposition 3. *Consider a one-period project with* Cost $> \$0$ *that is expected to deliver* $\mathbb{E}[\text{Payoff}_1] = \text{Cost} + \mathbb{E}[\Delta\text{NOI}_1]$ *next year and nothing after that. If the manager uses her firm's financing yield as the hurdle rate,* $\text{HR} = \text{FY}$, *then the project's IRR matches its income yield,* $\text{IRR} = \text{IY}$, *and the IRR-hurdle rule in Equation* (11) *is identical to the EPS-maximizing rule in Proposition 1.*

This connection helps explain why corporate executives often quote a project's IRR right next to its predicted EPS impact. For example, in 2019 BP (NYSE:BP) and Bunge (NYSE:BNG) announced a 50:50 joint biofuel venture, BP Bunge Bioenergia.[9] Five years later, BP bought out Bunge's 50% stake in Bioenergia for \$1.4b.[10] Figure 7 shows how BP justified the deal to its shareholders by pointing out that Bunge was willing to sell for less than 4× Bioenergia's annual in-

[9]E. Voegele. "Bunge, BP launch BP Bunge Bioenergy joint venture in Brazil." *Ethanol Producer Magazine.* Dec 2 2019.
[10]R. Bousso and S. Bose. "BP to buy out Bunge's stake in Brazilian biofuels JV in \$1.4b deal." *Reuters.* Jun 20 2024.

come, $\mathbb{E}[\text{NOI}]$, giving the acquisition a very high income yield, $\text{IY} > 1/4\times = 25\%$. Executives at BP also highlighted how they expected the buyout to generate a return greater than 15%.

The connection is not limited to one-period projects, either. The same logic holds if a project is expected to generate the same income boost year after year. When discounting at $\text{r} > 0\%$, the present value of a perpetual stream of identical income boosts, $\mathbb{E}[\Delta\text{NOI}_t] = \mathbb{E}[\Delta\text{NOI}_1]$ for all $t \geq 1$, is given by

$$\mathbb{PV}_\text{r}[\,\text{Perpetuity}\,] = \sum_{t=1}^{\infty} \frac{\mathbb{E}[\Delta\text{NOI}_1]}{(1+\text{r})^t} \tag{13a}$$

$$= \mathbb{E}[\Delta\text{NOI}_1] \times \left(\frac{1}{\text{r}}\right) \tag{13b}$$

From the definition of an IRR, we know that $\text{Cost} = \mathbb{PV}_{\text{IRR}}[\text{Perpetuity}]$. Hence, this perpetuity must have $\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\mathbb{PV}_{\text{IRR}}[\text{Perpetuity}]} = \text{IRR}$.

Proposition 4. *Consider an infinitely-lived project with* $\text{Cost} > \$0$ *that is expected to generate the same income boost* $\mathbb{E}[\Delta\text{NOI}_t] = \mathbb{E}[\Delta\text{NOI}_1]$ *for all* $t \geq 1$*. If the manager uses her firm's financing yield as the hurdle rate,* $\text{HR} = \text{FY}$*, then the project's IRR matches its income yield,* $\text{IRR} = \text{IY}$*, and the IRR-hurdle rule in Equation* (11) *is identical to the EPS-maximizing rule in Proposition 1.*

Equation (13b) matches how EPS maximizers think about financing costs. Consider a growth stock with an earnings yield of $\text{EY}^G = 3\%$ and a marginal interest rate of $\text{i}^G = 6\%$ in a world where $\text{rf} = 4\%$. If you replace r with $\text{EY}^G = 3\%$, then Equation (13b) says that equity markets are willing to provide $\$1 \times \left(\frac{1}{3\%}\right) \approx \$33$ of capital in exchange for \$1 of expected earnings. If you replace r with $\text{i}^G = 6\%$, the same equation says that bond markets are only willing to give $\$1 \times \left(\frac{1}{6\%}\right) \approx \$17$ in exchange for \$1 of expected earnings. If you swap out r for $\text{rf} = 4\%$, Equation (13b) now says spending $\$1 \times \left(\frac{1}{4\%}\right) = \$25$ of cash today reduces earnings by \$1 next year.

In a world where corporate executives think next year, $t = 1$, will be representative of future years, $t \geq 2$, there is no longer a bright line between short- and long-term thinking. The same logic applies to a one-period project (Proposition 3) and an infinitely-lived project (Proposition 4). Think about a \$100k project that will generate $\mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$ next year. We have already seen that this project will be accretive to a $\text{EY}^G = 3\%$ growth stock. The company can issue \$100k worth of new equity at an earnings cost of just $3\% \times \$100\text{k} = \$3{,}000$. Hence, investing in a \$100k project that generates \$5,000 of income next year would add $(\frac{+\$2{,}000}{\#\text{Shares}})$ to the firm's EPS.

On the one hand, the manager's reasoning is completely nearsighted. Her calculation compares the project's \$5,000 income to its \$3,000 funding cost next year. On the other hand, Proposition 4 tells us that the end result can be reformulated as the output of an infinitely farsighted calculation. If the manager expects the project to generate the same \$5,000 income in every future year, $\mathbb{E}[\Delta\text{NOI}_t] = \mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$ for all $t \geq 1$, then it would be as if she were checking whether $\text{IRR} - \text{HR} \lesseqgtr 0\%\text{pt}$, not whether $\text{IY} \lesseqgtr \text{FY}$.

EPS maximizers do not go out of their way punish to projects that will generate income in year 2 and beyond. Consider a project with upfront Cost = \$100k that will deliver income of $\mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$ next year, a payoff of $\mathbb{E}[\text{Payoff}_2] = \text{Cost} + \$5{,}000 = \$105\text{k}$ the following year, and nothing after that. It is possible to replicate this stream of payoffs by paying \$100k for a perpetuity that will deliver a \$5,000 coupon every year going forward, collecting the first two coupon payments, and then selling the rights to the remaining coupons for \$100k at the end of year 2. Both investments have the same IRR. An EPS-maximizing $\text{EY}^G = 3\%$ CEO would gladly greenlight either.

Corporate-finance textbooks tend to emphasize the shortcomings of IRR vis-à-vis NPV. These issues stem from applying IRRs to pathological cash-flow streams. For example, Berk and DeMarzo (2007) warns readers that "the IRR rule should not be used unless all negative cash flows precede the positive ones." Otherwise, a project might have "multiple IRRs, or the IRR may not exist."

For a one-period project, the future-value comparison in Equation (12c) is equivalent to using the positive-NPV rule in Equation (7) and the EPS-maximizing approach in Proposition 1. There is no problem with using IRRs for projects with "one outflow followed only by inflows. (Welch, 2008)" The "yield to maturity" on a coupon bond is an IRR, and no one claims it is misleading to compare a Treasury's yield to its coupon rate rather than its price to the face value. A Treasury with a yield above its coupon rate is trading at a discount.

It turns out that the kinds of situations that are problematic for IRRs correspond to the situations where the EPS-maximizing capital-budgeting rule leads to over- and underinvestment. For example, consider the scenario above where the project's future payoffs correspond to those of a two-year par bond with a \$100k face value and a 5% annual coupon rate.

Suppose Treasuries are trading at rf = 4%, and consider a value stock with $\text{EY}^V = \text{i}^V = 6\%$. In this setup, spending \$100k cash would only reduce the manager's earnings by $4\% \times \$100\text{k} = \$4{,}000$ next year. Hence, paying cash for a project that is expected to deliver $\mathbb{E}[\Delta\text{NOI}_1] = \$5{,}000$ next year would accrete $\left(\frac{+\$1{,}000}{\#\text{Shares}}\right)$ to the firm's EPS. If everyone expected the riskfree rate to stay at rf = 4% forever, there would be no disconnect between this EPS-maximizing logic and the positive-NPV rule. The present value of the project's future payoffs would be $\$101.9\text{k} \approx \frac{\$5{,}000}{(1+4\%)} + \frac{\$105\text{k}}{(1+4\%)^2} > \$100\text{k}$.

But that would no longer be true in a world where the riskfree rate was expected to jump to ~8% in year 2. In this new scenario, the \$105k delivered in two years would need to be discounted at $6\% \approx \sqrt{(1+4\%)\cdot(1+8\%)} - 1$, rather than rf = 4% like in year 1. Due to the higher year-2 discount rate, the project would be a bad investment. It would only generate an income stream worth $\$98.2\text{k} \approx \frac{\$5{,}000}{(1+4\%)} + \frac{\$105\text{k}}{(1+6\%)^2} < \$100\text{k}$ in present-value terms.

Nevertheless, an EPS maximizer would still be willing to greenlight the project. Regardless of what happens in year 2, next year's expected \$5,000 NOI boost would still be large enough to offset the $4\% \times \$100\text{k} = \$4{,}000$ opportunity cost of spending cash in a rf = 4% environment.

3/4 of the CFOs in Graham and Harvey (2001) said that they used IRRs for capital-budgeting purposes. Instead of interpreting this as a costly mistake, we assume that corporate executives are smart and use the observation to draw inferences about their mental model. The fact that managers often quote a project's IRR right next to its income yield tells us something about the kind of income streams they have in mind. The prototypical project has an upfront cost and delivers a steady stream of benefits going forward.

3.3 Payback Period

The payback-period rule argues that good projects generate enough income each year to quickly recoup their upfront cost. 56.7% of the CFOs in Graham and Harvey's survey said that they always or almost always took this logic into consideration. "Other than NPV and IRR, the payback period [was] the most frequently used technique. (Graham and Harvey, 2001)"

This is surprising given that textbooks have lamented the shortcomings of the payback criterion for decades. Welch (2008) calls it "a stupid idea." Brealey, Myers, and Marcus (2001) says the logic is so foolish "there is little point in dwelling on its deficiencies." According to Ross et al. (2009), the payback-period rule "doesn't ask the right question. Because time value is ignored, the payback period reflects how long it takes to break even in an accounting sense, but not in an economic sense."

We argue that these textbooks are not studying the right objective. The "accounting sense" is precisely what matters to an EPS maximizer. A project's payback period is an upside multiple. It is a way to quote a project's income yield, IY, which is analogous to using a PE ratio to talk about a firm's earnings yield, EY. Saying that a project will pay for itself within a few short years is analogous to saying that an M&A target can be acquired at a low multiple.

Proposition 5. *A project's payback period is an upside multiple given by*

$$\text{Cost} = \mathbb{E}[\Delta\text{NOI}_1] \times \underbrace{\left(\frac{1}{\text{IY}}\right)}_{\substack{\text{Payback} \\ \text{period}}} \tag{14}$$

Think back to BP's (NYSE:BP) reasons for buying out Bunge's (NYSE:BNG) 50% stake in Bioenergia in Figure 7. The firm pointed out that Bunge was valuing Bioenergia at \$2.8b, less than 4× the company's annual net operating income of \$800m. Thus, the acquisition would be accretive due to its very high income yield, $\text{IY} > 1/4\times = 25\%$. BP could just as easily have said the biofuel company would generate enough income over the next $4 = 1/25\%$ years to pay back the \$1.4b cost of acquiring a 50% stake, $\{50\% \times \$800\text{m/yr}\} \times 4\,\text{years} = \$1.6\text{b}$.

3.4 Multiple Metrics

74.9% of the 392 CFOs in Graham and Harvey (2001)'s survey reported using the positive-NPV rule. Yet, an even larger share of survey participants (75.6%) reported using an IRR. Graham and Harvey also found that more than half of CFOs (56.7%) reported looking at a project's payback period, and roughly 2 in 5 (38.8%) considered a target company's PE ratio when evaluating an M&A deal.

The coexistence of so many project-evaluation metrics is "a puzzle" (Brealey et al., 2001) from the perspective of textbook theory. "Given that NPV seems to be telling us directly what we want to know, you might be wondering why there are so many other procedures and why alternative procedures are commonly used. (Ross et al., 2009)" There is a prominent callout box in Berk and DeMarzo (2007) discussing the persistence of "rules other than the NPV rule."

But there is no puzzle if managers are maximizing EPS, rather than NPV. Our model accounts for the widespread use of these other popular metrics. IRRs offers a way to assess how accretive a project will be. A project's payback period is a way of quoting its income yield as a multiple. In the following section, we will see that investing in projects that have short payback periods is directly analogous to buying targets that have low PE ratios.

Why then did so many of the CFOs in Graham and Harvey (2001) claim to be calculating NPVs? This finding is especially puzzling given the results in Graham et al. (2005). While the first paper "did not ask managers whether they select projects primarily to increase earnings Welch (2008)," the second paper did. 257 of the 305 CFOs surveyed in the later study said that earnings was one of their three most important performance metrics.

Experimenter demand (Schwarz, 1999) offers one plausible explanation for why CFOs reported using NPVs in Graham and Harvey (2001). Most CFOs have MBA training. They know that the "correct" answer on any finance exam is to use the positive-NPV rule. When two finance professors sent out a questionnaire on capital budgeting, it was only natural that many respondents would reflexively tick the NPV box. These CFOs were taught that the positive-NPV rule was the gold standard. They might have even felt a bit self-conscious admitting how often they did not use it.

4 Some Applications

An EPS maximizer invests in accretive projects that are expected to generate enough income over the next year to cover their own short-term financing. This is the max EPS analog to the positive-NPV rule. And, unlike the textbook approach, it produces subtle context-dependent decision-making even before introducing further complications to the model. It is not a knuckle-dragging brute-force bias. max EPS has an internal logic all its own. In this section, we highlight this fact by looking at several different applications.

4.1 M&A Method of Payment

Why might one company pay target shareholders with cash while another pays with stock? For example, we saw in Figure 2 that IBM typically pays target shareholders in cash. By contrast, after Cisco Systems (Nasdaq:CSCO) went public in February 1990, the company went on an equity-financed buying spree. "From fiscal 1994 through fiscal 2001 (years ending in the last week of July), Cisco made 71 acquisitions. [...] The purchase price of these 71 acquisitions...totaled \$34.2b, of which 98% was paid in Cisco shares."[11]

Our simple max EPS model predicts that an acquirer will pay with stock if its PE ratio is sufficiently high, $\text{PE} = 1/\text{EY}$. The principle of EPS maximization implies that PE ratios are not just some ad hoc measure of price to fundamentals. When making capital-budgeting decisions, a CEO cares about whether equity markets are the cheapest financing option, $\text{PE} > 1/\text{rf}$, not whether her share price is higher than its fundamental value. A firm's PE ratio, $\text{PE} \propto \$1 \times \left(\frac{1}{\text{EY}}\right)$, tells you how much equity capital a firm can get in exchange for \$1 of earnings.

For a $\text{EY}^G = 3\%$ growth stock, shareholders are willing to fork over \$33 in exchange for each \$1 of earnings. For a $\text{EY}^V = 6\%$ value stock, they are only willing to exchange \$17 of capital for \$1 of earnings. When the riskfree rate is $\text{rf} = 5\%$, a $\text{PE}^G = 33\times = 1/3\%$ growth stock will view equity as the cheapest route since $1/5\% = 20\times$. The firm is a growth stock in this setting since $\text{EY} < \text{rf}$ implies $\text{PE} > 1/\text{rf}$.

[11] M. Carpenter and W. Lazonick. "Cisco Systems and Financialization." *Institute for New Economic Thinking.* Feb 28 2023.

If the same company were operating in a $\text{rf} = 2.5\%$ environment rather than a $\text{rf} = 5\%$ regime, then its EPS-maximizing CEO would have opted for cash financing since $1/2.5\% = 40\times > 33\times \approx 1/3\%$. The lower interest rate in this counterfactual is enough to convert the company into a value stock, $\text{EY} > \text{rf}$ and $\text{PE} < 1/\text{rf}$. This transformation can occur even if the company's fundamentals do not change one iota.

Proposition 6. *When running a growth stock* ($\text{EY} < \text{rf}$; $\text{PE} > 1/\text{rf}$), *an EPS maximizer will pay target shareholders in stock because issuing equity will be less dilutive than spending cash. When running a value stock* ($\text{EY} > \text{rf}$; $\text{PE} < 1/\text{rf}$), *the same EPS maximizer would pay target shareholders in cash.*

IBM paid cash for Lotus in 1995 because the Treasury rate was lower than the firm's forward earnings yield, $\text{rf} \approx 6.5\% < 9\% \approx \text{EY}$. Had the firm been trading at a $20\times$ multiple rather than at $1/9\% \approx 11\times$, IBM would have chosen to pay in equity since $\text{EY} = 1/20\times = 5\% < 6.5\% \approx \text{rf}$. The same logic explains why Cisco Systems spent much of the 1990s using equity to pay for one acquisition after another. Its PE ratio hovered around $\text{PE} \approx 50\times$ for much of the decade, giving the firm access to dirt-cheap equity financing, $\text{EY} \approx 1/50\times = 2\%$.

While it is not our main focus in this paper, the principle of EPS maximization also affects how CEOs select M&A targets. EPS maximizers look to acquire companies that will boost their own expected NOIs, $\mathbb{E}[\Delta\text{NOI}_1^{\text{Acq}}] \overset{\text{def}}{=} \mathbb{E}[\text{NOI}_1^{\text{Acq+Tgt}}] - \mathbb{E}[\text{NOI}_1^{\text{Acq}}]$. Thus, it is possible to express the income yield on an M&A deal as

$$\text{IY}^{\text{Acq}} = \frac{\mathbb{E}[\Delta\text{NOI}_1^{\text{Acq}}]}{\text{DealValue}} \tag{15}$$

Under certain conditions, an M&A deal's income yield will match the target company's earnings yield prior to announcement

$$\text{IY}^{\text{Acq}} = \text{EY}^{\text{Tgt}} \quad \Leftrightarrow \quad \begin{matrix} \mathbb{E}[\Delta\text{NOI}_1^{\text{Acq}}] = \mathbb{E}[\text{Earnings}_1^{\text{Tgt}}] \\ \text{and} \\ \text{DealValue} = \text{MarketCap}^{\text{Tgt}} \end{matrix} \tag{16}$$

First, the acquirer must be able to add the target's expected earnings to their own income in a straightforward way, $\mathbb{E}[\Delta\text{NOI}_1^{\text{Acq}}] = \mathbb{E}[\text{Earnings}_1^{\text{Tgt}}]$. Second, for $\text{IY}^{\text{Acq}} = \text{EY}^{\text{Tgt}}$, the acquirer cannot overpay, $\text{DealValue} = \text{MarketCap}^{\text{Tgt}}$.

These two assumptions highlight the logic behind a specific kind of accretive M&A deal, which is sometimes called “multiples arbitrage” or a “roll-up strategy”. Given that PE = 1/EY, a high-multiple company can increase its EPS by pursuing uncomplicated M&A deals in which they pay market prices for low-multiple targets (Guthmann and Dougall, 1940; Childs, 1971). Cisco’s approach to M&A activity during the 1990s is a perfect example. The company’s “goal [was] to be smoothly shipping the acquired company’s products under the Cisco label by the time the deal [was] officially closed, usually in 3-to-6 months.”[12]

Textbooks typically argue that asymmetric information is key to understanding M&A method of payment. The acquiring CEO is assumed to know exactly what her firm’s share price ought to be (Myers and Majluf, 1984; Hansen, 1987). By contrast, as outsiders, target shareholders are only able to make an educated guess. Sometimes, their guess will be a bit high. The idea is that equity-financed M&A deals occur when the acquiring CEO notices that target shareholders are overvaluing her shares. Otherwise, she pays cash.

While this logic might describe how some real-world corporate executives have behaved in certain situations, it does not capture the logic behind Cisco’s stock-financed acquisition spree in the 1990s and early 2000s. The target shareholders in Cisco’s first few deals might have been overvaluing the company’s stock. But, by 1997, Cisco had “spent more than $5b and added more than 2,000 employees to its own rapidly expanding work force.”[12] Financial journalists had begun calling the start-ups purchased by Cisco the “Cisco kids” in reference to a 1950s TV series starring Duncan Renaldo.

Once Cisco spent its first $5b, it was already common knowledge that they paid target shareholders in stock. Asymmetric information cannot explain why the company did another $29.2b in stock-financed acquisitions from 1998 through 2002. Cisco’s M&A strategy is perfectly consistent with our max EPS approach, which does not rely on asymmetric information. In fact, the EPS-maximizing CEO in our model acts like a “cross-market arbitrageur” (Ma, 2019) trying to time the market (Baker et al., 2003) without ever needing to know what her firm’s theoretically correct price is or how it was determined.

[12]G. Rifkin. “Growth by Acquisition: The Case of Cisco Systems.” *Strategy+Business.* Apr 1 1997.

Roll-up strategies were also common in the 1960s (Servaes, 1996) and led to the rise of numerous conglomerates, such as ITT Corp (NYSE:ITT)[13] and Gulf+Western (NYSE:GW)[14]. At the same time, not every M&A deal fits the "multiples arbitrage" template. When IBM paid $34b for Red Hat in 2019, they were not buying cheap assets. They were buying growth and relevance. Red Hat was "expected to post 15%-16% sales growth over the next two years", and IBM wanted to be seen as a hybrid-cloud leader, not just a legacy IT company. The company was trying to catch up with Amazon and Microsoft.[15] And the market has largely vindicated their decision. IBM's market cap grew from $105b in October 2018 to ~$200b in 2024.[16]

EPS maximization does not forbid low-PE acquirers from sometimes purchasing a high-PE target. It only says that M&A deals should be accretive. When the increase comes from paying a fair price for the target company's expected earnings, the acquiring CEO can say it is multiples arbitrage and everyone will be happy. Whereas, if the increase originates from elsewhere, a CEO needs to offer a compelling story for where the gains come from.

EPS accretion is not a loose hand-wavy metric that CEOs rely on when complex synergies make it challenging to perform NPV calculations (Sirower, 1997). The exact opposite is true. The positive-NPV rule is fuzzy about what exactly constitutes a "synergy"; whereas, the principle of EPS maximization offers a precise definition. Synergies are reasons to believe that an M&A deal will be accretive, $\mathrm{IY} > \mathrm{FY}$, even though the target company is currently trading at a higher multiple, $\mathrm{PE}^{\mathrm{Tgt}} > \mathrm{PE}^{\mathrm{Acq}}$.

4.2 Investment-Cash Flow Sensitivity

Financing constraints are very real and very important. Constrained firms have a harder time accessing external capital and therefore find it more difficult to start projects. Constraints come in many different shapes and sizes. So, for

[13] M. Weil. "ITT Empire Builder Harold Geneen Dies at 87." *Washington Post.* Nov 22 1997.
[14] W. Blair. "The Big Sell-Off: Gulf+Western Slims Down." *Time.* Aug 29 1983.
[15] L. Sun. "How Does IBM's Red Hat Acquisition Impact its Yield?" *The Motley Fool.* Oct 31 2018.
[16] Morgan. "IBM's Red Hat Acquisition To Pay for Itself by Next Year." *Next Platform.* Oct 24 2024.

the past 40+ years, researchers have been searching for a simple way to identify constrained firms using a cross-sectional sorting rule.

Fazzari et al. (1988) reasoned that, without access to external capital markets, the CEO of a constrained firm will not be able to finance new projects as they show up on her desk. The manager will have to wait until she can finance the project using internal cash reserves. By contrast, an unconstrained firm could use external capital markets to finance positive-NPV projects as soon as they arrived, giving them a lower investment-cash flow sensitivity.

As a benchmark to compare against, Fazzari et al. (1988) sorted firms based on their trailing dividend-payout ratio. The authors figured that a company cannot be that constrained if it can afford to pay out a large fraction of its gross income to shareholders each year. However, subsequent work by Kaplan and Zingales (1997) called this logic into question. They read the annual reports of 49 firms that Fazzari et al. (1988) labeled as “constrained” and found that these companies were able to repeatedly access external capital markets.

Decades of subsequent research have yet to produce a reliable universal way to distinguish between constrained and unconstrained firms. Researchers get conflicting results when sorting on different variables. Moreover, the same proxy often seems to imply different things at different points in time. Investment-cash flow sensitivity is related to financial constraints in a subtle context-dependent way. . . and that is exactly what the principle of EPS maximization predicts.

EPS maximizers make subtle context-dependent financing choices. They use cash reserves when it is their cheapest source of capital. If market conditions change and it becomes cheaper to issue equity or sell bonds, then they do that instead. Cross-sectional sorting rules are irrelevant. What matters is whether spending cash is cheaper than the cheapest alternative at the time, not whether a firm is in the top/bottom 30% of all public companies.

Proposition 7. *When running a growth stock* $(\mathrm{EY} < \mathrm{rf};\ \mathrm{PE} > 1/\mathrm{rf})$*, an EPS maximizer will have a low investment-cash flow sensitivity because issuing equity will be less dilutive than spending cash. When running a value stock* $(\mathrm{EY} > \mathrm{rf};\ \mathrm{PE} < 1/\mathrm{rf})$*, an EPS maximizer will have a high investment-cash flow sensitivity because spending cash would now be her cheapest financing option.*

Our simple max EPS model does not merely predict when a CEO will prefer to spend cash, it also accounts for academic researchers' conflicting findings on this topic over the past several decades. EPS maximizers care about whether $\text{PE} \lesseqgtr 1/\text{rf}$, not the level of her multiple in isolation or its rank relative to other companies. When looking at the world through max EPS-colored glasses, a PE ratio is not just any old financial ratio. It is special. It is the inverse of the cost of equity capital. It tells you how much money the stock market is willing to give the manager in exchange for $1 of her firm's expected earnings.

Consider an EPS-maximizing manager who is initially running a company with $\text{EY} = \text{i} = 6\%$. In a world where $\text{rf} = 4\%$, this CEO will use cash to finance new projects because each \$1 buys her $\$1 \times \left(\frac{1}{4\%}\right) = \$25$ of capital. Equity and debt markets are only offering her $\$1 \times \left(\frac{1}{6\%}\right) \approx \$17$ in exchange for the same \$1 of expected earnings. If the company's forward earnings yield suddenly fell by 300bps to $\text{EY} = 3\% < 4\% = \text{rf}$, then the CEO would switch to equity financing. She no longer has to settle for \$25 per \$1 of earnings. Equity markets now offering her $\$1 \times \left(\frac{1}{3\%}\right) \approx \$33$. And, if the riskfree rate were to subsequently fall to $\text{rf} = 2\%$, this EPS-maximizing manager would switch back to using cash. In this third scenario, spending $\$1 \times \left(\frac{1}{2\%}\right) = \$50$ of cash would cost her \$1 of expected earnings next year.

The firm was initially a "value stock". It had a high earnings yield, $\text{EY} = 6\% > 4\% = \text{rf}$ and a low $\text{PE} = 1/6\% \approx 17\times < 25\times = 1/\text{rf}$. When its earnings yield dropped by half, the company turned into a growth stock, $\text{EY} = 3\% < 4\% = \text{rf}$ and $\text{PE} = 1/3\% \approx 33\times > 25\times = 1/\text{rf}$. Then, following the rate cut, the manager once again found herself at the helm of a value stock, $\text{EY} = 3\% > 2\% = \text{rf}$ and $\text{PE} = 1/3\% \approx 33\times < 50\times = 1/2\% = 1/\text{rf}$. As a result, the CEO's investment-cash flow sensitivity jumped even though nothing about her company changed.

4.3 Convertible Bonds

How do EPS-maximizing managers handle projects that take several years to bear fruit? The CEO in our baseline setup would never invest in such a project. Without producing income next year, a project cannot pay for its own financing. Nevertheless, in practice, large public companies do invest in long-term projects that have non-zero build times. We now explore how EPS maximizers use debt financing to make these projects accretive.

Consider a project with Cost $> \$0$ today. Eventually, this project will deliver an income yield of $\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}]}{\text{Cost}}$ just like before. The only difference is that, now, the project has a "time to build" of $\text{T2B} \in \{0, 1, 2, \ldots\}$ years. While it is under construction, the project only generates a tiny amount of income (or maybe none at all). Let $\epsilon \approx 0\%$ denote the project's interim income yield during the first T2B years. Assume that $\text{IY} \gg \epsilon \geq 0\%$.

When $\text{T2B} = 0$, a project immediately starts generating income in year $\{\text{T2B}+1\} = 1$. This is the setting we have been studying so far. By contrast, when $\text{T2B} = 1$, a project's income yield is $\epsilon \approx 0\%$ in year 1 while under construction. Then, once operational, the project's income yield jumps up to its steady-state level of $\text{IY} \gg \epsilon$ from year $\{\text{T2B} + 1\} = 2$ onward. Investing in a project with $\text{T2B} = 10$ would produce an income yield of $\epsilon \approx 0\%$ for the first 10 years and followed by an income yield of $\text{IY} \gg \epsilon$ from year $\{\text{T2B} + 1\} = 11$ onward.

If a project has a low (but non-zero) income yield while under construction, $\epsilon > 0\%$, then an EPS maximizer may be able to use convertible bonds to finance it. For example, in August 2017 Tesla (Nasdaq:TSLA) issued \$1.8b worth of corporate bonds. With its single-B credit rating, the company had to pay a $\text{i} = 5.3\%$ coupon rate on these plain-vanilla bonds.[17] Whereas, in March 2017 Tesla was able to sell \$850m in convertible bonds at an interest rate of $\tilde{\text{i}} \approx 2.4\%$.

Tesla's convertible bonds allowed the owner to exchange \$1,000 of principal for 3 shares of TSLA stock. Tesla was trading at ~\$265/sh in March 2017. So, for this option to be in the money, its price needed to rise by ~25% to $\left(\frac{\$1{,}000}{3\,\text{shares}}\right) \approx \$333/\text{sh}$. Given Tesla's historical volatility, it did not seem out of the question that the company's share price might climb to, say, \$350/sh. In that case, each \$1,000 convertible bond would deliver an extra $\{\$350/\text{sh} - \$333/\text{sh}\} \times 3\,\text{shares} \approx \$51$. "Investors were rather attracted to the possibility that they could convert the bonds into stocks if Tesla's stock price appreciated enough."[18] They were willing to give Tesla \$1,000 of capital for $2.4\% \times \$1{,}000 \approx \$24$ in interest.

[17] E. Chang. "Tesla's first junk bond offering is a hit." *CNBC.* Aug 11 2017.
[18] E. Benmelech. "Tesla's Offering: Not Their First nor Their Last." *KelloggInsight.* Oct 2 2020.

By issuing convertible bonds, Tesla could make a project with a short-run income yield of just $\epsilon > \tilde{\imath} \approx 2.4\%$ seem accretive. But this financing scheme only makes sense for projects that were expected to have a much higher steady-state income yield once operational, $\text{IY} \gg \text{i} = 5.3\%$. After all, if a project went well, then Tesla's price would rise, causing bondholders to exercise their conversion option, leading to higher financing costs going forward. Tesla's March 2017 SEC filing spells out this exact logic.[19] Graham and Harvey (2001) found that "among firms that issue convertible debt, the most popular factor is that convertibles are an inexpensive way to issue delayed common stock."

Suppose a CEO learns about a promising project that has a non-zero build time, $\text{T2B} > 0$. When she calls up Goldman to inquire about external financing, the first thing they do is look at her PE to get a handle on her firm's cost of equity capital. Then, Goldman quotes her some interest rates on various borrowing options, including convertible debt. After getting off the call, the manager checks whether the project's income yield is large enough to cover the lowest number Goldman quoted her. If yes, the project is accretive and she invests. If no, it is dilutive and she does not.

The EPS-maximizing CEO does not need to know how Goldman came up with the interest rates on her firm's various bond-financing options. She takes these prices as given. However, assuming that bond markets correctly price a firm's future payoffs, we can predict that Goldman will quote systematically different numbers to high- and low-PE firms. To have a high PE ratio, a company must have lots of future upside for bond markets to participate in. Had Tesla's share price been less volatile, creditors would not have offered such a large rate reduction in exchange for convertibility.

Tesla's PE ratio has not dropped below 30× since it first reported positive earnings in Q4 2020. When Goldman gets a call from this sort of growth stock ($\text{EY} < \text{rf}$; $\text{PE} > 1/\text{rf}$), they think to themselves: "Equity investors are willing to pay a lot for a little of the company's earnings. The firm must have significant growth potential." And, as a result, Goldman will quote the CEO a low interest

[19]Tesla. SEC Filing 424(b)(5) #333-211437. Mar 15 2017. [Source]

rate on convertible debt. Bondholders ought to be willing to offer a sizable discount for the opportunity to participate in this upside.

By contrast, when Goldman fields a call from an otherwise similar value stock ($\text{EY} > \text{rf}$; $\text{PE} < 1/\text{rf}$), they see that equity investors are not willing to pay much for the company's expected earnings. Hence, the firm must not have much growth potential. And, as a result, Goldman will quote this CEO an interest rate on convertible debt that is barely below the rate on standard bonds. It is nothing personal. Why should bondholders offer the value stock a discount for the privilege of participating in its non-existent upside?

Proposition 8. *Consider two EPS-maximizing companies: one is a value stock* ($\text{EY} > \text{rf}$; $\text{PE} < 1/\text{rf}$), *the other is a growth stock* ($\text{EY} < \text{rf}$; $\text{PE} > 1/\text{rf}$). *Next year, both firms have identical expected incomes,* $\mathbb{E}[\text{NOI}_1]$, *and down-state payoffs,* FirmValue_d. *The ability to issue convertible debt gives the EPS-maximizing manager of the growth stock access to a strictly larger set of accretive projects.*

In theory, a company could have so much potential upside that credit markets would be willing to buy a zero-coupon convertible bond, $\tilde{\imath} = 0\%$. To an EPS maximizer, a zero-coupon convertible would look like free money, allowing her to raise capital without having to pay interest next year or issue new shares today. In practice, it was rare for a company to have so much potential upside that bond markets would stomach a zero-coupon offering prior to 2020.

COVID changed all that. Suddenly, creditors expected every company to be doing much better once the pandemic was over. "Issuance of convertible bonds in May 2020 hit a record high of $20.7b…as companies struggling with the impact of the coronavirus pandemic ventured into the one-time niche market seeking cheaper and easier ways to borrow cash."[20]

By August, regulators moved to close the loophole with Accounting Standards Update (ASU) 2020-06. "Under the new guidance…all convertible debt [must use] the 'if-converted' method."[21] Now that the updated rules have taken effect,

[20] K. Duguid and I. Moise. "Financing hunt during pandemic lifts convertible debt issuance to record." *Reuters.* Jun 2 2020.

[21] J. Schaeffer and N. Guruji. "Recent FASB Simplifications to Convertible Bond Accounting." *EquityMethods.* Oct 4 2020.

if a company issues a zero-coupon convertible, then its EPS would immediately reflect the number of shares that could be created by bondholders.

This extreme episode suggests we are capturing something important about how market participants think. Convertible bonds occupy a gray area between debt and equity. Our model points to a loophole that clever CEOs could exploit. When COVID gave corporate executives the opportunity to do so in 2020, they went for it. Smart people do not keep on walking when they see a $100 bill lying on the street. Regulators responded by immediately closing this loophole with ASU 2020-06. The acronym "EPS" appears 177 times in this document.

4.4 Capitalized Interest

For qualifying $\text{T2B} > 0$ projects that generate no income while under construction, $\epsilon = 0\%$, GAAP ASC 835-20 allows a firm to capitalize the interest expense incurred during the first T2B years for earnings purposes. The company still has to make these interest payments. The expense just does not dilute the firm's earnings. Instead, it gets rolled into the project's cost basis.

To illustrate, consider a $\{\text{T2B} = 1\}$ project with an upfront price tag of $\text{Cost} = \$100\text{k}$. The project will not generate any income in year 1. Then, starting in year 2, it will yield a constant annual income boost of $\mathbb{E}[\Delta\text{NOI}] = \$5{,}000$ from there on out. The EPS-maximizing manager of a $\text{EY} = 3\%$ growth stock would not fund this project by issuing \$100k in equity. That tactic would come with an immediate earnings cost of $3\% \times \$100\text{k} = \$3{,}000$ next year.

However, in a world where $\text{rf} = 4\%$, this growth-stock manager could add $\left(\frac{+\$810}{\#\text{Shares}}\right)$ to her EPS by taking out a \$100k riskfree loan and capitalizing the $4\% \times \$100\text{k} = \$4{,}000$ interest expense in year 1. Her firm will still have to make a \$4,000 payment to its creditors next year, but this initial interest expense will not dilute her earnings. Rather, it gets added to the project's cost, $\widetilde{\text{Cost}} = \$100\text{k} + \$4{,}000 = \$104\text{k}$, making its adjusted income yield 19bps lower once operational, $\left(\frac{\$5{,}000}{\$104\text{k}}\right) \approx 4.81\%$. In the CEO's mind, it is as if the capitalized interest expense reduces the project's expected income in year 2 from \$5,000 to $4.81\% \times \$100\text{k} \approx \$4{,}810$. Nevertheless, the project is still accretive because \$4,810 is enough to cover its \$4,000 steady-state funding cost.

More generally, when a manager capitalizes $\text{T2B} > 0$ years of interest expense, the project's new cost basis becomes

$$\widetilde{\text{Cost}} = \text{Cost} + \text{T2B}\times\text{i}\cdot\text{Cost} \tag{17a}$$

$$= \text{Cost}\times\{1+\text{i}\cdot\text{T2B}\} \tag{17b}$$

The larger cost basis, $\Delta\log\widetilde{\text{Cost}} = +\text{i}\cdot\text{T2B}$, makes the project look proportionally worse once operational. And, as a result, EPS-maximizing managers require projects with long build times to have higher steady-state income yields.

Proposition 9. *Consider a* $\text{T2B} > 0$ *project with a steady-state income yield of* IY *once operational. To be accretive under the capitalized-interest exemption, the project's steady-state income yield must satisfy*

$$\text{IY} \;>\; \text{i}\cdot\{1+\text{i}\cdot\text{T2B}\} \tag{18}$$

If the project is expected to deliver the same annual income boost from year $\{\text{T2B}+1\}$ *onward, then this rule is equivalent to requiring the project's* IRR *including the first* T2B *years to exceed the marginal interest rate,* $\text{IRR} - \text{i} > 0\%\text{pt}$.

While real-world corporate executives often evaluate $\text{T2B} > 0$ projects using IRRs, CEOs need not be discount anything. "IRR is a characteristic of a project's cash flows. It is not an interest rate. (Welch, 2008)" $\{1+\text{i}\cdot\text{T2B}\}$ is not the same as $(1{+}\text{i})^{\text{T2B}}$. Repeated multiplication, $(1{+}2\%)^{10} = (1{+}2\%){\times}(1{+}2\%){\times}\cdots{\times}(1{+}2\%) \approx 121.9\%$, stems from different underlying principles than repeated addition, $2\%\times 10 = 2\%+2\%+\cdots+2\% = 20\%$. Nevertheless, the two functional forms tend to point in similar directions. Including an extra 2% increases the result by ~2%pt in both cases: $(1+2\%)^{11} = 124.3\%$ and $2\%\times 11 = 22\%$. This explains why it is possible to continue using the same IRR-hurdle rule when evaluating debt-financed $\text{T2B} > 0$ projects with capitalized interest expense. It will give roughly the same answer as the more complicated income-yield calculation.

NPV- and EPS-maximizing managers are both put off by long build times, but for different reasons. A textbook NPV maximizer looks at a project that will take $\text{T2B} = 10$ years to complete and thinks: "The eventual payoff does not look very big after discounting it 10 times in a row." An EPS maximizer looks at the same project and thinks: "The income yield looks terrible after capitalizing an additional 10 years of interest expense into the cost." When interest rates are low, each additional year of capitalized interest adds a smaller amount to the project's cost basis. Low interest-rate environments will encourage EPS maximizers to roll the dice on projects with longer build times.

Corollary 9a. *Consider a* $\mathrm{T2B} > 0$ *project with a steady-state income yield of* IY *once operational. To be accretive for a company with a marginal interest rate of* i*, the project must be operational in under*

$$\mathrm{T2B}_{\mathrm{max}} \overset{\mathrm{def}}{=} \frac{\mathrm{IY} - \mathrm{i}}{\mathrm{i}^2} \tag{19}$$

Suppose a CEO wants to finance a $\mathrm{IY} = 9\%$ project by issuing bonds and capitalizing the initial interest expense. If the manager can borrow at i = 2%, she is willing to wait $\left(\frac{9\%-2\%}{2\%^2}\right) \approx 175$ years for the project to become operational. If her marginal interest rate is i = 4%, the manager needs the same project to bear fruit within $\left(\frac{9\%-4\%}{4\%^2}\right) \approx 31.2$ years. If the CEO has to pay i = 8%, the project must mature in under $\left(\frac{9\%-8\%}{8\%^2}\right) \approx 1.6$ years.

It is important to emphasize that firms can only capitalize interest expense. So, in addition to increasing a project's cost basis, the capitalized-interest exemption also pushes companies away from their preferred source of capital. Growth stocks ($\mathrm{EY} < \mathrm{rf}$; $\mathrm{PE} > 1/\mathrm{rf}$) see equity as cheap. They would like to finance all projects this way. However, because only interest expense can be capitalized, they must issue bonds to finance a $\mathrm{T2B} > 0$ project. These practical accounting wrinkles explain why growth stocks occasionally issue bonds.

Theoretically speaking, a firm should also be able to capitalize the earnings cost of new equity, EY×Cost. Companies frequently report a diluted EPS statistic, $\mathrm{DilutedEPS} \overset{\mathrm{def}}{=} \frac{\mathbb{E}[\mathrm{Earnings}_1]}{\#\mathrm{Shares}+\mathbb{E}[\Delta\#\mathrm{Shares}]}$, which pretends that hypothetical future shares have already been issued. If it is acceptable to include these vapor-shares a little early, why not let firms wait until a $\mathrm{T2B} > 0$ project is operational before including the shares that were issued to finance it?

Corollary 9b. *A CEO has financed her existing assets with the EPS-maximizing* $\text{Debt}_\star$*. Immediately afterwards, she issues bonds worth* $\text{Cost} > \$0$ *to fund a* $\text{T2B} > 0$ *project and capitalizes the initial interest expense. If the CEO created a growth stock* $(\text{EY} < \text{rf};\ \text{PE} > 1/\text{rf})$*, then these new bonds will represent* 100% *of her total debt,* $\frac{\text{Cost}}{\text{Debt}_\star + \text{Cost}} = 1$*. If the CEO started a value stock* $(\text{EY} > \text{rf};\ \text{PE} < 1/\text{rf})$*, then the new bonds will be a small fraction of total borrowing,* $\frac{\text{Cost}}{\text{Debt}_\star + \text{Cost}} \ll 1$.

A similar line of reasoning applies to the decisions of value stocks $(\text{EY} > \text{rf};\ \text{PE} < 1/\text{rf})$. Cash is the cheapest source of capital for this group of firms. But there is no way to capitalize the opportunity cost of spending cash. So, for $\text{T2B} > 0$ projects, value-stock managers are forced to borrow.

Again, there is no theoretical justification for restricting the capitalization exemption to interest expense. Holding cash is like negative debt. When a firm has cash reserves, it is as if they are lending at the riskfree rate. The EPS implications are the same either way. Hence, if it is permissible to capitalize interest expense, $\text{i} \times \text{Cost}$, there can be no reason to prevent the firm from capitalizing foregone interest income, $\text{rf} \times \text{Cost}$.

5 Supporting Evidence

This section provides empirical evidence in support of our main findings. We document that acquirers tend to pay target shareholders by issuing shares when it costs the least earnings to deliver payment this way. We find that companies have high investment-cash flow sensitivities when cash is their cheapest available source of capital. When a growth stock $(\text{EY} < \text{rf};\ \text{PE} > 1/\text{rf})$ issues debt, we show that these bonds are more likely to contain features like convertibility and have capitalized interest expense.

5.1 Data Description

We create an annual dataset of firm characteristics by merging variables from WRDS' Ratios Suite onto annual Compustat data. We use daily price data from CRSP. We rely on the IBES unadjusted summary file when calculating each firm's forward earnings yield and EPS. We also retrieve data from several other sources. The riskfree rate rf is the 10-year Treasury rate. Our data on new bond issuance comes from SDC.

We include public companies traded on NYSE, Nasdaq, or AmEx that have a share code of 10 or 11 (common stocks) and a share price over \$5. We exclude firms below the 30th percentile of the NYSE market capitalization in the month of their fiscal year-end. Following the existing literature, we also remove firms in the financial and utility industries (SIC codes 4900-4999 and 6000-6999). We winsorize all variables at the 1st and 99th percentile within each year. Each firm in year t has at least one analyst who made a next-twelve-month EPS forecast (end of fiscal year $t + 1$) at some point during the period from 11 months to 13 months prior to the end of the next fiscal year (year $t + 1$).

Our final dataset contains 44,155 firm-year observations over the period from 1978 to 2023. Since we use the PERMNO of a company's primary issuance as a unique identifier for that firm, we will talk about "firm" and "PERMNO" interchangeably. Table 1 reports summary statistics at the firm-year level. We double-cluster all standard errors by both firm and year.

5.2 Empirical Results

Our theoretical framework predicts that growth-stock acquirers ($\text{EY} < \text{rf};\ \text{PE} > 1/\text{rf}$) will prefer to pay target shareholders in stock. For this group of companies, issuing equity sacrifices the least earnings. By contrast, value-stock acquirers ($\text{EY} > \text{rf};\ \text{PE} < 1/\text{rf}$) should prefer to pay in cash whenever possible. Since their earnings yield is higher than the riskfree rate, the opportunity cost of spending cash reserves will be lower than that of issuing new shares.

To test this prediction, we study the subset of firms in fiscal year t that make at least one acquisition the following year, $|A_{n,t+1}| > 0$, where $a \in A_{n,t+1}$ denotes one of the acquisitions made by the nth public company in fiscal year $(t + 1)$. For each of these observations, we regress the percent of value that an acquirer delivered to target shareholders by issuing equity on a growth-stock indicator

$$\underbrace{100 \times \left(\frac{\sum_{a \in A_{n,t+1}} \text{StockPmt}_a}{\sum_{a \in A_{n,t+1}} \text{DealValue}_a} \right)}_{\text{\% paid to target shareholders in stock}} \overset{\text{OLS}}{\sim} \hat{\alpha} + \hat{\beta} \cdot \underset{(\text{EY} < \text{rf};\ \text{PE} > 1/\text{rf})}{\text{Is Growth Stock}_{n,t}} \qquad (20)$$

	# Obs	Avg	Sd	Min	Max
Is Growth Stock	44,155	36.7%			
Will Make Acquisition	44,155	19.3%			
% Paid to Tgt Shldrs in Stock	8,509	28.3%	38.0%	0.0%	100.0%
ΔCash / Assets	37,106	2.7%	14.2%	−39.1%	315.1%
CapEx / Sales	37,106	10.6%	19.8%	0.0%	310.2%
Will Issue Convertible	44,155	3.9%			
Promised Interest > $0	44,126	91.5%			
% of Debt with Capitalized Interest	39,862	6.6%	15.9%	0.0%	100.0%
$\log_2$(Market Cap)	44,134	31.0	2.2	25.7	38.5
Profitability	44,126	14.9%	10.7%	−54.9%	57.4%
Book To Market (B/M)	43,047	48.0%	35.3%	1.1%	298.5%
Tangibility	44,126	29.6%	22.6%	0.2%	93.2%

Table 1. Public companies from fiscal year $t = 1978$ to 2023. 'Is Growth Stock': Firm-year observation has a forward earnings yield below the 10-year Treasury rate, $\text{EY} < \text{rf}$. 'Will Make Acquisition': Firm acquires at least one other firm in fiscal year $(t + 1)$. '% Paid to Tgt Shldrs in Stock': Sum up the value of all the acquisitions an acquirer made in fiscal year $(t + 1)$. What percent of this total value was delivered to target shareholders in equity? 'ΔCash / Assets': Change in cash and cash equivalents from fiscal year t to year $(t + 1)$ as a percent of total assets in year t. 'CapEx / Sales': Capital expenditures in fiscal year $(t + 1)$ as a percent of total sales in year t. 'Will Issue Convertible': Percent of firms that issue a convertible bond in fiscal year $(t + 1)$. 'Promised Interest > $0': Percent of firms that have non-zero interest expense in fiscal year t. '% of Debt with Capitalized Interest': Among firms with non-zero interest expense in fiscal year t, what percent of interest expense comes from loans with at least 1 capitalized payment? '$\log_2$(Market Cap)': Base-2 log of market cap in fiscal year t. 'Profitability': Operating income before depreciation as a percent of total assets. 'Book To Market (B/M)': Book value of equity as a percent of market cap. 'Tangibility': Net PP&E as a percent of total assets.

Dependent Variable: % Paid to Target Shareholders in Stock

	(1)	(2)	(3)	(4)
Is Growth Stock EY < rf; PE > 1/rf	27.8*** (2.5)	19.9*** (1.9)	19.5*** (1.9)	23.3*** (2.1)
$\log_2$(Mkt Cap)				−2.0*** (0.4)
Profitability				−24.6* (12.6)
Book to Market				−14.3*** (3.8)
Tangibility				10.3** (3.8)
Firm FE	*N*	*Y*	*N*	*N*
Year FE	*N*	*N*	*Y*	*N*
# Obs	8,509	7,533	8,509	8,381
Adj. R^2	12.6%	25.1%	19.3%	14.5%

Table 2. '% Paid to Target Shareholders in Stock' represents the percent of an acquirer's total deal value in fiscal year $(t+1)$ that was delivered to target shareholders by issuing equity. 'Is Growth Stock' is a 1/0 indicator for observations that have a forward earnings yield below the 10-year Treasury rate, EY $<$ rf. Numbers in parentheses are standard errors double-clustered by firm and year. *, **, and *** denote statistical significance at 10%, 5%, and 1%. We do not report the intercept or fixed-effect coefficients. Sample includes public companies with an acquisition in fiscal year $(t+1)$.

Consistent with our theory, column (1) in Table 2 shows that growth-stock acquirers pay $\hat{\beta} = 27.8$%pt more to target shareholders in stock. Column (2) confirms that the effect persists after controlling for firm-specific considerations. In column (3), we see that around $1/3$ of the effect can be soaked up by year fixed effects. In the DotCom Era, high stock prices meant that there were more growth stocks (EY $<$ rf; PE $>$ $1/$rf) and more equity-financed acquisitions.

In column (4), we include controls for firm size, profitability, book-to-market, asset tangibility, and marginal tax rates. Adding these variables to our regression reduces $\hat{\beta}$ slightly, but the estimate is still statistically significant and economically large. This tells us something important: what matters is whether equity markets are a company's cheapest source of financing, not whether it looks "growthy" on other dimensions, such as book-to-market.

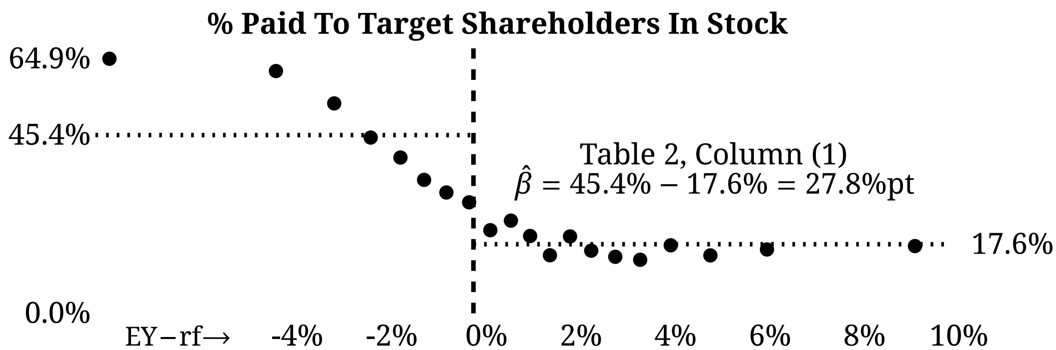


Figure 8. Binned scatterplot showing how likely an acquirer is to pay target shareholders with stock. x-axis: Difference between the acquirer's forward earnings yield and the 10-year Treasury rate in year t, EY − rf. Growth stocks are on the left (EY < rf; PE > 1/rf). Value stocks are on the right (EY > rf; PE < 1/rf). y-axis: Percent of an acquirer's total deal value in year $(t + 1)$ that was delivered to target shareholders by issuing equity. Sample includes public companies with an acquisition in fiscal year $(t + 1)$.

Figure 8 shows a shift in the equity-payment rate at the dividing line between value and growth stocks, EY = rf. Note that the location of this threshold has changed dramatically over time. In the early 1980s when the 10-year Treasury rate a little over 10%, a EY − rf = −1% growth stock had an earnings yield of EY = 9% and PE ratio of 1/9% = 11×. When the 10-year Treasury rate was sitting at ~2% in the late 2010s, a EY − rf = −1% growth stock had an earnings yield of EY = 1% and PE ratio of 1/1% = 100×. The companies trading at 11× in 1985 (Chrysler, NYSE:C; Bethlehem Steel, NYSE:BS) were qualitatively different from the ones trading at 100× in 2020 (Netflix, Nasdaq:NFLX; Zoom, Nasdaq:ZM). This fact helps ameliorate concerns about bunching in the running variable on either side of the threshold at EY − rf = 0%.

Because growth-stock acquirers (EY < rf; PE > 1/rf) prefer equity financing, our theory predicts that these companies will accumulate cash while simultaneously making large capital-intensive investments. Moreover, this pattern should hold regardless of whether the investment happens to an acquisition or some other kind of capital expenditure. We test this prediction by estimating the specification below for observations that made significant investments in fiscal year $(t+1)$. The dependent variable is the percent change in a company's cash and cash equivalents over the next twelve months

$$100 \times \left(\frac{\Delta \text{Cash}_{n,t+1}}{\text{Assets}_{n,t}} \right) \overset{\text{OLS}}{\sim} \hat{\alpha} + \hat{\beta} \cdot \underset{(\text{EY} < \text{rf}; \text{ PE} > 1/\text{rf})}{\text{Is Growth Stock}_{n,t}} \tag{21}$$

The left panel of Figure 9 shows that growth stocks ($\text{EY} < \text{rf}$; $\text{PE} > 1/\text{rf}$) that made at least one acquisition in fiscal year $(t+1)$ also added cash to their balance sheet worth around 7.3% of their assets. In column (1) of Table 3 panel (a), we find that this is 6.6%pt more than the typical value-stock acquirer ($\text{EY} > \text{rf}$; $\text{PE} < 1/\text{rf}$). Column (1) in panel (b) documents that, among observations with above-median CapEx / Sales in fiscal year $(t+1)$, growth stocks accumulate cash at a 5.3%pt faster rate.

In column (2) of both panels in Table 3, we see that around $1/2$ of the main effect can be soaked up by firm fixed effects. This does not constitute evidence against our model. It is exactly what one would expect if growth- and value-stock labels were persistent. The fact that $\hat{\beta}$ remains significant in column (4) when we include controls for firm size, profitability, book-to-market, and asset tangibility suggests that it is not explained by the usual firm-specific considerations.

Cash accumulation is flat at $\leq 1\%$ for all value stocks ($\text{EY} > \text{rf}$; $\text{PE} < 1/\text{rf}$) on the right-hand side of both panels in Figure 9. This strongly suggests that value stocks are financing their investment activity out of cash reserves. Again, this is true even though value-stock fundamentals have changed dramatically over the course of our sample period. In the early 1980s when the 10-year Treasury rate was ~10%, a $\text{EY} - \text{rf} = +2\%$ growth stock had an earnings yield of $\text{EY} = 12\%$ and PE ratio of $1/12\% \approx 8\times$. When Treasuries were at ~2% in the late 2010s, a $\text{EY} - \text{rf} = +2\%$ value stock had an earnings yield of $\text{EY} = 4\%$ and PE ratio of $1/4\% = 20\times$. When you picture a value stock trading at $\text{PE} \approx 8\times$ in 1985, you should think of DuPont (NYSE:DD). Whereas, Google (Nasdaq:GOOG) is a prototypical value stock trading at $\text{PE} \approx 20\times$ in 2020. The only thing these two companies have in common is their excess earnings yield of $\text{EY} - \text{rf} = 2\%$.

Convertible bonds offer EPS maximizers a way to lower the short-term funding requirements for projects that will take a while to become operational.

Dependent Variable: $100 \times \left(\frac{\Delta \text{Cash}}{\text{Assets}}\right)$

	Acquirers			
Panel (a)	(1)	(2)	(3)	(4)
Is Growth Stock EY < rf; PE > 1/rf	6.6⋆⋆⋆ (2.1)	3.8⋆⋆⋆ (1.1)	5.7⋆⋆⋆ (1.5)	4.2⋆⋆⋆ (1.0)
$\log_2$(Mkt Cap)				−0.5⋆⋆⋆ (0.2)
Profitability				−19.6 (14.0)
Book to Market				−10.9⋆⋆ (4.1)
Tangibility				−1.8 (1.2)
Firm FE	*N*	*Y*	*N*	*N*
Year FE	*N*	*N*	*Y*	*N*
# Obs	7,554	6,767	7,554	7,439
Adj. R^2	2.7%	8.7%	6.1%	5.2%

	High CapEx			
Panel (b)	(1)	(2)	(3)	(4)
Is Growth Stock EY < rf; PE > 1/rf	5.3⋆⋆⋆ (1.4)	2.0⋆⋆⋆ (0.6)	5.5⋆⋆⋆ (1.0)	2.6⋆⋆⋆ (0.7)
$\log_2$(Mkt Cap)				−0.6⋆⋆⋆ (0.1)
Profitability				−19.9⋆⋆ (7.6)
Book to Market				−6.7⋆⋆⋆ (1.6)
Tangibility				−5.2⋆⋆⋆ (1.2)
Firm FE	*N*	*Y*	*N*	*N*
Year FE	*N*	*N*	*Y*	*N*
# Obs	18,587	17,944	18,587	18,240
Adj. R^2	2.3%	17.0%	7.5%	6.5%

Table 3. '$100 \times \left(\frac{\Delta \text{Cash}}{\text{Assets}}\right)$' represents the change in a firm's cash and cash equivalents from fiscal year t to year $(t+1)$ as a percent of its total assets in fiscal year t. 'Is Growth Stock' is a 1/0 indicator for observations that have a forward earnings yield below the 10-year Treasury rate, EY < rf. Numbers in parentheses are standard errors double-clustered by firm and year. ⋆, ⋆⋆, and ⋆⋆⋆ denote statistical significance at 10%, 5%, and 1%. We do not report the intercept or fixed-effect coefficients. Panel (a) looks at the subset of observations with at least one acquisition in fiscal year $(t+1)$. Panel (b) looks at the subset with above-median CapEx / Sales in fiscal year $(t+1)$.

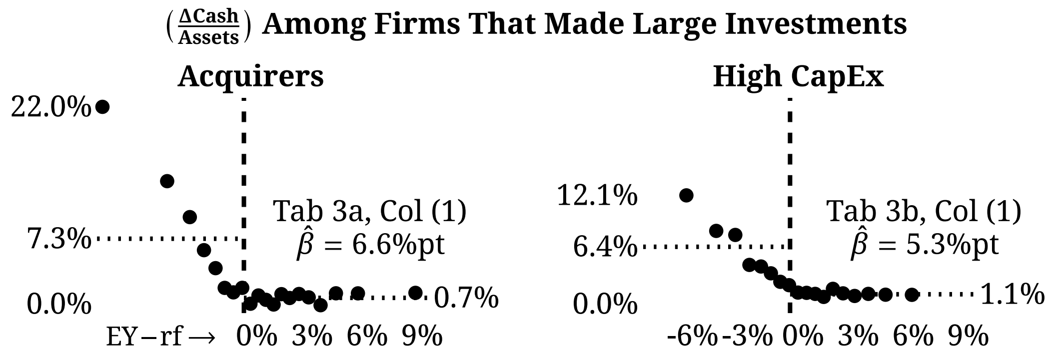


Figure 9. Binned scatterplot showing the change in a firm's cash reserves following a major investment. Left panel looks at the subset of observations where the company made at least one acquisition in fiscal year $(t+1)$. Right panel looks at the subset of observations with above-median CapEx / Sales for fiscal year $(t+1)$. x-axis: Difference between a firm's forward earnings yield and the 10-year Treasury rate in year t, EY − rf. Growth stocks are on the left (EY < rf; PE > 1/rf). Value stocks are on the right (EY > rf; PE < 1/rf). y-axis: Change in cash and cash equivalents from fiscal year t to year $(t+1)$ as a percent of total assets in fiscal year t.

All CEOs would like to avail themselves of this financing option. However, when pricing assets correctly, our model predicts that bond markets will only offer a significant discount to growth stocks (EY < rf; PE > 1/rf) in exchange for the convertibility option. As a result, convertible bond issuance should be more common among this group of firms.

We test this prediction by regressing an indicator for issuing convertible debt in fiscal year $(t+1)$ on a firm's value/growth status in year t

$$100 \times \text{Will Issue Convertible Bond}_{n,t} \overset{\text{OLS}}{\sim} \hat{\alpha} + \hat{\beta} \cdot \underset{(\text{EY} < \text{rf; PE} > 1/\text{rf})}{\text{Is Growth Stock}_{n,t}} \tag{22}$$

It is relatively rare to see a firm issue convertible debt. The summary statistics in Table 1 show that only 4 in 100 randomly selected observations will issue convertible debt the following year. Given the low base rate, the findings shown in Table 4 and the left panel of Figure 10 are economically massive. Column (1) shows that the average growth stock (EY < rf; PE > 1/rf) is $\hat{\beta}$ = 3.4%pt more likely to issue bonds with a conversion option the following year.

Dependent Variable: 100 × Will Issue Convertible Bond

	(1)	(2)	(3)	(4)
Is Growth Stock EY < rf; PE > 1/rf	3.4*** (0.5)	2.3*** (0.4)	3.7*** (0.6)	2.4*** (0.4)
$\log_2$(Mkt Cap)				−0.0 (0.1)
Profitability				−18.3*** (2.7)
Book to Market				−1.5** (0.6)
Tangibility				−0.1 (0.7)
Firm FE	*N*	*Y*	*N*	*N*
Year FE	*N*	*N*	*Y*	*N*
# Obs	44,155	43,273	44,155	43,047
Adj. R^2	0.7%	7.5%	1.6%	1.6%

Table 4. '100 × Will Issue Convertible' is a 100/0 indicator for observations that issue a convertible bond in fiscal year $(t+1)$. 'Is Growth Stock' is a 1/0 indicator for firm-year observations that have a forward earnings yield below the 10-year Treasury rate, EY < rf. Numbers in parentheses are standard errors double-clustered by firm and year. *, **, and *** denote statistical significance at 10%, 5%, and 1%. We do not report the intercept or fixed-effect coefficients.

Our baseline model predicts that, under normal conditions, a growth stock (EY < rf; PE > 1/rf) will prefer to finance new projects by issuing shares rather than selling bonds or spending cash. A $\text{EY}^G = 3\%$ growth stock can raise \$100k of capital at an earnings cost of just 3% × \$100k = \$3,000 by issuing equity. If the riskfree rate is rf = 4%, then the company would miss out on collecting a 4% × \$100k = \$4,000 by spending cash. If the firm issued \$100k in riskfree bonds, then it would have to pay \$4,000 in interest next year.

In a fair fight, equity financing always wins out in the eyes of an EPS-maximizing growth-stock CEO. So, when we do occasionally see growth stocks sell bonds, we can infer that equity had one hand tied behind its back. For example, EPS-maximizing managers can only capitalize interest.

Imagine that an EPS-maximizing manager decides to finance a \$100m project with a 2-year build time by selling 10-year bonds with a 6% annual coupon. As a result, the company makes a 6% × \$100m = \$6m interest payment each year

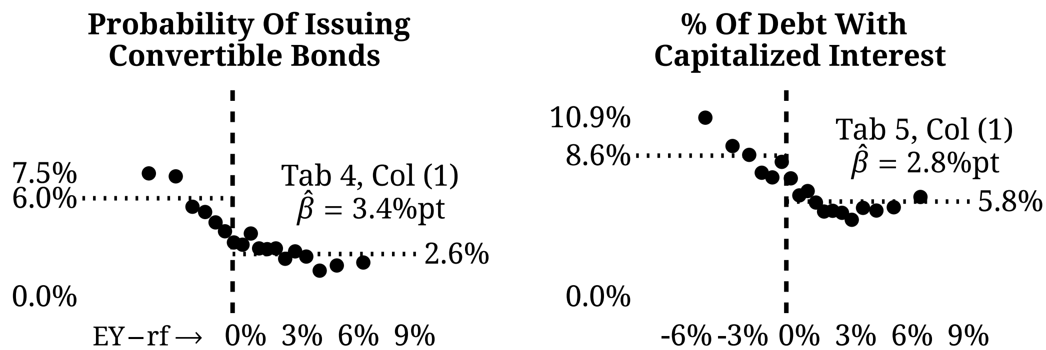


Figure 10. Binned scatterplot showing the prevalence of exotic debt features. x-axis: Difference between a firm's forward earnings yield and the 10-year Treasury rate in fiscal year t, EY−rf. Growth stocks are on the left ($\text{EY} < \text{rf};\ \text{PE} > 1/\text{rf}$). Value stocks are on the right ($\text{EY} > \text{rf};\ \text{PE} < 1/\text{rf}$). y-axis, left: Percent of observations that issue a convertible bond in fiscal year $(t+1)$. y-axis, right: Among the subset of observations with non-zero interest expense in fiscal year t, what percent of their interest expense is associated with loans that involve at least 1 capitalized payment?

for the following decade. We want to construct a variable that will have a value of 100% if this capitalized bond is the firm's only debt and a value of 0% if the firm was already highly levered for other reasons.

Compustat reports the amount of interest that the firm capitalized each year, $\text{CapInt}_{n,t}$. The \$100m project had T2B = 2 years. So, if the 10-year 6%-coupon bond used to finance it was the company's only capitalized debt, then Compustat would show a pair of \$6ms followed by 8 years of \$0s. Ideally, we would like to create a new variable that reflects the intiial \$6m capitalized payment as an expense in each of the next 10 years. If the firm only has \$6m in annual interest expense for the next decade, then the ratio would be \$6m/\$6m = 100%. Conversely, if the firm was already highly levered and paid hundreds of millions in interest each year, then the ratio would be tiny, \$6m/\$100m = 6%.

Unfortunately, we cannot see the maturity of the bond issuance that each capitalized payment is attached to. So, we take a conservative approach and assume that all bonds with capitalized interest expense have a 5-year maturity. We then regress the resulting proxy on the usual 1/0 indicator for whether a

Dependent Variable: % of Debt With Capitalized Interest

	(1)	(2)	(3)	(4)
Is Growth Stock EY < rf; PE > 1/rf	$2.8^{\star\star\star}$ (0.6)	$2.5^{\star\star\star}$ (0.6)	$1.1^{\star\star}$ (0.4)	$2.9^{\star\star\star}$ (0.6)
$\log_2$(Mkt Cap)				$0.3^{\star\star}$ (0.1)
Profitability				−1.1 (2.8)
Book to Market				$1.9^{\star}$ (1.0)
Tangibility				$22.1^{\star\star\star}$ (1.7)
Firm FE	*N*	*Y*	*N*	*N*
Year FE	*N*	*N*	*Y*	*N*
# Obs	38,456	37,692	38,456	37,406
Adj. R^2	0.7%	4.8%	4.0%	11.3%

Table 5. '% of Debt With Capitalized Interest' is the percent of a firm's interest expense in fiscal year *t* that is associated with a bond/loan that had at least 1 capitalized payment. 'Is Growth Stock' is a 1/0 indicator for firm-year observations that have a forward earnings yield below the 10-year Treasury rate, EY < rf. Numbers in parentheses are standard errors double-clustered by firm and year. *, **, and *** denote statistical significance at 10%, 5%, and 1%. We do not report the intercept or fixed-effect coefficients. Sample includes observations with non-zero interest expense in fiscal year *t*.

firm is growth stock in fiscal year *t*

$$\underbrace{100 \times \left(\frac{\sum_{\ell=0}^{4} [\Delta \text{CapInt}_{n,t-\ell}]_+}{\text{TotalInterest}_{n,t}} \right)}_{\text{\% of debt with capitalized interest}} \overset{\text{OLS}}{\sim} \hat{\alpha} + \hat{\beta} \cdot \underset{(\text{EY} < \text{rf; PE} > 1/\text{rf})}{\text{Is Growth Stock}_{n,t}} \tag{23}$$

The implied estimates likely underestimates the importance of capitalized interest expense. In the above example where the firm issued a 10-year 6%-coupon bond, the left-hand-side variable in our regressions would be 0% in both scenarios for years 6 through 10. We would only calculate a 100% – 6% = 94%pt difference in the first 5 years, effectively cutting the implied $\hat{\beta}$ in half. In spite of these concerns, we still find a statistically significant difference between the capitalized-debt usage of growth and value stocks in Table 5.

6 Conclusion

This paper provides a unified framework for understanding how EPS maximizers make capital-budgeting decisions. Rather than dismissing EPS maximization as a misguided practice, we show that it generates a coherent set of predictions that can explain numerous real-world patterns in corporate finance. EPS maximizers follow a simple but powerful rule: invest in projects that have income yields that exceed the firm's cheapest source of funding, $\text{IY} > \text{FY} = \min\{\text{EY}, \text{i}, \text{rf}\}$.

EPS-maximizing managers look for ways to capture the income-vs-financing yield spread, $\text{IY} - \text{FY}$, by arbitraging between asset and capital markets. This line of reasoning can produce both under- and overinvestment. EPS maximizers ignore long-term project benefits, which can cause underinvestment. But they also disregard long-term financing costs, which can lead to overinvestment. For example, think about IBM's $1b investment in the Watson AI Group during the favorable credit conditions of the early 2010s.

We document strong empirical support for our model's predictions, which depend on whether a firm's earnings yield is above or below the riskfree rate. Growth stocks ($\text{EY} < \text{rf}$; $\text{PE} > 1/\text{rf}$) pay target shareholders with equity, accumulate cash while investing heavily, and are more likely to issue convertible debt and have higher proportions of capitalized interest expense. Value stocks ($\text{EY} > \text{rf}$; $\text{PE} < 1/\text{rf}$) exhibit the opposite patterns: they pay cash in acquisitions, have a high investment-cash flow sensitivity, and issue plain-vanilla bonds. These patterns hold across different time periods and market conditions.

Ultimately, we are hoping to push corporate-finance research onto a more productive path going forward. Whatever their reasons, the people running large public corporations fixate on EPS growth. This has been the status quo for decades now. Instead of mourning the persistent use of EPS as a valuation metric, why not work to understand the implications of this objective? By taking EPS maximization seriously, we are able to generate valuable insights that are both theoretically interesting and empirically robust.

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A Proofs and Derivations

Proof. **(Proposition 1)** *Consider a project with upfront* Cost $> \$0$ *that is expected to generate income of* $\mathbb{E}[\Delta\text{NOI}_1]$ *next year. We look at the limiting case as the project's income yield* $\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}}$ *remains constant and* $\text{Cost} \longrightarrow \$0$. *The manager has access to three sources of capital: equity, debt, and cash.*

Issuing Equity. Suppose the manager pays for the new project by issuing $\Delta\#\text{Shares} = \text{Cost}/\text{Price}$ *new shares. Her company's new EPS would be*

$$\widetilde{\text{EPS}} = \frac{\mathbb{E}[\text{Earnings}_1] + \mathbb{E}[\Delta\text{NOI}_1]}{\#\text{Shares} + \Delta\#\text{Shares}} \tag{24a}$$

$$= \frac{\mathbb{E}[\text{Earnings}_1] + \text{IY} \times \text{Cost}}{\mathbb{PV}[\text{EquityPayoffs}_1]/\text{Price} + \text{Cost}/\text{Price}} \tag{24b}$$

$$\propto \frac{\mathbb{E}[\text{Earnings}_1] + \text{IY} \cdot \text{Cost}}{\mathbb{PV}[\text{EquityPayoffs}_1] + \text{Cost}} \tag{24c}$$

Taking the derivative $\frac{d\widetilde{\text{EPS}}}{d\text{Cost}}$ *as* $\text{Cost} \longrightarrow \$0$ *gives*

$$\left.\frac{d\widetilde{\text{EPS}}}{d\text{Cost}}\right|_{\$0} = \frac{\text{IY}}{\mathbb{PV}[\text{EquityPayoffs}_1]} - \frac{\mathbb{E}[\text{Earnings}_1]}{\mathbb{PV}[\text{EquityPayoffs}_1]^2} \tag{25a}$$

$$= \frac{1}{\mathbb{PV}[\text{EquityPayoffs}_1]} \times \left\{ \text{IY} - \frac{\mathbb{E}[\text{Earnings}_1]}{\mathbb{PV}[\text{EquityPayoffs}_1]} \right\} \tag{25b}$$

$$\propto \text{IY} - \text{EY} \tag{25c}$$

Hence, if an EPS-maximizing manager only has access to equity financing, she will greenlight projects with an income yield higher than her earnings yield.

Selling Bonds. If the manager borrows Cost, *her new EPS would be*

$$\widetilde{\text{EPS}} = \frac{\mathbb{E}[\text{Earnings}_1] + \mathbb{E}[\Delta\text{NOI}_1] - \text{i} \cdot \text{Cost}}{\#\text{Shares}} \tag{26}$$

Hence, the change in EPS will be proportional to

$$\Delta\widetilde{\text{EPS}} \propto \mathbb{E}[\Delta\text{NOI}_1] - \text{i} \cdot \text{Cost} \tag{27a}$$

$$= \left\{ \text{IY} - \text{i} \right\} \times \text{Cost} \tag{27b}$$

If the manager only has access to debt financing, she will invest in projects that have an income yield higher than her marginal interest rate.

Spending Cash. If the manager uses this cash to pay for the new project, her EPS would be

$$\widetilde{\mathrm{EPS}} = \frac{\mathbb{E}[\mathrm{Earnings}_1] + \mathbb{E}[\Delta\mathrm{NOI}_1] - \mathrm{rf}\cdot\mathrm{Cost}}{\#\mathrm{Shares}} \tag{28}$$

The resulting calculation is identical to the case of selling bonds with $\mathrm{i} = \mathrm{rf}$*. Hence, if an EPS-maximizing manager only has access to cash, she will greenlight projects with an income yield higher than the riskfree rate.*

The manager's goal is to maximize her firm's EPS. So, if she has access to all three sources of capital, a project will be worth doing so long as one of the financing options is accretive. If multiple financing options satisfy this criterion, she chooses the one that will increase her EPS the most. Since IY *is the same regardless of where the funding comes from, this means choosing the cheapest source of financing,* $\mathrm{FY} = \min\{\mathrm{EY}, \mathrm{i}, \mathrm{rf}\}$*, conditional on a project being accretive.* □

Proof. **(Proposition 2)** *Consider a project with an upfront price tag of* $\mathrm{Cost} > \$0$*. For a given discount rate* $\mathrm{r} > 0\%$*, the present value of the project's future income stream is given by*

$$\mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq1}] = \sum_{t=1}^{\infty} \frac{\mathbb{E}[\Delta\mathrm{NOI}_t]}{(1+\mathrm{r})^t} \tag{29a}$$

$$= \frac{\mathbb{E}[\Delta\mathrm{NOI}_1]}{1+\mathrm{r}} + \sum_{t=2}^{\infty} \frac{\mathbb{E}[\Delta\mathrm{NOI}_t]}{(1+\mathrm{r})^t} \tag{29b}$$

$$= \mathbb{PV}_{\mathrm{r}}[\Delta\mathrm{NOI}_1] + \mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq2}] \tag{29c}$$

To be accretive, a project must generate enough income next year to cover its financing cost, $\mathbb{E}[\Delta\mathrm{NOI}_1] - \mathrm{FY}\cdot\mathrm{Cost} > \$0$*. To be positive-NPV, the present value of a project's future income stream must be larger than the upfront cost,* $\mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq1}] - \mathrm{Cost} > \$0$*. Taking the difference gives*

$$\begin{aligned}\big\{\mathbb{E}[\Delta\mathrm{NOI}_1] - \mathrm{FY}\times\mathrm{Cost}\big\} - \big\{\mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq1}] - \mathrm{Cost}\big\} \\ = (\mathbb{E} - \mathbb{PV}_{\mathrm{r}})[\Delta\mathrm{NOI}_1] \\ - \mathbb{PV}_{\mathrm{r}}[\{\Delta\mathrm{NOI}_t\}_{t\geq2}] \\ + (1-\mathrm{FY})\times\mathrm{Cost}\end{aligned} \tag{30}$$

which is proportional to the desired expression since $\mathrm{Cost} > \$0$*.* □

Proof. **(Proposition 3)** *Consider a project with upfront* $\text{Cost} > \$0$ *that will generate* $\mathbb{E}[\text{Payoff}_1]$ *next year and nothing after that. Equation (10) tells us that the project's IRR must satisfy*

$$\frac{\mathbb{E}[\text{Payoff}_1]}{1 + \text{IRR}} = \text{Cost} \tag{31}$$

If we further assume that $\mathbb{E}[\text{Payoff}_1] = \text{Cost} + \mathbb{E}[\Delta\text{NOI}_1]$, *then*

$$\begin{aligned} \mathbb{E}[\Delta\text{NOI}_1] &= \quad \mathbb{E}[\Delta\text{NOI}_1] \quad - \text{Cost} && \text{(32a)} \\ &= (1 + \text{IRR}) \times \text{Cost} - \text{Cost} = \text{IRR} \times \text{Cost} && \text{(32b)} \end{aligned}$$

From this we conclude that $\text{IRR} = \text{IY}$. *Hence, if we set* $\text{HR} = \text{FY}$, *the IRR-hurdle rule in Equation (11) would be identical to the* $\max \text{EPS}$ *rule.* □

Proof. **(Proposition 4)** *Consider an infinitely-lived project with upfront* $\text{Cost} > \$0$ *that is expected to generate the same income boost each year going forward,* $\mathbb{E}[\Delta\text{NOI}_t] = \mathbb{E}[\Delta\text{NOI}_1]$ *for all* $t \geq 1$. *This project's income stream represents a perpetuity that pays an annual* $\mathbb{E}[\Delta\text{NOI}_1]$ *coupon. When discounting at* $\text{r} > 0\%/\text{yr}$, *the present value of this constant never-ending income stream is given by*

$$\begin{aligned} \mathbb{PV}_{\text{r}}[\,\text{Perpetuity}\,] &= \sum_{t=1}^{\infty} \frac{\mathbb{E}[\Delta\text{NOI}_1]}{(1 + \text{r})^t} && \text{(33a)} \\ &= \mathbb{E}[\Delta\text{NOI}_1] \times \left(\frac{1}{\text{r}}\right) && \text{(33b)} \end{aligned}$$

The project's IRR is the discount rate that equates $\mathbb{PV}_{\text{IRR}}[\,\text{Perpetuity}\,] = \text{Cost}$. *Hence, this perpetuity has an income yield of* $\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\mathbb{PV}_{\text{IRR}}[\text{Perpetuity}]} = \text{IRR}$. *If we set* $\text{HR} = \text{FY}$, *the IRR-hurdle rule in Equation (11) is identical to the EPS-maximizing rule in Proposition 1.* □

Proof. **(Proposition 5)** *The formula follows directly from rearranging the definition of a project's income yield*

$$\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}_1]}{\text{Cost}} \qquad \Leftrightarrow \qquad \text{Cost} = \mathbb{E}[\Delta\text{NOI}_1] \times \left(\frac{1}{\text{IY}}\right) \tag{34}$$

If a project generates income of $\mathbb{E}[\Delta\text{NOI}_1]$ *for* $(1/\text{IY})$ *straight years, then the total earnings boost will be enough to offset the upfront* $\text{Cost} > \$0$. □

Proof. **(Proposition 6)** *Proposition 1 implies that financing a project by issuing equity will dilute earnings by* $\text{EY} \times \text{Cost}$*, selling bonds will dilute earnings by* $\text{i} \times \text{Cost}$*, and spending cash will reduce a firm's expected earnings by* $\text{rf} \times \text{Cost}$*. A growth stock is defined as a company with a forward earnings yield less than the riskfree rate,* $\text{EY}^G < \text{rf}$*. Hence, since a firm's marginal interest rate must be at least as large as the riskfree rate when selling plain-vanilla corporate bonds,* $\text{i} \geq \text{rf}$*, its EPS-maximizing manager will see equity issuance as the cheapest way to finance any new projects, including an acquisition. Conversely, given that a value stock is defined as the opposite kind of company with a forward earnings yield above the riskfree rate,* $\text{EY}^V > \text{rf}$*, the reverse logic tells us that its EPS-maximizing manager will view cash as the cheapest financing option.* □

Proof. **(Proposition 7)** *Issuing equity dilutes earnings by* $\text{EY} \times \text{Cost}$*, selling bonds dilutes earnings by* $\text{i} \times \text{Cost}$*, and spending cash dilutes earnings by* $\text{rf} \times \text{Cost}$*. Hence, the earnings cost of financing a project can be written as* $\min\{\text{EY}, \text{i}, \text{rf}\} \times \text{Cost}$*.*

Notice that the derivative of this expression depends on whether cash is a firm's cheapest financing option

$$\tfrac{\mathrm{d}}{\mathrm{d}\,\text{rf}}[\,\min\{\text{EY}, \text{i}, \text{rf}\} \times \text{Cost}\,] = \text{Cost} \times \begin{cases} 1 & \textit{if}\ \text{rf} < \min\{\text{EY}, \text{i}\} \\ 0 & \textit{otherwise} \end{cases} \tag{35}$$

If cash is not a firm's cheapest financing option, then changes in the cost of spending cash have no impact on a firm's capital-budgeting decisions.

A growth stock is defined as a company with a forward earnings yield less than the riskfree rate, $\text{EY}^G < \text{rf}$*. Since a firm's marginal interest rate must be at least as large as the riskfree rate when selling plain-vanilla corporate bonds,* $\text{i} \geq \text{rf}$*, an EPS-maximizing growth-stock manager will see equity issuance as the cheapest way to finance any new projects, even when cash is present. Hence, this group of firms will have a low investment-cash flow sensitivity.*

Conversely, value stocks are defined as the opposite kind of company with a forward earnings yield above the riskfree rate, $\text{EY}^V > \text{rf}$*. Now, the reverse logic tells us that an EPS-maximizing value-stock manager will view cash as the cheapest financing option whenever it is available. Hence, this group of firms will have a high investment-cash flow sensitivity.* □

Proof. **(Proposition 8)** *Take the binomial asset-pricing framework from Appendix B. Hold fixed the state prices,* $\{\text{q}_u, \text{q}_d\}$*, a company's expected income next year,* $\mathbb{E}[\text{NOI}_1]$*, and the total down-state value,* FirmValue_d*. Given this setup, increasing the growth rate* g *will cause the firm's current price to rise,* $\text{Price} = \mathbb{E}[\text{NOI}_1] \times (\frac{1}{\text{r}-\text{g}})$*.*

Moreover, the total payoff to owning the firm in the up state next year will be increasing in g

$$\mathrm{FirmValue}_u = \frac{\mathrm{Price} - \mathrm{q}_d \times \mathrm{FirmValue}_d}{\mathrm{q}_u} \tag{36a}$$

$$= \left(\frac{1}{\mathrm{q}_u}\right) \cdot \left(\frac{\mathbb{E}[\mathrm{NOI}_1]}{\mathrm{r} - \mathrm{g}}\right) - \left(\frac{\mathrm{q}_d}{\mathrm{q}_u}\right) \cdot \mathrm{FirmValue}_d \tag{36b}$$

$$\approx \left(\frac{1}{\mathrm{q}_u}\right) \times \left\{ \mathrm{Const} + \left(\frac{\mathbb{E}[\mathrm{NOI}_1]}{\mathrm{r}^2}\right) \times \mathrm{g} \right\} \tag{36c}$$

The approximation in the third line is a Taylor expansion of $\mathrm{Price} = \mathbb{E}[\mathrm{NOI}_1] \times \left(\frac{1}{\mathrm{r}-\mathrm{g}}\right)$ *around* $\mathrm{g} = 0\%$, *and the constant is* $\{\mathbb{E}[\mathrm{NOI}_1]/\mathrm{r}\} - \{\mathrm{q}_d \times \mathrm{FirmValue}_d\}$.

To issue a bond with a face value of FV *at an interest rate* $\tilde{\imath} < \mathrm{rf}$, *a firm must give creditors a conversion option that is sufficiently valuable*

$$\mathbb{PV}[\mathrm{ConversionOption}] > \mathrm{FV} - \{\mathrm{q}_u \times (1 + \tilde{\imath}) \cdot \mathrm{FV} + \mathrm{q}_d \times (1 + \tilde{\imath}) \cdot \mathrm{FV}\} \tag{37a}$$

$$= \mathrm{FV} - \left\{ \frac{(1 + \tilde{\imath}) \cdot \mathrm{FV}}{1 + \mathrm{rf}} \right\} \tag{37b}$$

$$= \mathrm{FV} \times \left\{ 1 - \frac{1 + \tilde{\imath}}{1 + \mathrm{rf}} \right\} \tag{37c}$$

The second line assumes that it is optimal for the firm to repay the debt in the down state, making the interest payments riskfree. If it is optimal to default in the down state, the present value of the conversion option must be even higher.

Equation (37c) *provides a lower bound for the size of the conversion option. The total firm value in the up state puts an upper bound on the size of the conversion option. The payoff to converting the bond into equity cannot be larger than*

$$\mathbb{PV}[\mathrm{ConversionOption}] < \mathrm{q}_u \times \{\mathrm{FirmValue}_u - (1 + \tilde{\imath}) \times \mathrm{FV}\} \tag{38}$$

If there is not enough equity left over, it will not be possible to offer a conversion option that is sufficiently attractive to warrant such a low interest rate.

Equating the minimum and maximum conversion-option values makes it possible to solve for the minimum viable $\tilde{\imath}_{\min}$ *for a firm with a given up-state value*

$$\tilde{\imath}_{\min} = \left(\frac{1 - \mathrm{q}_d}{\mathrm{q}_d}\right) - \left(\frac{1}{\mathrm{q}_d}\right) \times \left(\frac{\mathrm{q}_u \times \mathrm{FirmValue}_u}{\mathrm{FV}}\right) \tag{39}$$

Since $\tilde{\imath}_{\min}$ *is decreasing in* $\mathrm{FirmValue}_u$, *Equation* (36c) *tells us that all else equal a growth stock will be able to issue convertible bonds at lower interest rates.* □

Proof. **(Proposition 9)** *Consider project with upfront* Cost > \$0 *that generates no income the first* T2B > 0 *years. Then, starting in year* {T2B + 1}, *the project generates income of* $\mathbb{E}[\Delta\text{NOI}]$ *every year after, giving it a steady-state income yield of* $\text{IY} = \frac{\mathbb{E}[\Delta\text{NOI}]}{\text{Cost}}$ *once operational. If a manager finances the project by issuing bonds with a coupon rate of* i *and capitalizing the interest expense, then the project's new cost basis would be* $\widetilde{\text{Cost}} = \text{Cost} \times \{1 + \text{i} \cdot \text{T2B}\}$, *giving it a cost-adjusted income yield of*

$$\frac{\mathbb{E}[\Delta\text{NOI}]}{\widetilde{\text{Cost}}} = \frac{\mathbb{E}[\Delta\text{NOI}]}{\text{Cost}} \times \left(\frac{\text{Cost}}{\widetilde{\text{Cost}}}\right) = \text{IY} \times \left(\frac{1}{1 + \text{i} \cdot \text{T2B}}\right) \tag{40}$$

If a project's cost-adjusted income yield is still large enough to cover its own financing cost once operational, the original unadjusted income yield must satisfy

$$\left(\frac{1}{1 + \text{i} \cdot \text{T2B}}\right) \times \text{IY} > \text{i} \tag{41a}$$

$$\text{IY} > \text{i} \times \{1 + \text{i} \cdot \text{T2B}\} \tag{41b}$$

$$\text{IY} - \text{i} > \text{i}^2 \cdot \text{T2B} \tag{41c}$$

The present value of a delayed perpetuity which does not make its first payment until {T2B + 1} *years from now is*

$$\mathbb{PV}_\text{r}[\text{Delayed Perpetuity}] = \frac{\mathbb{PV}_\text{r}[\text{Perpetuity}]}{(1 + \text{r})^{\text{T2B}}} \tag{42a}$$

$$= \mathbb{E}[\Delta\text{NOI}] \times \left(\frac{1}{\text{r} \cdot (1 + \text{r})^{\text{T2B}}}\right) \tag{42b}$$

Let IRR *denote the internal rate of return on this delayed perpetuity, which does not pay any coupon during the first* T2B *years. By definition,* IRR *satisfies*

$$\text{Cost} = \mathbb{PV}_{\text{IRR}}[\text{Delayed Perpetuity}] \tag{43a}$$

$$\text{Cost} = \mathbb{E}[\Delta\text{NOI}] \times \left(\frac{1}{\text{IRR} \cdot (1 + \text{IRR})^{\text{T2B}}}\right) \tag{43b}$$

$$\text{IRR} \cdot (1 + \text{IRR})^{\text{T2B}} = \underbrace{\frac{\mathbb{E}[\Delta\text{NOI}]}{\text{Cost}}}_{=\text{IY}} \tag{43c}$$

This gives us an equation relating the project's original unadjusted income yield to its full-term IRR, which includes the first T2B *years where it generates no income*

$$\text{IY} = \text{IRR} \cdot (1 + \text{IRR})^{\text{T2B}} \tag{44}$$

For a manager following the rule IRR > i *not to invest in dilutive projects, the delayed perpetuity's IRR must satisfy*

$$\mathrm{IY} - \mathrm{T2B} \cdot \mathrm{i}^2 \geq \mathrm{IRR} \tag{45}$$

That way, if IRR > i*, then it must be that* $\mathrm{IY} - \mathrm{i} > \mathrm{T2B} \cdot \mathrm{i}^2$*. Suppose we write* $\mathrm{IRR} \approx \mathrm{IY} - \delta$ *for some small* $\delta > 0\%$*. Then, we would have*

$$\begin{aligned}\mathrm{IY} &= (\mathrm{IY} - \delta) \times (1 + [\mathrm{IY} - \delta])^{\mathrm{T2B}} && \text{(46a)}\\ &= (\mathrm{IY} - \delta) \times (1 + \mathrm{T2B} \cdot [\mathrm{IY} - \delta] + \cdots) && \text{(46b)}\\ &\approx \mathrm{IY} - \delta \cdot (1 + \mathrm{T2B} \cdot \mathrm{IY}) + \mathrm{T2B} \cdot \mathrm{IY}^2 && \text{(46c)}\end{aligned}$$

Solving for δ *gives*

$$\delta = \frac{\mathrm{T2B} \cdot \mathrm{IY}^2}{1 + \mathrm{T2B} \cdot \mathrm{IY}} \approx \mathrm{T2B} \cdot \mathrm{IY}^2 \tag{47}$$

Since it would never make sense to wait on a project that was dilutive to begin with, we can conclude that IY > i *and thus* $\delta = \mathrm{T2B} \cdot \mathrm{IY}^2 > \mathrm{T2B} \cdot \mathrm{i}^2$. □

Proof. **(Corollary 9a)** *The result follows from replacing ">" with "=" in Equation* (18) *and solving for* T2B

$$\mathrm{IY} - \mathrm{i} > \mathrm{i}^2 \cdot \mathrm{T2B} \qquad \Rightarrow \qquad \mathrm{T2B}_{\max} = \frac{\mathrm{IY} - \mathrm{i}}{\mathrm{i}^2} \tag{48}$$

□

Proposition 3.4 (Ben-David and Chinco, 2025b)**.** *There will be a large qualitative change in the EPS-maximizing choice of leverage at the threshold,* EY = rf

$$\ell_\star \begin{cases} = 0 & \textit{if } \mathrm{EY} < \mathrm{rf} \quad \text{growth stocks; PE} > 1/\mathrm{rf} \\ \geq \ell_{\max r_f} & \textit{if } \mathrm{EY} > \mathrm{rf} \quad \text{value stocks; PE} < 1/\mathrm{rf} \end{cases} \tag{49}$$

Growth stocks use no debt. Value stocks exhaust their riskfree borrowing capacity.

Proof. **(Corollary 9b)** *Proposition 3.4 in Ben-David and Chinco (2025b) tells us that, if a manager has just purchased the assets to create her firm using the EPS-maximizing amount of leverage, then her amount of debt will hinge on where she is running a growth stock or a value stock. The EPS-maximizing manager of a growth stock (*EY < rf; PE > 1/rf*) will have used no leverage to finance her initial asset purchase. Hence, the new project's debt financing will represent her only leverage. By contrast, an EPS maximizer running a value stock (*EY > rf; PE < 1/rf*) will have already exhausted her riskfree borrowing capacity. Hence, the new project's debt financing will represent a small fraction of her total leverage.* □

B Binomial Framework

This appendix outlines a simple binomial asset-pricing framework à la Dixit and Pindyck (1994) for thinking about state-contingent payoffs and prices. It is just a toy model. None of our main results rely on the specifics of this analysis because EPS-maximizing managers do not need to know how assets are priced. However, NPV-maximizing managers do need to know the asset-pricing model. So, we have found this simple model to be helpful when comparing the max EPS approach with the textbook positive-NPV rule.

B.1 Asset Prices

A firm starts off in year 0 with a collection of assets worth AssetValue_0. Over the previous year, these existing assets generated a net operating income of NOI_0. Going forward, the assets' expected NOIs will grow at a constant annual rate, $\mathbb{E}[\text{NOI}_t] = (1+\text{g})^t \cdot \text{NOI}_0$ for all $t \geq 1$. At each point in time $t \geq 0$, the firm's assets are worth the present value of the future NOI stream they are expected to produce. If $\text{r} > 0\%$ denotes the annual discount rate, the Gordon model says

$$\text{AssetValue}_t = \mathbb{E}_t[\text{NOI}_{t+1}] \times \left(\frac{1}{\text{r}-\text{g}}\right) \tag{50a}$$

$$= (1+\text{g}) \cdot \text{NOI}_t \times \left(\frac{1}{\text{r}-\text{g}}\right) \tag{50b}$$

$$= (1+\text{g})^t \cdot \text{NOI}_0 \times \left(\frac{1}{\text{r}-\text{g}}\right) \tag{50c}$$

What do you get by owning the firm next year absent any investment? You get to collect the net operating income produced by the firm's assets, NOI_1. You will also be able to sell the assets and collect AssetValue_1. Thus, the total payoff to owning the firm in year 1 is given by

$$\text{FirmValue}_1 = \text{NOI}_1 + \text{AssetValue}_1 \tag{51a}$$

$$= \text{NOI}_1 \times \left(\frac{1+\text{r}}{\text{r}-\text{g}}\right) \tag{51b}$$

The firm's expected NOIs always grow at the same annual rate of $\text{g} > 0\%/\text{yr}$. However, as shown in Figure B1, there is some uncertainty about whether the firm's NOIs will be high or low in year 1. The up state occurs with probability π_u, in which case the firm's net operating income will be $u > 0\%$ higher than expected. The down state occurs with probability $\pi_d = 1 - \pi_u$. If the down state occurs, the firm's existing assets generate NOIs that are $d \in (0\%, 100\%)$ lower

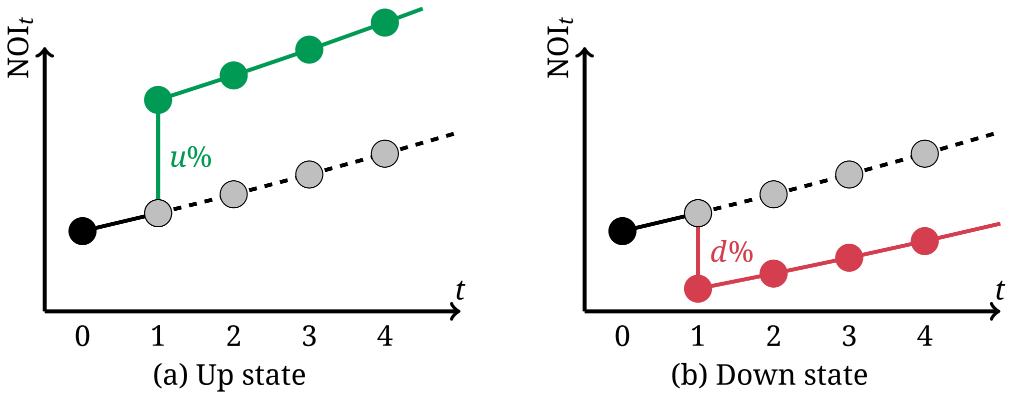

Figure B1. (Left panel) Net operating income (NOI) in years $t = 0, 1, 2, 3, 4$ if up state realized in year $t = 1$. **(Right panel)** NOI stream if down state realized. **Black dots:** NOI_0 in year $t = 0$; same in both panels. **Gray dots:** Unconditional $\mathbb{E}[\text{NOI}_t]$ in years $t = 1, 2, 3, 4$; same in both panels. **Green dots:** Conditional expectation of NOI_t in years $t = 1, 2, 3, 4$ after a positive shock. **Red dots:** Conditional expectation of NOI_t in years $t = 1, 2, 3, 4$ after a negative shock.

than expected

$$\mathbb{E}[\text{NOI}_1|s] = (1 + \text{g}) \cdot \text{NOI}_0 \times \begin{cases} (1+u) & \text{in the up state, } s = u \\ (1-d) & \text{in the down state, } s = d \end{cases} \tag{52}$$

To ensure that the unconditional expectation in year 1 still satisfies $\mathbb{E}[\text{NOI}_1] = (1 + \text{g}) \times \text{NOI}_0$, we require the up- and down-state probabilities to obey the condition $\mathbb{E}[\text{NOI}_1] = \pi_u \cdot \mathbb{E}[\text{NOI}_1|u] + \pi_d \cdot \mathbb{E}[\text{NOI}_1|d]$.

Let $\text{X} \in \{\text{X}_u, \text{X}_d\}$ denote an arbitrary payoff defined over the two future states of the world next year. We use $\mathbb{PV}[\text{X}] \overset{\text{def}}{=} \text{q}_u \cdot \text{X}_u + \text{q}_d \cdot \text{X}_d$ to denote its present discounted value (i.e., the risk-neutral expectation) where

$$\text{q}_u = \frac{1}{\text{FirmValue}_u - \text{FirmValue}_d} \times \left\{ \text{AssetValue}_0 - \left(\frac{\text{FirmValue}_d}{1+\text{rf}} \right) \right\} \tag{53a}$$

$$\text{q}_d = \frac{1}{\text{FirmValue}_u - \text{FirmValue}_d} \times \left\{ \left(\frac{\text{FirmValue}_u}{1+\text{rf}} \right) - \text{AssetValue}_0 \right\} \tag{53b}$$

Note that these state prices are not probabilities. The present value of getting \$1 in both states next year is $\mathbb{PV}[\$1] = \text{q}_u \cdot \$1 + \text{q}_d \cdot \$1 = \frac{\$1}{1+\text{rf}} < \$1 = \mathbb{E}[\$1]$.

Let $\text{Debt}_0 \overset{\text{def}}{=} \ell \cdot \text{AssetValue}_0$ denote the value of the firm's existing debt at time 0 where $\ell \in [0, 1)$. We write the fair interest rate on the manager's existing debt as $\bar{\text{i}} \geq \text{rf}$. In exchange for getting Debt_0 at time 0, the manager had to promise to repay principal plus interest next year, $(1+\bar{\imath}) \cdot \text{Debt}_0$. Shareholders get any remaining firm value in year 1 after servicing the debt. The present value of these future equity payouts is given by

$$\begin{aligned} \mathbb{PV}[\text{EquityPayoffs}_1] &= q_u \cdot \{ \text{FirmValue}_u - (1+\bar{\imath}) \cdot \text{Debt}_0 \} \\ &\quad + q_d \cdot \max\left\{ \underbrace{\text{FirmValue}_d - (1+\bar{\imath}) \cdot \text{Debt}_0}_{\substack{\text{Manager repays debt. Share-} \\ \text{holders get residual value.}}}, \underbrace{\$0}_{\substack{\text{Manager} \\ \text{defaults}}} \right\} \end{aligned} \tag{54}$$

If the up state occurs in year 1, then we assume that it is optimal for the manager to repay the firm's existing debt, $(1+\bar{\imath}) \cdot \text{Debt}_0$. However, in the down state, shareholders might prefer to default on their debt obligations and receive \$0. This outcome could be better than servicing debt worth more than the firm as a whole. If the manager defaults, then the lender gets the value of the firm. Thus, the present value of future debt service is given by

$$\begin{aligned} \mathbb{PV}[\text{DebtPayoffs}_1] &= q_u \cdot \{ (1+\bar{\imath}) \cdot \text{Debt}_0 \} \\ &\quad + q_d \cdot \min\left\{ \underbrace{(1+\bar{\imath}) \cdot \text{Debt}_0}_{\substack{\text{Manager repays.} \\ \text{Lender gets pmt.}}}, \underbrace{\text{FirmValue}_d}_{\substack{\text{Manager defaults.} \\ \text{Lender gets firm.}}} \right\} \end{aligned} \tag{55}$$

If the manager pays $\text{Cost} > \$0$ to acquire new assets at time 0, then her new larger asset base will generate more net operating income next year at time 1 as well as in future years, $t \geq 2$. The higher NOIs in subsequent years get capitalized into the sale price of the firm's assets at time 1. Thus, the change in firm value in each state of the world next year is given by

$$\Delta\text{FirmValue}_s = \Delta\text{NOI}_s + \Delta\text{AssetValue}_s \tag{56a}$$

$$= \Delta\text{NOI}_s \times \left(\frac{1+\text{r}}{\text{r}-\text{g}} \right) \tag{56b}$$

Importantly, when a manager learns about a new project idea, it does not alter the state prices, $\{q_u, q_d\}$; her costs of raising new capital, $\{\text{EY}, \text{i}, \text{rf}\}$; or, the financing of her original assets. Existing bondholders will not accept a lower coupon rate because the manager claims to have had a brainflash.

B.2 Debt Overhang

This leads to a "debt overhang" problem (Myers, 1977), which discourages an NPV-maximizing manager with risky debt from investing in profitable new projects. Suppose that the firm borrowed so much money to finance its existing assets at time 0 that servicing the debt would cost more than the value of the firm in the down state. In this scenario, shareholders would benefit by defaulting in the down state next year. The present value of their default option is

$$\mathbb{PV}[\text{DefaultSavings}_1] = q_u \cdot \$0 + q_d \cdot \max\left\{ \underset{\substack{\text{Manager}\\ \text{repays}}}{\$0}, \underset{\substack{\text{Manager defaults to avoid making}\\ \text{debt payment worth more than firm.}}}{(1+\bar{\imath})\cdot\text{Debt}_0 - \text{FirmValue}_d} \right\} \tag{57}$$

If shareholders will save \$1 by defaulting in the down state, then bondholders will lose out on that \$1 in the event of default. Creditors charge a risk premium in the up state, $(\bar{\imath} - \text{rf}) \cdot \text{Debt}_0 > \$0$, to make up for these losses

$$\underbrace{q_u \cdot \{(\bar{\imath} - \text{rf}) \cdot \text{Debt}_0\}}_{\mathbb{PV}[\text{RiskPremium}_1]} = \underbrace{q_d \cdot \max\left\{ \underset{\substack{\text{Manager}\\ \text{repays}}}{\$0}, \underset{\substack{\text{Manager defaults to avoid making}\\ \text{debt payment worth more than firm.}}}{(1+\bar{\imath})\cdot\text{Debt}_0 - \text{FirmValue}_d} \right\}}_{\mathbb{PV}[\text{DefaultSavings}_1]} \tag{58}$$

A firm that can repay its debt even in the down state, $\mathbb{PV}[\text{DefaultSavings}_1] = \$0$, will not get charged a credit spread, $\bar{\imath} = \text{rf}$, because there are no down-state losses for bondholders to make up for. Otherwise, creditors will set $\bar{\imath} > \text{rf}$.

The manager in our model has already financed her original assets at time 0 prior to learning about the new project. These existing creditors do not have to pay any of the upfront Cost $> \$0$, but they might get some of the benefit

(#1) Still optimal to default in down state even after investing.

Suppose the manager used risky debt to finance her original assets, and it is still optimal for shareholders to default if the down state occurs next year. In this scenario, every \$1 of value created by the project in the down state will go to creditors.

(#2) No longer optimal to default in down state after investing.

Suppose the manager used risky debt to finance her original assets, but the new project has increased the firm's value so much that it is no longer optimal to default in the down state next year. In this scenario, shareholders will get some of the project's benefits in the down state. However, the first \$\$\$s of value will go towards eroding the present value of their default option. Moreover, even though investing in the project has made their existing debt riskfree, they still have to pay their original risk premium. Investing can make the right-hand side of Equation (58) smaller by increasing FirmValue_d. But the left-hand side never changes.

(#3) Was never optimal to default in down state to begin with.

In this scenario, there is no debt-overhang problem because shareholders get all project benefits in both states of the world.