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The Horizon of Investors' Information and Corporate Investment

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ABSTRACT

We study how the quality of investors' information across horizons influences investment. In our theory, managers care about how investment is impounded in current stock prices. Because prices imperfectly reflect investment's value, they under-invest. However, they under-invest *less* when investors have better information about the horizon matching that of their projects. Using a measure of projects' horizon obtained from the text of regulatory filings, we find that improvements in investors' long-term (short-term) information induce firms with long-term (short-term) projects to invest more, especially when managers focus on current stock prices. Therefore, the quality of investors' information across horizons has real effects.

Key words: Project Horizon, Short-termism, Information Quality, Forecasting horizon, Forecasts' informativeness, Managerial Incentives

JEL classification: D84, G14, G17, M41

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I Introduction

Asset valuation requires investors to use their information to forecast cash flows at various horizons. Naturally, the quality of short-term forecasts is higher than that of long-term ones (e.g., Patton and Timmermann (2010) or Dessaint, Foucault, and Fresard (2021)). Recent evidence indicates that this difference in quality has become more pronounced over time.[1] This evolution could reduce investments in projects generating cash flows in the long run if the quality of investors' information about these cash flows affects the allocation of capital between long and short-term projects in the economy. Is this the case? Does the horizon at which investors produce information matter? Answering this question has important ramifications, for instance, for understanding the real effects of information production in financial markets or firms' ability to respond to challenges and opportunities whose effects will materialize in the long run (e.g., climate or technological change).[2] Yet, to our knowledge, this question has not been addressed so far.

To do so, we focus on one channel via which the quality of investors' information can affect firms' investment, namely the "improved incentives channel" (e.g., Bond, Edmans, and Goldstein (2012)). According to this channel, managers care about the impact of their investment decisions on the stock price of their firm in the short-run rather than just its long-run value (e.g., because of price-based compensation or the short horizon of incumbent shareholders). If investors lack information on the future cash flows of new profitable projects, their value will take time to be reflected into stock prices, and managers will underinvest in them. Therefore, the "improved incentives channel" predicts that lower quality of investors' information for a given horizon reduces managers' incentive to invest in projects whose cash flows materialize at this horizon. Our main contribution is to empirically test this novel hypothesis.

To guide our empirical analysis, we first consider a model in which the manager of a firm

[1]Dessaint, Foucault, and Fresard (2021) find that equity analysts' long-term forecasts have become less informative over time while analysts' short-term forecasts have become more informative. Based on survey evidence, Graham (2022)) report that managers' ability to make long-term forecasts has declined.

[2]Addressing climate change requires firms to make long-term investments. If a drop in the quality of investors' long-term forecasts reduces firms' incentives to make such investments then they will be less prepared to cope with the associated risks.

chooses how much to invest in a project whose cash flow arises either quickly (in the short-term) or slowly (in the long-term). The project has a longer horizon if its cash flow is more likely to arise slowly. In the baseline version, the project's horizon is fixed, and the manager chooses the investment amount that maximizes a weighted average of his firm's current stock price and its long-run fundamental value. The expected cash-flow increases with the amount invested in the project but this amount is not immediately observable by investors. However, after the investment is made, investors receive two imperfect signals about the project's cash flow: (i) a *short-term signal* if the cash flow materializes quickly, and (ii) a *long-term signal* if it materializes slowly. As informed investors trade on these signals, the firm's stock price reflects their information about the present value of the project's future cash flow, albeit imperfectly.

As implied by the "improved incentives channel", the manager under-invests relative to the efficient level, and this under-investment is mitigated when the quality of investors' signals improves. However, our model highlights a new implication of this channel: this mitigation is stronger when the horizon for which the quality of investors' signals improves *matches* that of the project. That is, an improvement in the quality of investors' long-term signal matters more for investment than an identical improvement in the quality of investors' short-term signal when the project has a long horizon (and vice versa when the project has a short horizon). In other words, for reducing under-investment, it does not suffice that market participants produce better information. They must also do so at the horizon relevant to a firm's investment project.

The model generates four ancillary predictions. The above mechanism arises because the manager cares about his firm's current price, and investment is not immediately observable to investors. Therefore, the effects of investors' information quality should be stronger when managers have greater incentives to maximize the current stock price of their firm (prediction #1), and weaker when investment is more easily observed (prediction #2). Moreover, because of discounting, the effects should be weaker when firms' cost of capital is higher (prediction #3). Finally, when we allow the manager to control the average project's horizon of his firm by allocating capital between a short-term and a long-term project, the model predicts that more capital is allocated to the long-term project when the quality of investors' long-term signal improves or that of their short-term signal deteriorates.

Testing these predictions is challenging because neither the horizon of firms' projects nor the quality of investors' information about cash flows at specific horizons is directly observed. To overcome the first challenge, we exploit the fact that the horizon of firms' projects varies by economic activity due to heterogeneity in the length of firms' production and operation cycles, and the useful life of their capital. For instance, projects of firms in the shipbuilding industry have intrinsically longer horizons than projects in the apparel retail industry. Thus, our theory predicts that investment of shipbuilders should be more (less) sensitive to the quality of investors' long-term (short-term) signals than that of retailers. We measure projects' horizon based on the horizon of the *business plans* disclosed by managers in the text of regulatory filings. They routinely refer to their "3-year business plan" or "5-year strategic plan". Thus we search for regular expressions such as "-year business plan" or "-year strategic plan" through all filings and retrieve information about the horizon of firms' business plans. We obtain the business plans' horizon of 3,925 firms and average it across by industry to measure the (time-invariant) project's horizon of each industry. The average horizon is 4.45 years across all industries and ranges between 1 and 8 years.

To measure the quality of investors' signals at a given horizon, we rely on the measure of sell-side equity analysts' forecasts informativeness (denoted R^2) developed by Dessaint, Foucault, and Fresard (2021) (hereafter DFF2021). We posit that analysts' information is representative of that of investors, and that better information should lead to more informative forecasts.[3] For a given analyst-date-horizon, R^2 is obtained by regressing realized earnings at a given horizon on the analyst's earnings forecasts for this horizon. A higher R^2 means that an analyst's forecasts have higher predictive power for the earnings of the firms she covers (e.g., if $R^2 = 1$, the analyst has perfect foresight). We average R^2 across all analysts by year and horizon to obtain two aggregate proxies for the informativeness of investors' signals: one for short-term horizons (between 1 and 2 years), and another one for long-term horizons (beyond 2 years). We contend that aggregate variations in R^2 likely reflect country-wide economic forces that are plausibly exogenous to firm-specific determinants

[3]For evidence that investors rely on analysts' forecasts for valuing stocks, see Landier and Thesmar (2020) or Hong, Wang, and Yang (2021).

of investment.

To test our main prediction, we estimate a standard investment equation augmented with interaction terms between firms' project horizon and the informativeness of investors' signals at short and long horizons (as the model suggests to do). This specification allows us to measure separately the sensitivity of firms' investment to the informativeness of investors' long and short-term signals, and to examine how it varies across firms with short and long projects' horizons. As predicted, the investment of firms with long-horizon projects is more sensitive to the informativeness of investors' long-term signal, *but* less sensitive to the informativeness of short-term signal. Hence, the horizon at which financial markets produce information matters. These results hold after controlling for other determinants of investment documented in the literature, especially the value of new investment opportunities (through Tobin's Q corrected for measurement errors following Erickson, Jiang, and Whited (2014)).

We also obtain empirical support for our ancillary predictions. First, the above results are stronger when managers are more likely to focus on their current stock price. The literature suggests that this is the case when: managers' compensation and wealth are tied to their firm's current stock price, shareholders' horizon is short, equity dependence is strong, and takeover threat is high. We find stronger effects in all four situations. Moreover, we also find greater effects when using the number of words referring to short rather than long-term horizons in firms' regulatory filing to measure managers' focus on their current stock price. Second, we confirm that the effects of projects' horizon on the sensitivity of firms' investment to the informativeness of investors' signals are weaker when investment is easier to observe, measured by the extent to which firms issue guidance on Capex or disclose information about investment plans, or yet by the speed with which they report financial statements. Third, as expected, we find weaker effects for firms with a higher cost of capital (using various measures of the cost of capital).

To test the last ancillary prediction, we focus on multi-division firms operating across several industries, since they can alter their average project's horizon by shifting resources across divisions with different horizons. As predicted, these firms allocate relatively more capital to divisions operating in industries with long-horizon projects when the informativeness of investors' long-term signals improves or when that of short-term signals deteriorates. This test allows us to include firm-year fixed effects in our specification and thus to control for any confounding time-*varying* determinant of firm investment.

Overall, the "improved incentives channel" can explain why the horizon of investors' information matters for corporate investment. Of course, there might be alternative explanations (discussed in Section VI) for our empirical findings. However, to threaten our interpretation, these alternative explanations must not only predict the opposite sign of the effects of project horizon on the sensitivity of investment to the informativeness of investors' short and long-term signals, but also explain the ancillary results. The improved incentives channel predicts all these results while other channels do not, at least not in an obvious way.

Finally, we investigate whether the improved incentives channel is beneficial to shareholders. We do so by focusing on large-scale investments dedicated to the acquisition of private firms for which we observe acquirers' revaluation when the project is undertaken. The market reaction to acquisitions of targets in industries in which projects have long horizons is higher when investors' long-term signals are more informative. Thus, better information of investors about long-term cash flows is associated with more valuable long-term investments. Combined with our main evidence, this analysis suggests that investors' increased focus on improving the quality of their short-term information could reduce investments in valuable long-term projects.

The rest of the paper is organized as follows. In the next section, we position the contribution of our paper in the literature. In Section III, we present the theory that guides our empirical analysis. Section IV presents the data and our new measure of project horizon. In Sections V, we report our findings. Section VI discusses alternative explanations and the implications of our findings. Section VII concludes. All definitions for the variables used in our tests and the proofs of the theoretical claims are reported in the Appendix.

II Contribution to the Literature

Our paper is related to two strands of literature. First, it contributes to the literature on the real effects of trading in secondary markets (see Bond, Edmans, and Goldstein (2012) and Goldstein (2022) for surveys). This literature largely focuses on the learning channel, whereby the information produced by stock markets affects real decisions because managers learn information (about their investment opportunities) from stock prices. Our paper focuses on another channel, "the improved incentives channel" (see Bond, Edmans, and Goldstein (2012), Section 3) that has received less attention.

Fishman and Hagerty (1989) develop a theory of corporate disclosure based on this channel. Our theory builds on their model but accounts for the fact that firms differ in the horizon of their projects.[4] It highlights one novel implication of the improved incentives channel, namely that investment inefficiencies (under-investment in our model) should be smaller when investors possess information about future cash-flows at the horizon that matches that firms' projects, and our tests provide support for this implication.[5] We are not aware of other studies relating the informativeness of investors' signals for various horizons to investments in projects generating cash flows at different horizons. To do so, we propose a novel text-based approach to measure the horizon of firms' projects based on that of their business plans.[6]

The improved incentives channel assumes that managers care about the effect that their decisions have on their firm's current stock price. Hence, our paper is also related to the

[4]Dow, Han, and Sangiorgi (2021) consider a model in which firms choose the maturity of their investment. In their model, firms with projects that mature faster attract more informed traders because their future stock price reflects fundamentals more quickly, enabling informed investors to cash in and exit their positions (to recycle their capital) more quickly. In turn, firms with more informed traders can better incentivize managers using compensation schemes based on the current stock price. This leads firms to excessively reduce the maturity of their investment projects (relative to the social optimum). Our analysis focuses on the level of investment in a project, holding its maturity fixed.

[5]In Edmans (2009), the presence of a large blockholder mitigates under-investment in long-term projects because a blockholder has incentives to produce information about these projects and is, therefore, less likely to sell her stake (and depress the stock price) following bad news when long-term projects are sound. To the extent that the informativeness of investors' signals about firms' long-term cash flows is higher in firms with large blockholders, our model would also imply a positive effect of block ownership on long-term investment.

[6]In contrast, the existing literature relies on the type of investment (R&D and patent applications are assumed to correspond to long-term investment) or the nature of firms' assets (e.g., Hubert de Fraisse (2022)). Instead, we measure the horizon of projects directly from textual mentions in firms' disclosures.

literature on the real effects of managerial myopia (or "short-termism"). One source of managerial myopia comes from managers' compensation contracts that are partly tied to current stock prices. Several theories (e.g., Stein (1988), Stein (1989), Bebchuk and Stole (1993), Bizjak, Brickley, and Coles (1993), Goldman and Slezak (2006), Benmelech, Kandel, and Veronesi (2010), or Edmans et al. (2012)) predict that this type of contracts can induce managers to take actions (e.g., cut investment) that raise their firm's stock price in the short run at the expense of its long-run value.[7] Several recent studies (e.g., Asker, Farre-Mensa, and ljungqvist and (2016), Edmans, Fang, and Lewellen (2017), Ladika and Zautner (2020), Edmans, Fang, and Huang (2022)) provide empirical support for this possibility. In contrast, we focus on a different implication of managerial myopia: the allocation of investment across projects of different horizons depends on the quality of investors' information about cash flows at different horizons. In this way, we contribute to the scarce literature studying the prevalence of long-term versus short-term investments in the economy (see Aghion, Angeletos, Banerjee, and Manova (2010)).

III Theory

A Baseline model with fixed project's horizon

Figure I shows the time line of the model. At date 0, the manager of an all-equity firm must choose the scale I_m of investment in a project. The cost of the investment is $C(I_m)$ where $C(0) = 0$. This cost is increasing in investment and strictly convex with $\lim_{I_m \to \infty} C'(I_m) = \infty$. The investment is funded by the cash holdings M of the firm. The residual $(M - C(I_m))$ is distributed to current shareholders as a dividend at date 0. The manager's investment decision, I_m (and the firm's cash holdings) is correctly anticipated by investors in equilibrium but not directly observed when the stock price of the firm is determined at date 1.[8]

[7] A related literature explains why, despite this possibility, shareholders can find optimal to tie managers' compensation to stock prices, in the presence of agency issues (e.g., Bolton, Scheinkman, and Xiong (2006)). More broadly, various papers analyze how performance-based compensation (e.g., based on earnings) affect managers' choices between long-term and short-term projects (e.g., Narayanan (1985), Von Thadden (1995) or Thakor (2020).

[8] One reason is that there is a delay between the moment investment decisions are made in a year and reported to investors. Another possible reason is that investment plans take time to implement (see, Lamont

[Insert Figure I about here]

With probability $(1-h)$ the project generates a (per share) cash-flow $\theta_{st}(I_m) = \kappa I_m + \eta_{st}$ at date 2 and zero at date 3. With probability h, it generates a cash flow of zero at date 2 and a cash flow of $\theta_{lt}(I_m) = I_m + \eta_{lt}$ at date 3 where $\eta_j \rightsquigarrow N(0, \sigma^2_{\eta_j})$ for $j \in \{st, lt\}$ and $Cov(\eta_{st}, \eta_{lt}) = 0$.[9] Thus, parameter $h \in [0,1]$ controls the horizon of the project. The higher is h, the longer the horizon (or maturity). We assume that h is observed (this is a characteristic of the firm). In contrast, the cash flows are uncertain because the $\eta_j s'$ are unknown. Henceforth, we refer to $\theta_{st}(I_m)$ as the project's short-term cash-flow and to $\theta_{lt}(I_m)$ as the long-term cash-flow.

Given these assumptions, at date 0, the manager expects the firm's cash flows (per share) at dates 2 and 3 to be respectively $(1-h)\kappa I_m$ and hI_m. Parameter κ allows to control the relative profitability of short-term vs. long-term projects. For instance, when κ decreases, short-term projects (those with low h) become relatively less attractive since their expected payoff decreases.

At date 1, as in Kyle (1985), one risk-neutral informed investor and noise traders can trade shares of the firm stock with a risk-neutral competitive market maker. The informed investor has two signals s_{st} (the "short-term signal") and s_{lt} ("the long-term signal") such that:

$$s_j = \theta_j(I_m) + (\tau_j)^{-1/2}\varepsilon_j, \text{ for } j \in \{st, lt\}. \tag{1}$$

where $\varepsilon_j \rightsquigarrow N(0, \sigma^2_{\eta_j})$. When τ_j increases, the precision of the signal of type j increases. Let $R^2_j \equiv \frac{\tau_j}{1+\tau_j}$. It is easily checked that R^2_j is the R-squared of a regression of the cash flow $\theta_j(I_m)$ on the signal s_j. Thus, the higher R^2_j, the higher the predictive power of the signal at horizon j for the cash flow at this horizon. For this reason, we refer to R^2_{st} (R^2_{lt}) as the informativeness of the informed investor's signal (or forecasts) about the short-term (long-term) cash-flow. We assume that the noise terms in the informed investor's signal are independent ($Cov(\epsilon_{st}, \epsilon_{lt}) = 0$).

(2000) and Christano and Todd (1996)) and structure investments are realized (and expensed) over multiple periods (see Luo (2022)).

[9] The assumption that the cash flow of the investment is proportional to the investment is as in Fishman and Hagerty (1989) or Edmans (2009).

We denote by $x(s_{st}, s_{lt})$ the market order submitted by the informed investor and by z the noise traders' aggregate demand. As in Kyle (1985), z is normally distributed with mean zero and variance σ_z^2. The risk-neutral dealer observes the aggregate order flow $O = z + x(s_{lt}, s_{st})$ and sets the stock price so that she breaks even:

$$p_1(O; I_b, I_m, h) = \mathrm{E}(V(I_b, h)\,|O = z + x(s_{lt}, s_{st}))\,, \tag{2}$$

where

$$V(I_b, h) = \begin{cases} \dfrac{\theta_{st}(I_b)}{1+r} \text{ with prob. } (1-h), \\ \dfrac{\theta_{lt}(I_b)}{(1+r)^2} \text{ with prob. } h, \end{cases} \tag{3}$$

and r is the firm's cost of capital. That is, $V(I_b, h)$ is the discounted value of the firm's future cash flow (its fundamental value) given that the market maker and the informed investor expect the manager to invest I_b. At date 1, the firm's fundamental value is unknown because (i) the date at which the project generates its cash flow is uncertain, and (ii) this cash flow is uncertain because the $\eta_j s'$ are unknown. However, the informed investor receives signals about the firm's cash flow, whose mean values depend on the actual investment of the firm, I_m. This explains why ultimately the stock price at date 1 depends on the actual manager's investment decision at date 0, even though at date 1 this decision is not yet observed.

At date 0, the manager chooses the investment amount that maximizes a weighted average of the expected stock price at date 1 (the firm's short-term stock price) and the expected long-run value of the firm plus the firm's cash holdings (M) net of the cost of investment. Specifically, the manager solves the following problem[10]:

$$I_m^* \in \mathrm{Argmax}_{I_m} \quad \omega\mathrm{E}(p_1^*(O; I_b, I_m, h)) + (1-\omega)\mathrm{E}(V(I_m, h)) + M - C(I_m), \tag{4}$$

where $\omega \in [0, 1]$ (the sensitivity of the manager's objective to the short-term stock price) is a measure of managerial myopia (short-termism). There might be several reasons why the manager cares about the impact of her investment decision on the firm's stock price in the short-run (see Stein (1989)). One possibility is that the manager acts on behalf of incumbent

[10]To simplify notations, we assume that the time elapsed between date 0 and 1 is short so that we can ignore discounting between dates 0 and 1 in specifying the manager's objective function.

shareholders who plan to liquidate their stake in the short-run (at date 1). Alternatively, the manager's compensation can be tied to the stock price. For instance, Edmans, Fang, and Lewellen (2017) shows that the amount of vesting equity in a given quarter has a negative effect on the growth of investments in research and capital expenditures (see also Ladika and Zautner (2020)). In this case, $\omega \times \mathrm{E}(p_1^*(O; I_b, I_m, h))$ can be interpreted as the amount of vesting equity in the next period for the manager.

In equilibrium, the informed investor and the market-maker's belief about the manager's investment decision is rational, that is, $I_b = I_m^*$. However, in solving for the equilibrium, one must entertain the possibility that $I_m \neq I_b$ because the manager's deviation from the equilibrium investment strategy is not observed at date 1. Note that for $I_b \neq I_m$, the expected stock price at date 1 differs from the manager's expectation about the long-run value of the firm because $\mathrm{E}(p_1^*(O; I_b, I_m, h)) = \mathrm{E}(V(I_b, h) \neq \mathrm{E}(V(I_m, h)$.

Equilibrium definition. An equilibrium of the model is a vector $(I_m^*, I_b^*, x^*(s_{st}, s_{lt}), p_1^*)$ such that:

1. The firm's stock price at date 1 is such that the risk-neutral dealer breaks even:

$$p_1^*(O; I_b^*, I_m^*, h) = \mathrm{E}(V(I_b^*, h)\,|O = z + x^*(s_{st}, s_{lt}))\,. \tag{5}$$

2. The market order of the informed investor, $x^*(s_{lt}, s_{st})$, maximizes her expected profit:

$$x^*(s_{st}, s_{lt}) \in \mathrm{Argmax}_x\ \mathrm{E}((V(I_b^*, h) - p_1^*)x\,|s_{st}, s_{lt})\,. \tag{6}$$

3. The investment of the manager at date 0, I_m*, maximizes current shareholders' wealth at date 0:

$$I_m^* \in Argmax_{I_m} \quad \omega \mathrm{E}(p_1^*(O; I_b^*, I_m, h)) + (1-\omega)\mathrm{E}(V(I_m, h)) + M - C(I_m). \tag{7}$$

4. Market participants (the dealer and the informed investor) have rational expectations about the manager's investment decision: $I_b^* = I_m^*$.

To solve for the equilibrium, we first derive the equilibrium of the stock market at date

1, for arbitrary values of I_b and I_m. Then in a second step, we derive the optimal investment decision of the manager at date 0. We define $\Delta(h,r,\kappa) = (\frac{\kappa(1-h)}{1+r} + \frac{h}{(1+r)^2})$. This is the ex-ante (date 0) expected marginal present value of one dollar invested in the firm's project given its horizon, h.

Lemma 1 ***Equilibrium of the stock market.*** *For given values of (I_b, I_m), the equilibrium of the stock market at date 1 is such that:*

$$x^*(s_{st}, s_{lt}) = \beta_{st}(s_{st} - \kappa I_b) + \beta_{lt}(s_{st} - I_b) \tag{8}$$

$$p_1^*(O; I_b, I_m, h) = \Delta(h,r,\kappa) I_b + \lambda O, \tag{9}$$

where $\lambda = (\frac{(\frac{(1-h)}{1+r})^2 R_{st}^2 \sigma_{\eta_{st}}^2 + (\frac{h}{(1+r)^2})^2 R_{lt}^2 \sigma_{\eta_{lt}}^2}{4\sigma_z^2})^{\frac{1}{2}}$, $\beta_{st} = \frac{(1-h)}{(1+r)} \frac{R_{st}^2}{2\lambda}$, $\beta_{lt} = \frac{h}{(1+r)^2} \frac{R_{lt}^2}{2\lambda}$ *and* $O = x^*(s) + z$.

The equilibrium of the stock market is similar to that in Kyle (1985). The main difference is that the informed investor has two signals: (i) one useful to forecast the long-term cash flow (θ_{lt}), and (ii) one useful to forecast the short-term cash flow (θ_{st}). As in Kyle (1985), the investor trades less aggressively on her signals when her trade has a stronger impact on the equilibrium price (β_j is inversely related to λ). Moreover, the investor trades more on a given signal if the informativeness of this signal increases (β_j increases with R_j^2). Last, the investor trades relatively more on the short-term signal and less on the long-term signal when h is lower. Thus, the order flow is more informative about the short-term cash flow when the horizon of the project is shorter.

The sensitivity of the expected stock price at date 1 to the investment of the firm at date 0 increases with the informativeness of the investor's signals, R_{st}^2 and R_{lt}^2. To see this, observe that the order flow at date 1 is:

$$O = x^*(s_{st}, s_{lt}) + z = \beta_{st}\kappa(I_m - I_b + \eta_{st} + (\tau_{st})^{-1}\varepsilon_{st}) + \beta_{lt}(I_m - I_b + \eta_{lt} + (\tau_{lt})^{-1}\varepsilon_{st}) + z, \tag{10}$$

because the informed investor's signals are about the actual firm's cash flow (that is, the cash flow under the actual investment of the firm in its project, not the investment anticipated by the informed investor). Thus, the manager expects the stock price at date 1 to be[11]

$$\begin{aligned} \mathrm{E}(p_1^*(O; I_b, I_m, h)) &= \Delta(h, r, \kappa) I_b + \lambda E(O) \\ &= \Delta(h, r, \kappa) I_b + \lambda \beta_{st} \kappa (I_m - I_b) + \lambda \beta_{lt} (I_m - I_b) \\ &= \Delta(h, r, \kappa) I_b + \gamma(R_{st}^2, R_{lt}^2, h)(I_m - I_b). \end{aligned} \tag{11}$$

where

$$\gamma(R_{st}^2, R_{lt}^2, h) = \frac{1}{2}\left(\frac{(1-h)\kappa}{(1+r)} R_{st}^2 + \frac{h}{(1+r)^2} R_{lt}^2\right). \tag{12}$$

Thus, $\gamma(R_{st}^2, R_{lt}^2, h)$ is the sensitivity of the stock price to the firm's investment on average. It increases with the informativeness of the informed investor's signals, R_{st}^2 and R_{lt}^2. Intuitively, the stock price at date 1 reflects the effect of the firm's investment on its value only insofar that market participants (in this case the informed investor) have information about future cash flows. Moreover, the investor trades more aggressively on her signals, and thus more information is impounded into the price about the effect of the investment on future cash flows when these signals are more informative. We deduce from eq.(7) (the manager's investment problem) the following result.

Proposition 1 *The optimal investment of the firm at date* 0*,* I_m^**, solves:*

$$C'(I_m^*) = \omega \gamma(R_{st}^2, R_{lt}^2, h) + (1-\omega)\Delta(h, r, \kappa). \tag{13}$$

Thus, holding the horizon of the project (h) constant, the investment of the firm at date 0 *increases with the informativeness of the short-term signal (*$\frac{\partial I_m^*}{\partial R_{st}^2} > 0$*) and the informativeness of the long-term signal (*$\frac{\partial I_m^*}{\partial R_{lt}^2} > 0$*). However, the sensitivity of investment to the informativeness of the short-term signal decreases with the project's horizon (*$\frac{\partial I_m^*}{\partial h \partial R_{st}^2} < 0$*) while the sensitivity of investment to the informativeness of the long-term signal increases with the horizon (*$\frac{\partial I_m^*}{\partial h \partial R_{lt}^2} > 0$*).*

Holding the horizon of the project fixed (i.e., for a given h), an increase in the informativeness of the signals used by informed investors leads the firm to invest more in its

[11] The manager's expectation differs from that of the informed investor or the market maker because the manager knows that her investment. For instance, the market maker and the investor expect the order flow to have a mean of zero given their conjecture that the manager invests I_b. However, this is not the case if the manager invests an amount different from I_b.

project.[12] However, the magnitude of the sensitivity of investment to the informativeness of the informed investor's signal at a given horizon depends on the horizon. That is, an increase in the informativeness of the short-term signal has a weaker effect on investment when the maturity of the project is longer (h increases). In contrast, an increase in the informativeness of the long-term signal has a stronger effect on investment when the project's horizon is longer. This differential effect of the informativeness of short-term and long-term signals on the firm's investment is our main prediction and we test it in Section V.

To better highlight this point, henceforth we assume that $C(I_m^*) = \frac{1}{2}(I_m^*)^2$. In this case, eq.(13) implies:

$$I_m^* = \alpha_0 + \alpha_1 \times h + \alpha_2 R_{st}^2 + \alpha_3(R_{st}^2 \times h) + \alpha_4(R_{lt}^2 \times h), \tag{14}$$

with $\alpha_0 = \frac{(1-\omega)\kappa}{(1+r)}$, $\alpha_1 = \frac{(1-\omega)}{(1+r)^2}$, $\alpha_2 = \frac{\omega\kappa}{2(1+r)}$, $\alpha_3 = -\alpha_2$, and $\alpha_4 = \frac{\omega}{2(1+r)^2}$. This linear specification for the relationship between investment and signals' informativeness corresponds to the specification that we estimate in Section V. The main prediction is $\alpha_3 < 0$ and $\alpha_4 > 0$.

It is easily checked that an increase in the manager's myopia (ω) reduces investment ($\frac{\partial I_m^*}{\partial \omega} < 0$), as found empirically by Edmans, Fang, and Lewellen (2017). More importantly for our purpose, the joint effects of the investment horizon and signals informativeness become stronger (in absolute value) when the manager's myopia increases ($\mid \frac{\partial \alpha_3}{\partial \omega} \mid > 0$ and $\mid \frac{\partial \alpha_4}{\partial \omega} \mid > 0$).

Eq.(14) also implies that investment should decrease with the level of the firm's cost of capital, r. This simply reflects the fact that the expected net present value of the firm project is then smaller. Moreover, the effect of short-term and long-term informativeness on the sensitivity of the firm's investment to the horizon of its project should be smaller (in absolute value) when the cost of capital is higher (($\mid \frac{\partial \alpha_3}{\partial r} \mid < 0$ and $\mid \frac{\partial \alpha_4}{\partial r} \mid < 0.$)). The reason is that the marginal increase in net present value due to reduced investment inefficiency is smaller when future cash flows are discounted more.

[12]Derrien and Kecskes (2013) finds that firms losing analysts coverage reduce their investment. To the extent that a drop in analyst coverage reduces the informativeness of signals available to investors to forecast short-run and long-run cash flows, their result is consistent with this implication of the model. Their interpretation is different, however (they argue that a loss in analysts' coverage raises the firm cost of capital).

The model also implies that the horizon of the project, h, should affect the level of investment in it. Indeed, eq.(14) implies:

$$\frac{\partial I_m^*}{\partial h} = \alpha_1 + \alpha_3 R_{st}^2 + \alpha_4 R_{lt}^2. \tag{15}$$

We have $\alpha_3 < 0$, $\alpha_4 > 0$ and the sign of α_1 can be positive or negative depending on κ and r. Thus, the model does not make clear-cut predictions about the effect of the project's horizon on the level of investment (this effect is positive for κ low enough and negative for κ large enough for instance). Our objective is not to study this effect but the effect of the informativeness of the signals available at date 1 on the sensitivity of investment to the project's maturity (the interaction effects between h and R_h^2)).[13]

In equilibrium, $I_b^* = I_m^*$ (investors correctly anticipate the level of investment chosen by managers). Thus, in equilibrium, the value of the firm at date 0 is (from eq.(7)):

$$V_0^*(h, R_{st}^2, R_{lt}^2) = \mathrm{E}(V(I_m^*, h)) = \Delta(h, r, \kappa) I_m^* + M - C(I_m^*). \tag{16}$$

The efficient investment level (i.e., the one maximizing the long-run fundamental value of the firm) is obtained when $\omega = 0$. Let I^e be the efficient level. We obtain the following corollary.

Corollary 1 *In equilibrium, the manager under-invests:* $U^* = I^e - I_m^* > 0$ *when* $\omega > 0$. *The level of under-investment decreases with the informativeness of the long-term and the short-term signals. However, the negative effect of the informativeness of the short-term signal on under-investment is weaker when the project's horizon is longer while the negative effect of the informativeness of the long-term signal on under-investment is stronger when the project's horizon is longer (*$\frac{\partial U^*}{\partial h \partial R_{st}^2} = -2\alpha_3 > 0$ *and* $\frac{\partial U^*}{\partial h \partial R_{st}^2} = -2\alpha_4 < 0$*).*

The manager's short-termism induces under-investment at date 0 because it takes time for the impact of the firm's investment on future expected cash-flows to be fully reflected into its stock price. In line with this implication, Asker, Farre-Mensa, and ljungqvist and

[13] To simplify notations, we have assumed that the discount rate, r, is identical for short-term and long-term cash-flows. However, it is straightforward to extend the model to the case in which the long-run discount rate differs from the short-term. In this case, all terms in $(1+r)^2$ (resp., $(1+r)$) must be replaced by $(1+r_{lt})^2$ (resp., $(1+r_{st})$) where r_{lt} (r_{st}) is the long (short) run discount rate. One can then show that the sensitivity of firms' investment to an increase in the long-run interest rate is negative and even more so for firms with projects with longer horizon (i.e., $\frac{\partial^2_{I_m^*}}{\partial r_{lt} \partial lt} < 0$), as documented by Hubert de Fraisse (2022).

(2016) find that public firms under-invest relative to private firms because of short-termism pressures. Our theory further predicts that an improvement in the informativeness of the signals received at date 1 by stock market participants should alleviate this issue. The manager has less incentive to forgo investing in positive NPV projects when investors are better informed about future cash flows and hence the value of these investments is reflected quicker into stock prices. The last part of Corollary 1 establishes that an improvement in investors' forecasts informativeness has a stronger negative effect on under-investment when forecasts are informative at the horizon corresponding to that of the firm's projects. This suggests that to reduce under-investment in long-term projects, an informative stock market is useful but not sufficient. In addition, it must also be informative about long-horizon cash flows.

Testing whether short-termism induces under-investment is notoriously difficult because the efficient level of investment is not easy to measure empirically.[14] However, as shown in the proof of Corollary 1, the effects of the informativeness of investors' signals on under-investment (U) are driven by their effects on I_m^* (because the efficient level of investment, I^e, does not depend on signals informativeness). Thus, testing whether $\alpha_3 < 0$ and $\alpha_4 > 0$ in eq.(14) is identical as testing the joint effect of signals' informativeness and projects' horizon on under-investment (as the last part of Corollary 1 implies).

B Extension to multiple projects with different horizons

In the baseline model, the firm has a single project with a fixed horizon, h. In this section, we consider a firm that can allocate a fixed capital, $\bar{I}$, between two projects: (i) a short-term project that pays a cash flow $\theta_{st} = \kappa I_{st} + \eta_{st}$ at date 2, and (ii) a long-term project that pays a cash flow $\theta_{lt} = I_{lt} + \eta_{lt}$ at date 3, where I_h is the investment in the project with horizon h and $\bar{I} = I_{st} + I_{lt}$. The total cost of investment is $C(I_{st}, I_{lt}) = 0.5I_{st}^2 + 0.5I_{lt}^2$. To simplify, we assume that $\bar{I}$ is fixed and known to investors but investors do not observe how the manager allocates capital between the two projects. In this version of the model, the firm implicitly chooses the average horizon of its projects by choosing I_{st} and I_{lt}. Given its allocation of

[14] Asker, Farre-Mensa, and ljungqvist and (2016) addresses this issue by comparing the investment of private firms (insulated from stock market-driven short-termism) to the investment of similar public firms.

capital, the fundamental value of the firm is:

$$V(I_{st}, I_{lt}) = \frac{\theta_{st}}{(1+r)} + \frac{\theta_{lt}}{(1+r)^2}, \tag{17}$$

and the manager now chooses I_{st} and I_{lt} at date 0 to maximize:

$$\{I^*_{st}, I^*_{lt}\} \in Argmax_{\{I_{st}, I_{lt}\}} \quad \omega \mathrm{E}(p^*_1(O; I_{b,st}, I_{b,lt}, I_{st}, I_{lt})) + (1-\omega)\mathrm{E}(V(I_{st}, I_{lt}) + M - C(I_{st}, I_{lt}), \tag{18}$$

under the constraint that $\bar{I} = I_{st} + I_{lt}$ and where $I_{b,h}$ is the market maker and the informed investors' belief about the manager's investment in the project with horizon h. The analysis of this case is very similar to that in the baseline case. Thus, we report the optimal firm's investment in the next proposition and provide a detailed analysis of this case (in particular the derivation of the equilibrium of the stock market) in the online appendix.

Proposition 2 . *Let* $I^e(\bar{I}) = \frac{\bar{I}}{2} + \frac{\kappa}{1+r} - \frac{1}{(1+r)^2}$. *At date* 0*, the manager optimally chooses the following allocation of capital between the two projects:*

$$I^*_{st}(\omega) = I^e(\bar{I}) + \frac{\omega}{2}\left[\frac{\kappa}{1+r}(\frac{R^2_{st}}{2} - 1) + \frac{1}{(1+r)^2}(1 - \frac{R^2_{lt}}{2})\right], \tag{19}$$

and

$$I^*_{lt}(\omega) = \bar{I} - I^*_{st}. \tag{20}$$

Thus, the investment in the long-term (resp., short-term) project increases in the informativeness of the investor's long-term (short-term) signal and decreases in the informativeness of the short-term (long-term) signal.

One way to test this prediction is to consider firms that operate in multiple industries. In this interpretation, $\bar{I}$ is the total investment of the firm, and I^*_h is its investment in the division with project's horizon h. We follow this approach in Section V.C.4, in which we test whether as the project's horizon corresponding to a division increases, investment in this division becomes more sensitive to the informativeness of the long-term signal and less sensitive to the informativeness of the short-term signal, controlling for the firm's total investment($\bar{I}$).

The efficient level of investments in the short-term and long-term projects (denoted I^e_{st} and I^e_{lt}) are obtained when $\omega = 0$ (the manager maximizes the long-run value of the firm).

Thus, from Proposition 2, $I_{st}^e = I^e(\bar{I})$ and $I_{lt}^e = \bar{I} - I^e(\bar{I})$. The expressions for I_{st}^* and I_{lt}^* show that in general, the investment chosen by the manager deviates from the efficient allocation as in the baseline case. However, in contrast to the baseline case, there can be under-investment ($I_h^* < I_h^e$) or over-investment ($I_h^* > I_h^e$) in the project with horizon h. In particular, there can be over-investment in the long-term project (and therefore under-investment in the short-term project) when $\kappa(1+r) > \frac{2-R_{lt}^2}{2-R_{st}^2}$.[15] As R_{lt}^2 increases, over-investment in the long-term project increases. This implication highlights again the importance of the horizon of the information produced by the stock market. If investors focus too much on the production of long-term information, one can obtain situations in which the manager invests too much in long-term projects, especially if r and κ are large.[16]

C Discussion and extensions

Public information vs. private information: The assumption that signals are private is not key for our testable implications. Consider again the baseline version of the model and the polar case in which the signals are public information (i.e., observed by the market maker). In this case, the price at date 1 is:

$$\begin{aligned} p_1^{*public}(s_{st}, s_{lt}; I_b, I_m, h) &= \mathrm{E}(V(I_b^*, h)\,|s_{st}, s_{lt}) \\ &= (\frac{(1-h)\kappa}{(1+r)} R_{st}^2) s_{st} + (\frac{h}{(1+r)^2} R_{lt}^2) s_{lt}, \end{aligned}$$

and therefore the expected price at date 0 is

$$\mathrm{E}(p_1^{*public}(s_{st}, s_{lt}; I_b, I_m, h)) = (\frac{(1-h)\kappa}{(1+r)} R_{st}^2 + \frac{h}{(1+r)^2} R_{lt}^2) I_m = 2\gamma(R_{st}^2, R_{lt}^2, h) I_m. \quad (21)$$

[15] In the knife-edge case in which $\kappa(1+r) = 1$, it is efficient to allocate capital equally between the two divisions. However, this is not the case if the informativeness of the long-term signal is different from the informativeness of the short-term signal.

[16] Managerial myopia does not necessarily imply that managers invest too much in short-term projects. It just means that they deviate from the maximization of the firm's long-run value. Bebchuk and Stole (1993) also obtain the possibility of over-investment in a long-term project when a short-termist manager allocates a fixed amount of capital between a short-term and a long-term project. However, in Bebchuk and Stole (1993), this never happens in the case in which the firm investment cannot be perfectly observed. In Bebchuk and Stole (1993), the information possessed by investors about future cash-flows when the stock price is set plays no role (investors are implicitly assumed to have no information on the cash-flow of the long-term project when investment is non-observable). As our analysis shows, this is not innocuous since when investors have too good long-term signals relative to short-term signals, one can also obtain over-investment in long-term projects even if the manager's investment is not observed.

It follows immediately that Proposition 1 still holds. The only difference is that $\gamma(R_{st}^2, R_{lt}^2, h)$ is multiplied by 2. Hence the level of investment is larger when signals are public than when they are private. The reason is that the stock price better reflects the fundamental value of the firm given its investment when the signals are public. When they are private, the equilibrium stock price is less informative about the fundamental value of the firm because the informed investor trades strategically on her information, which reduces the amount of information impounded into prices.[17] As a result, the level of investment is smaller with private information than with public information. However, it does not alter our main prediction regarding the sensitivity of investment to the informativeness of the short-term and the long-term signals for projects with different horizons.[18]

Multiple Informed Traders: For simplicity, we have assumed that there is only one informed investor. However, this assumption is not key. It just reduces the informativeness of the order flow for the dealer, holding the informativeness of signals (R_{st}^2 and R_{lt}^2) constant. When the number of informed investors increases, the sensitivity of the expected stock price to investment increases from γ (the case with one informed investor) to 2γ (when the number of informed investors is infinite). Similar to the public information case, as the number of informed investors becomes infinite, the order flow becomes fully informative about informed investors' signals. Thus, the model implies that the predicted effects should be stronger in markets with more informed traders, assuming that this number does not directly affect the informativeness of signals.[19]

Stock price informativeness vs. signals informativeness: In the model, an increase in the informativeness of the signal at a given horizon makes the stock price at date 1 more informative about the firm's fundamental value (i.e., it reduces $Var(V(I_m^*, h) \mid P)$, the resid-

[17]This comparison is other things equal. It is possible that, in reality, public signals are less informative than private signals. However, this does not affect our predictions regarding the effects of varying the informativeness of short-term and long-term signals of a given type (public or private).

[18]Similarly, Corollary 1 and Proposition 2 still hold. The only difference is that when the signals are public, investment inefficiencies vanish when both signals become perfect. This is not the case when signals are private because even when they are perfect, they are not fully revealed via the trading process (due to noise trading).

[19]In reality, informed investors may choose to invest less in information when there are more informed investors since the return on the cost of producing information decreases with the number of informed investors.

ual uncertainty about V after observing the price). However, our main predictions cannot be tested with a proxy for price informativeness in place of separate measures for the informativeness of investors' long-term and short-term signals. Indeed, when the informativeness of the long-term signal and the short-term signal vary in opposite directions (as is the case over the long run; see DFF2021), the net effect of price informativeness on investment is ambiguous. To see this, consider a firm whose project has a short horizon (h small) and suppose that, for this firm, the informativeness of the short-term signal increases while the informativeness of the long-term signal decreases by a much larger amount. As h is small, the informativeness of the price about future short-term cash-flows (θ_{st}) increases. However, investment can drop because R^2_{lt} drops by a larger amount than R^2_{st} (see eq.(14)). In sum, the variations of R^2_{lt} and R^2_{st} have separately more explanatory power to understand variations of investment than the variations in price informativeness (which reflects a weighted average of the informativeness of short-term and long-term signals).

IV Data and measurements

To test the predictions of the model, we need measures of (i) the horizon of firms' projects (h), and (ii) the informativeness of investors' signals about short-term and long-term cash-flows (R^2_{st} and R^2_{lt}). This section explains how we construct these measures (Appendix I provides a summary of all the variables used in our tests and their definition).

A Project horizon (h)

We use the horizon of firms' business plans as a proxy for the horizon of their projects. Business plans describe companies' objectives and detail the time frame and investments needed to achieve these objectives as well as the associated cash-flow projections. Thus, variations in the horizon of business plans should correlate positively with variations in the horizon of the corresponding projects' cash flows.

We measure the horizon of business plans from the text of firms' disclosures. We systematically search for the terms "year business plan", "year strategic plan", "year growth plan", "year investment plan", "year capital expenditure plan", "year expansion plan", "year development plan", "year extension plan", and "year plan" through the content of all SEC filings (including 10Ks, 10Qs, 8Ks,...) between 1994 and 2015. We find 13,908 filings matching at least one of the above expressions. We drop cases where the horizon cannot be identified (e.g., when managers refer to their "multi-year" plan) and then collect the information about the horizon in number of years when it is explicitly mentioned (e.g., "3-year business plan" or "5-year strategic plan"). When several horizons are mentioned in the same filing, we take the average horizon. For example, if managers refer to their "3 to 5-year plan", we assign a horizon of 4 years. In this set of filings, the shortest horizon is 1 year and the longest is 30 years (e.g., Huntington Ingalls Industries (shipbuilding), Oklahoma Gas & Electric (utilities), or Molycorp (mining)). At the end of this process, we obtain information on the horizon of the business plans for 3,925 distinct firms over the 1994-2015 period.

[Insert Figure II about here]

On average, the business plan horizon is 4.3 years. Figure II shows that 3-year and 5-year horizons are the most common horizons. Most of the heterogeneity is cross-sectional, suggesting that the horizon of a firm's business plan is highly persistent. Indeed, firm fixed effects explain up to 70% of variation in business plan horizon. Business plan horizon also clusters by industry. This persistence within firm over time, and across firms within industry is consistent with our conjecture that the horizon of the projects that firms undertake primarily reflects permanent economic characteristics due to business specificities such as the length of production and consumption cycle or the useful life of assets. These are outside managerial control, as assumed in the baseline version of our model.

We focus on the average horizon by two-digit SIC industry across all available filings, denoted *Project Horizon*. *Project Horizon* is thus time-invariant. Moreover, for any given firm i, $\textit{Project Horizon}_i$ corresponds to its industry average, even if i never mentions the horizon of its business plan. This aggregation serves three purposes. First, it allows us to extract the time-invariant component of projects' horizon by industry and thus to better identify structural differences in investing horizon across firms. Second, it reduces noise coming from heterogeneous capital budgeting practices. Third, it increases the power of our tests, since we can include all firms with a known industry.

[Insert Table I and Figure IIIabout here]

Table I shows the ranking of industries with the longest horizons (left panel) and the shortest ones (right panel). Firms in the "utility", "mining", "steel", and "shipbuilding" industries use the longest business plans, and firms operating in "defense", "candy and soda", "banking" and "health services" use the shortest ones.[20] This ranking is consistent with Graham (2022). His survey data indicate that the shortest expected life for new projects is in "retail" and "finance", and the longest in "tech" and "manufacturing".[21] Figure III shows that our horizon measure closely matches his project life measure for the six sectors he uses. The differences in the number of years between the two measures are never statistically significant, and the correlation between the two exceeds 0.9. Our industry rankings are also in line with Hubert de Fraisse (2022) and Dew-Becker (2012) who use accounting depreciation rates to measure horizon.[22]

Compared to (the inverse of) accounting-based depreciation rates, one benefit of our measure is that it is better connected to the real life of firms' projects. For example, some assets may fully depreciate (e.g. software) before the projects' actual termination, while others may never depreciate (e.g. land) despite the projects having a finite horizon.[23] Another benefit of our measure is that it is an *ex-ante* measure of horizon that does *not* depend on past, current, or expected future investment choices (as is the case for price-based duration measures or duration measures using ex-post cash flow realizations).

[20]Business plan horizon is surprisingly short for firms in the "Defense" industry. This is because the demand for firms in this industry depends on the Bipartisan Budget, which is a two-year plan that sets spending for the Pentagon and other federal agencies.

[21]See Figure 7, Panel B on Page 25 in Graham (2022).

[22]In the online appendix, we show that our results are identical when using this accounting-based approach as an alternative measure for project horizon by industry, or when using measures for firm cash-flows duration.

[23]Another weakness of depreciation-based measures inferred from accounting statements is that they depend on past investment and the age of existing assets. Little depreciation could indicate that the assets employed have a long useful life, or that these assets are obsolete and need to be replaced. Because depreciation rates reflect assets' obsolescence speed, they will tend to systematically capture re-investment needs.

B The informativeness of investors' signals (R^2)

We obtain variation in the overall informativeness of signals available to investors for cash flows realized at different horizons from the forecasts of sell-side analysts. Following a large literature on beliefs formation and asset prices, we assume that sell-side analysts' forecasts are overall representative of investors' information, and that these forecasts are a good approximation for the signals available to investors at short and long horizons (e.g., Landier and Thesmar (2020) or Hong, Wang, and Yang (2021)).

We capture the informativeness of investors' signals about cash flows at short and long horizons using the measure developed by DFF2021. They measure the informativeness of the forecasts issued by an analyst at a given time for a given horizon by the R-squared (R^2) of a regression of the realized earnings (of the firms she covers) on the forecasted earnings, based on data from I/B/E/S. Higher R^2 implies that the forecasts of a given analyst for a given horizon explain a larger fraction of realized earnings at that horizon, and thus that her forecasts are more informative. They consider horizons ranging from one day to five years. We use the same analyst-date-horizon R^2 data and we average the informativeness across all available analysts by year and horizon. We focus on two aggregate proxies for investors' signals' informativeness for each year t: one for short-term horizons (from 12 months to 23 months), denoted $R^2_{st,t}$ (a proxy for R^2_{st} in our theory), and another one for long-term horizons (from 24 months to 59 months), denoted $R^2_{lt,t}$ (a proxy for R^2_{lt} in our theory).

We consider the above aggregate measures of signals' informativeness, as opposed to firm-level measures for four main reasons. First, aggregation reduces measurement error. This is especially important because forecast informativeness is noisy at the analyst level, especially long-term forecasts. Second, aggregation avoids reverse causality concerns, since firm-specific variation in investment is unlikely to affect the informativeness of forecasts made by *all* analysts. Third, aggregation mitigates concerns about omitted variables because *aggregate* variation in forecasts informativeness that is common to all analysts should be arguably less related to the characteristics of individual firms and analysts. Finally, the aggregation of $R^2_{st,t}$ and $R^2_{lt,t}$ reflects the informativeness of the forecasts for distinct horizons made by a myriad of analysts, and are thus more likely to capture overall investors' signals about cash-flows materializing in the short-term or long-term.

Table IA.1 of the online appendix reports the aggregate value of $R^2_{st,t}$ and $R^2_{lt,t}$ by year between 1993 and 2015. Short-term forecasts are more informative than long-term forecasts. Moreover, the informativeness of short-term forecasts has improved over time, as R^2_{st} increases by 0.3 percentage points per year, and the increase is statistically significant with t-statistics of 2.57. In contrast, the informativeness of long-term forecasts has deteriorated, with R^2_{lt} decreasing by 0.2 percentage points per year, a trend that is also significant (t-statistic of -1.76).[24] The (Pearson) correlation between the two time series is 0.34, indicating a substantial variation in the relative informativeness of investors' signals about short and long horizon cash flows.

V Empirical evidence

This section tests Proposition 1. We study how different firms (some with short-horizon projects and others with long-horizon projects) modify their investment in response to changes in the informativeness of investors' signals about short and long-term cash flows.

A Baseline specification

Our main specification derives from the theory (see Section III). We take eq.(14) to the data and test whether $\alpha_4 > 0$ and $\alpha_3 < 0$ by estimating:

$$Capex_{i,t} = b_1(\text{Project Horizon}_i \times R^2_{lt,t-1}) + \\ + b_2(\text{Project Horizon}_i \times R^2_{st,t-1}) + \gamma X_{i,t-1} + \phi_i + \eta_t + \varepsilon_{i,t} \quad (22)$$

where $Capex_{i,t}$ is the capital expenditures (scaled by lagged PPENT) of firm i in fiscal year t, Project Horizon$_i$ is the average business plan horizon corresponding to firm i's industry, and $R^2_{st,t-1}$ and $R^2_{lt,t-1}$ are aggregate measures for the informativeness of investors' signals about short and long-term cash flows. The main coefficients of interest are b_1 and b_2 (the empirical counterparts of α_4 and α_3 in eq.(14)). Proposition 1 predicts that the sensitivity of investment to the informativeness of investors' long-term signal increases with project horizon

[24] Economic magnitude for the two opposing trends differs from Dessaint, Foucault, and Fresard (2021) because the time period is different, and the definition we use for short and long horizon as well.

(i.e., $\alpha_4 > 0$ in eq.(14)), and thus that $b_1 > 0$. In contrast, the sensitivity of investment to the informativeness of investors' short-term signal should decrease with project horizon (i.e., $\alpha_3 < 0$ in eq.(14)), implying $b_2 < 0$. Therefore, Proposition 1 predicts $b_1 > 0$ and $b_2 < 0$ in eq.(22).

We estimate eq.(22) with firm (ϕ_i) and fiscal year (η_t) fixed effects and include control variables for known determinants of investment, namely, the log of total assets, cash flows, the inverse of PP&E, and Tobin's Q. The fixed effects and control variables aim at capturing determinants of investment that are absent from our model but could nevertheless influence the estimation of b_1 and b_2.[25] We cluster standard errors by SIC2 and fiscal year. We estimate eq.(22) on a sample comprising all U.S. firms from Compustat (fic=USA, loc=USA, and curcd=USA) that (i) are not active in the financial sector (SIC between 6000 and 6999) or the utility sector (SIC between 4900 and 4999), (ii) have non-missing information on total assets, sales, capital expenditures, property, plant and equipment (PP&E), equity, debt, cash and net income, and (iii) can be merged with CRSP and I/B/E/S. We further require that total assets and sales are both greater than \$1 million, and that sales are greater than net income. The sample starts in 1994, when SEC filings became available in electronic format, and ends in 2015 as R^2 for long-term forecasts cannot be estimated after because earnings realizations are not yet available.

[Insert Table II about here]

Table II shows summary statistics. On average, *Capex* is 0.34, Project Horizon is 4.35 years. In line with DFF2021, who show that the term-structure of forecasts informativeness is downward sloping, R^2_{st} is approximately 60% in this panel, and is greater than R^2_{lt} (approximately 40%). All other variables are defined in Appendix I. Variables based on Compustat data are winsorized by fiscal year at the 2% level in each tail.

B Main results

Table III presents various estimations of eq.(22). The first column reports results obtained without the inclusion of control variables or firm fixed effects, exploiting solely the cross-

[25] Notice the fixed effects absorb the direct effects of h as well as R^2_{st} and R^2_{lt}

sectional variation in investment observed in a given year across firms with short and long projects' horizons. Supporting our predictions, we observe that $b_1 > 0$ and $b_2 < 0$, and both are statistically significant. All else equal, firms with longer project horizons invest more than firms with shorter horizons in years in which the informativeness of investors' long-term signals is high. Similarly, firms with shorter project horizons invest more than firms with longer horizons when the informativeness of investors' short-term signals is high.

[Insert Table III about here]

Columns (2) and (3) show similar results when controlling for firm fixed effects as well as for firm size, capital stock, cash flows, and Q. A specification with these controls, especially the inclusion of Q, is particularly important since it further lessens the concerns that the results stem from a correlation between the informativeness of investors' short and long-term signals and firms' (time-varying) characteristics, such as their size or the attractiveness (i.e., expected cash flows) of their projects at different horizons, or variation in discount rates (as suggested by the model). Indeed, investors may have more informative signals at short (long) horizons for larger (smaller) firms or when firms have more (less) valuable opportunities at specific horizons. Our use of aggregate (as opposed to firm-specific) signals informativeness is designed to limit this concern. The stability of the results obtained with controls for firms' time-varying characteristics should also alleviate it.

To further address the potential correlation between the informativeness of investors' signals and firms' characteristics (other than the horizon of their projects), we add interaction terms between each control variable and both measures of signals' quality ($R^2_{st,t-1}$ and $R^2_{lt,t-1}$). The results, reported in Column (4), are unchanged. In addition, in the last column of Table III, we alter the estimation approach and replace OLS with the cumulant estimator developed by Erickson, Jiang, and Whited (2014) to make sure that our results are not due to unobserved investment opportunities that might correlate with signals' informativeness. Existing research indicates that Q (the ratio of market value to assets) might be a poor proxy for firms' investment opportunities, leading to biased estimates in investment specifications like ours. However, we obtain similar conclusions when we limit these biases following Erickson, Jiang, and Whited (2014).

These results are robust to using alternative measures of firms' project horizons. For example, using the equity duration measure of Goncalves (2021) or that of Weber (2018) averaged by SIC2 as a proxy for average project horizon by industry leads to similar inferences.[26] Results are also the same if we proxy for projects' horizons using sales growth (i.e., higher growth reflecting longer horizons) or the inverse of firms' depreciation rates (i.e., lower depreciation of assets reflecting longer horizons).[27]

C Ancillary results

The results so far corroborate the model's main prediction: the sensitivity of firms' investment to the informativeness of investors' long-term signals increases with the horizon of firms' project horizon while the sensitivity to the informativeness of investors' short-term signals decreases with project horizon. To ensure that this result stems from the mechanisms highlighted by the model, we test four ancillary predictions.

C.1 Differential effects by managerial incentives (ω)

First, as shown in our theoretical analysis, an increase in the sensitivity (ω) of a manager's objective function to her current stock price should make the effects documented in the previous section stronger. We test this prediction using four groups of variables used by prior research as proxies for the extent of managerial myopia: managers' compensation schemes (e.g., Edmans, Fang, and Lewellen (2017)), investors' short-term focus (e.g., Derrien, Kecskes, and Thesmar (2013)), firms' reliance on external financing (e.g., Baker, Stein, and Wurgler (2003)), and takeover pressures (e.g., Stein (1989)).

First, we rely on the scaled wealth-performance sensitivity developed by Edmans, Gabaix, and Landier (2009) (i.e., the dollar change in CEO wealth for a 100 percentage point change in firm value, scaled by annual compensation) and the fraction of equity shares owned by the CEO as a proxy for managers' short-term incentives stemming from their compensation schemes. Second, we follow Derrien, Kecskes, and Thesmar (2013) and use the fraction of institutional investors with short horizons (measured by their portfolio turnover) in a firm's ownership as another proxy for ω. Third, we measure firms' need to tap markets based on

[26]See Online Appenix, Section 2, Table IA.2, Columns 1 and 2
[27]See online appendix, Section 2, Table IA.2, Columns 3 and 4

the predicted likelihood that they will issue stocks in the next 12 months as well as the maturity of their debt. Fourth, we measure firms' exposure to takeover pressure using the presence of a poison pill or a classified board, and firms' takeover defense score (from Capital IQ) which summarizes the strength of takeover defenses (across various aspects of corporate governance and takeover defenses mechanisms). Finally, we develop a text-based measure of managers' short-term orientation as the fraction of words in SEC filings referring to "short-term" (i.e., "short-term", "short-run", "current" and "currently") over words referring to both "short-term" and "long-term" (i.e., "long-term" and "long-run"). We present the detailed construction of these variables in Appendix I, and the summary statistics in Table II.

[Insert Table IV about here]

To test whether the joint effects of project horizon and investors' signal informativeness on investment is stronger when managerial myopia is more prevalent (i.e., larger ω), we augment eq.(22) by interacting R^2_{st}, R^2_{lt}, project horizon, and their respective interaction with binary variables indicating whether each (lagged) proxy for ω is above the sample mean (or positive if the proxy in binary). The coefficients of interest in these augmented models are those on these two triple interactions. Consistent with the model's prediction, Table IV confirms that, across all eight proxies, the effects documented in Table III are more pronounced when managers have stronger incentives to maximize their current stock price. For instance, the results indicate that firms with longer project horizons invest more than firms with shorter horizons when the informativeness of investors' long-term signals is high, only when CEOs' wealth-performance sensitivity or equity ownership is above average.

C.2 Differential effects by investment observability

As is common in the literature on short-termism (e.g., Fishman and Hagerty (1989), Stein (1989), or Edmans (2009),), we have assumed that the manager's investment decision at date 0 is not observed at date 1. This assumption can be relaxed to some extent: our predictions hold as long as *part* of the firm's investment is unobserved by investors at date 1.[28] However,

[28]One possible reason is that date 1 (the horizon at which the manager cares about her stock price) arises before the firm releases information about its investment. For instance, Edmans, Fang, and Lewellen (2017)

when investment is fully observed, the manager makes the efficient decision independently of the informativeness of investors' signals. Thus, the effects predicted by the model should be weaker for firms that provide better and more timely information about their investment. We test whether this is the case using three measures of the timeliness of firms' information on their investment.

First, we consider the average time lag (in days) between the date of the announcement of firms' earnings and their reported financial statements. We conjecture that a longer lag reflects less timely available information on investment. The effects documented in Table III should thus be more pronounced when reporting lags are longer. Second, we consider issues of investment guidance about the dollar amount of capital expenditures (from I/B/E/S). Third, we consider whether firms voluntarily disclose information about their investment policy or expansion plans through press releases and company communication (from Capital IQ Key Development). More guidance and voluntary disclosure about investment should provide investors with more timely information about firms' investment.

[Insert Table V about here]

We again introduce interaction terms between our main explanatory variables and these three proxies (denoted ψ) in eq.(22), and focus on the triple-interaction coefficients. Table V confirms the empirical relevance of our assumption. The first column indicates that the difference in investment sensitivity to the informativeness of long-term forecasts between firms with short and long-horizon projects concentrates on firms with longer reporting lags. The remaining two columns show that this difference narrows significantly when firms produce more information about their investment through guidance and specific disclosures.

C.3 Differential effects by cost of capital (r)

Next, we test whether our main effects are weaker when discount rates are higher, as our model predicts. We estimate a weighted average cost of capital for every firm in every year (hereafter $wacc_{i,t}$).[29]. Then we introduce this variable in our main specification using the

show empirically that managers cut investment (and sell equity) in the quarter in which large amounts of equity vest, presumably before the annual investment is observed by investors.

[29] We provide a detailed description of the method we use to calculate the WACC in Appendix I.

same triple-interaction approach as before. Specifically, we interact our main explanatory variables with the inverse of $(1 + wacc_{i,t})$.[30] All results are reported in Table VI.

[Insert Table VI about here]

In column (1), we use the equity risk premium of Martin (2016) to first calculate the cost of equity, and then the WACC. We find that the coefficient on the first triple interaction is positive and significant, indicating that when the WACC is larger (and thus $(1 + wacc)^{-1}$ is lower), the difference in investment sensitivity to the informativeness of long-term forecasts between firms with short and long horizon projects becomes weaker. The same symmetric effect is observed for the investment sensitivity to the informativeness of short-term forecasts. The coefficient on the second triple interaction is indeed negative and significant. The rest of the table shows similar results when calculating the cost of equity (and then the WACC) using the equity risk premium from other sources.

C.4 Extension to multi-division firms

As explained in Section II.B, another way to test our theory is to consider multi-division firms. Proposition 2 implies that an increase in the informativeness of short-term signals should lead these firms to shift capital from divisions with long-term projects to divisions with short-term projects and that an increase in the informativeness of long-term signals should have the opposite effect. We test this prediction using multi-divisions firms operating across multiple industries. These firms can more easily alter the average horizon of their projects by shifting investment across divisions. We can thus test whether, holding total investment fixed, firms reallocate capital toward divisions with shorter projects' horizon when the informativeness of investors' short-term signals increases or the informativeness of their long-term signals decreases. To do so, we estimate the following specification:

$$Capex_{i,d,t} = b_1(Project\ Horizon_{i,d} \times R^2_{lt,t-1}) + \\ + b_2(Project\ Horizon_{i,d} \times R^2_{st,t-1}) + \gamma X_{i,d,t-1} + \phi_{i,t} + \varepsilon_{i,d,t} \quad (23)$$

[30] We do not directly interact with $wacc_{i,t}$ because the discounting function is not linear but obtain similar results if we do.

where $Capex_{i,d,t}$ is the capex of division d of firm i in year t. The project horizon of each division, $Project\ Horizon_{i,d}$, corresponds to that of its corresponding industry. $R^2_{st,t-1}$ and $R^2_{lt,t-1}$ are defined as before. We include firm×year fixed effects ($\phi_{i,t}$) to absorb any time-*varying* unobserved firm-specific characteristics that may correlate with the informativeness of investors' signals, firms' project horizon, and their overall investment level. The vector X includes (lagged) control variables, namely, the log of division assets, one divided by the division depreciation and amortization, and the average Tobin's Q of the corresponding industry as a proxy for the division's investment opportunities. We cluster standard errors by SIC2 and year.

For this test, we use Compustat Segment data and define divisions by aggregating firms' activities (e.g., investment or assets) in specific (two-digit SIC) industries. We keep all U.S. firms with at least two divisions in a given year that (i) are not active in the financial (SIC between 6000 and 6999) or utility sectors (SIC between 4900 and 4999), and (ii) have non-missing (non-negative) assets and sales. As before, we focus on the period between 1994 and 2015. Because property, plant and equipment is not well populated at the division level, we define division's investment as capital expenditures divided by depreciation and amortization. A ratio greater than 1 indicates that the amount of net invested capital in the division increases. Table IA.4 of the online appendix presents summary statistics for this sample and shows that the average division's investment ratio is 1.24. All other variables are defined in Appendix I. Variables based on Compustat data are winsorized by fiscal year at the 2% level in each tail.

[Insert Table VII about here]

The coefficients of interest in eq.(23) are again b_1 and b_2. Proposition 2 predicts that $b_1 > 0$ and $b_2 < 0$. Table VII shows that this prediction is supported by the data. Consistent with our theory, multi-division firms lengthen (shorten) the horizon of their overall projects by allocating more (less) capital to divisions with longer project horizons when the informativeness of investors' long-term signals improves (deteriorates). In contrast, they decrease their average projects' horizon by allocating more (less) capital to divisions with shorter project horizons when investors' short-term signals' informativeness increases (decreases).

The estimates of b_1 and b_2 are statistically significant in all specifications. They hold with or without controls, irrespective of the estimation methods (i.e., OLS or the cumulant estimator of Erickson, Jiang, and Whited (2014)).

VI Robustness, alternative channels, and implications

A Robustness

The findings are consistent with our predictions. Yet, it is possible that omitted factors correlating with R^2_{lt} and/or R^2_{st} may affect our estimates. However, to confound our theory, any omitted factor should confound *all* our results. In particular, it should simultaneously explain why $b_1 > 0$ *and* $b_2 < 0$ in eq.(22). For that, it should be positively correlated with R^2_{lt} *and* negatively correlated with R^2_{st} (or negatively correlated with R^2_{lt} *and* positively correlated with R^2_{st}) because R^2_{lt} and R^2_{st} are *positively* correlated. Moreover, the interaction between the same omitted factor and our proxies for ω, ψ, and r should generate the same effects as our theory predicts. We cannot rule out this possibility, but it seems unlikely.

[Insert Figure IV about here]

Nevertheless, to further mitigate this concern, we perform three types of test (see Sections 6, 7, and 8 in online appendix). First, we show that our results survive when controlling for a host of macro variables (e.g., GDP growth, VIX, Treasury Yields, ...) capturing variations in economic cycles, uncertainty, and overall financing conditions.[31] Next, we show that these results are also robust to controlling for unobserved trends by Fama-French 17 industry, by the state of location, and by the state of incorporation.[32] Finally, we verify that we are not capturing any pre-trend (i.e., that the observed change in investment is not due to pre-existing forces affecting firms with long-horizon projects and unrelated to variations in R^2_{lt} and R^2_{st}) by estimating the dynamic of capital re-allocation across firms after R^2 changes in a given year.[33] Figure IV displays the results (The graph plots the regression coefficients reported in online appendix, Section 8, Table IA.8). We find no evidence of any pre-trend.

[31] See online appendix, Section 6, Table IA.6.
[32] See online appendix, Section 7, Table IA.7.
[33] See online appendix, Section 8, Table IA.8.

B Economic magnitude and alternative channels

Our main results imply that firms usually investing in say 3-year projects increase (decrease) investment relative to firms investing in 1-year (5-year) projects after R^2_{lt} (R^2_{st}) increases. To gauge the economic magnitude of this effect, we normalize all our variables by their within-firm standard deviation in our preferred specification (except *Project Horizon* which is constant within-firm). We find b_1=.054 and b_2=-.040 in eq.(22).[34] These estimates imply that the increase (decrease) in investment in the above example represents $2 \times 5.4\% = 10.8\%$ ($2 \times 4.0\% = 8.0\%$) of within-firm standard deviation in investment.

To further assess the importance of the "improved incentives" channel, we benchmark it against the "cost of capital" channel. The existing literature shows that investors' expectations of return vary by horizon, suggesting that the cost of capital for short and long-horizon projects may differ. Thus, one possible alternative explanation for our findings is that when the quality of investors' information for a given horizon increases then the discount rate for cash flows at this horizon decreases. To control for and assess the importance of this channel, we augment our specification with variables capturing the aggregate variation in debt and equity yields for short and long horizons, interacted with *Project Horizon*. We find that none of these interaction terms is significant.[35] Thus, we cannot reject the null that, *everything else equal*, changes in the term-structure of expected return for debt and equity does *not* affect investment across projects with different horizon. This finding is hardly surprising because the discount rate that managers use for capital budgeting is known to be sticky (Graham and Harvey (2001)). Managers use the same rate for capital budgeting across divisions (Krüger, Landier, and Thesmar (2015)) and infrequently update this rate (Jacobs and Shivdasani (2012)). It is therefore unlikely that managers use a different discount rate by horizon to account for the term structure of investors' expected return when calculating the NPV of an investment project.

Another possible explanation for our findings relates to the "learning channel". According to this channel, managers learn information about their investment opportunities from stock

[34]See online appendix, Section 9, Table IA.9, Column 1
[35]See online appendix, Section 10, Table IA.9, Column 2

prices. Their investment is therefore sensitive to stock prices and even more so when prices are more informative (see Bond, Edmans, and Goldstein (2012)). Our measures of the informativeness of investors' short-term and long-term forecasts could arguably capture the informativeness of stock prices at various horizons. If so, our baseline findings regarding the effects of project horizon on the sensitivity of investment to the quality of investors' signal should disappear when we allow these effects to depend on the level of firms' stock price. Table IA.10 in the online appendix shows that this is not the case. Moreover, the "learning channel" does *not* imply that the effect of the informativeness of investors' signals should weaken when managers care more about the impact of their decision on firms' long-run value (as we find in Table IV). Indeed, the learning channel is supposed to operate even (if not more) when managers care about the impact of their decision on firms' long-run value.[36] These observations do not imply that the learning channel does not play a role. They just indicate that it cannot fully explain our baseline and ancillary findings.

C Implication for the evolution of projects' horizon

If better investors' information about short-term cash flows generates more investment in short-term projects (as we show), and if investors have become better at predicting the short-term (as documented by recent research), one would expect to observe (i) greater capital allocation to short-term projects over time, and (ii) a decreasing trend in firms' projects' horizon. These implications are supported by the data. Graham (2022) documents that the average life of the new projects that firms undertake has been decreasing in recent years.[37] In the online appendix, we provide two pieces of evidence that corroborate this finding. First, we show that there has been less investment over time in industries with long-horizon projects, even after controlling for variation in Tobin's Q. [38]

[Insert Figure V about here]

[36] To our knowledge, all models of the "learning channel" implicitly assume that managers maximize the long-run firm value. We are not aware of models of this channel with myopic managers. One could argue that managerial myopia should weaken the learning channel: If managers do not seek to maximize the firm's long-run value, they have fewer incentives to collect information (including from stock prices) useful for this.

[37] See Figure 7, Panel A on Page 25 in Graham (2022).

[38] see online appendix, Section 12, Table IA.11.

We provide more direct evidence supporting this negative trend focusing on mergers and acquisitions. At the time of deal announcement, bidding firm managers may disclose the horizon at which they expect synergies to materialize and the deal to be EPS-accretive. We gather this information for a large sample of deals (from SDC Platinum). Figure V shows that both horizons have been decreasing since the 90's on average, and thus that firms are now engaging in acquisition projects providing earlier benefits. We formally establish that this negative trend is significant, and even more so after controlling for the project value (using the market reaction to deal announcement as a proxy and applying the correction for measurement error of Erickson, Jiang, and Whited (2014)).[39]

D Implication for firm value

Our analysis confirms that the horizon at which financial markets produce information matters for the allocation of investment across projects with different horizons. This effect arises because the higher quality of investors' information improves managerial incentives, and mitigates under-investment. A related question is whether this mitigation is really value-enhancing (i.e., limit under-investment in positive NPV projects). Answering this question is challenging because the NPV of the projects that firms undertake is typically unobserved.

[Insert Table VIII about here]

To provide a preliminary answer, we analyze the acquisition of private firms as large-scale projects for which we can use market reaction as a proxy for their NPV. Specifically, we assess how market reactions to deals involving targets in industries with long or short horizons changes after R^2_{lt} and R^2_{st} changes. Table VIII shows that the market reaction to acquiring targets in industries with long(short)-horizon projects increases when R^2_{lt} (R^2_{st}) increases. Higher quality investors' information about long-term cash flows is associated with more valuable long-term investments. Likewise better information about the short-term is associated with more valuable short-term investments.

[39] See online appendix, Section 12, Table IA.12.

VII Conclusion

Recent research suggests that the horizon at which investors can predict the future has declined over time. To understand whether this trend has real effects, we analyze whether the quality of investors' information for various horizons affects firms' investment. We show that it does, because the quality of investors' information impacts managers' incentives, the "improved incentive channel". In our theory, managers care about how their investment decision is impounded in current stock prices. Because prices imperfectly reflect investment's value, they under-invest. However, we predict that they under-invest less when investors have better information about the horizon matching that of their projects.

Our main contribution is to show that this prediction is supported by the data. Using a measure of projects' horizon obtained from the text of regulatory filings, we find that improvements in investors' long-term (short-term) information induce firms with long-term (short-term) projects to invest more. This effect is especially strong when managers focus on current stock prices. Hence, the horizon at which financial markets produce information matters.

An implication of our findings is that the increased focus on the production of information about short-term cash flows by investors could reduce the aggregate level of investment in long-term projects. Preliminary evidence from the expected horizon of synergy realizations in M&A corroborates the survey evidence of Graham (2022) and confirms an overall reduction in long-term investments since the late 1990s. A more systematic analysis of the aggregate decline in the horizon of firms' projects and the underlying mechanisms is an interesting venue for future research.

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Figure I: Timeline of the model

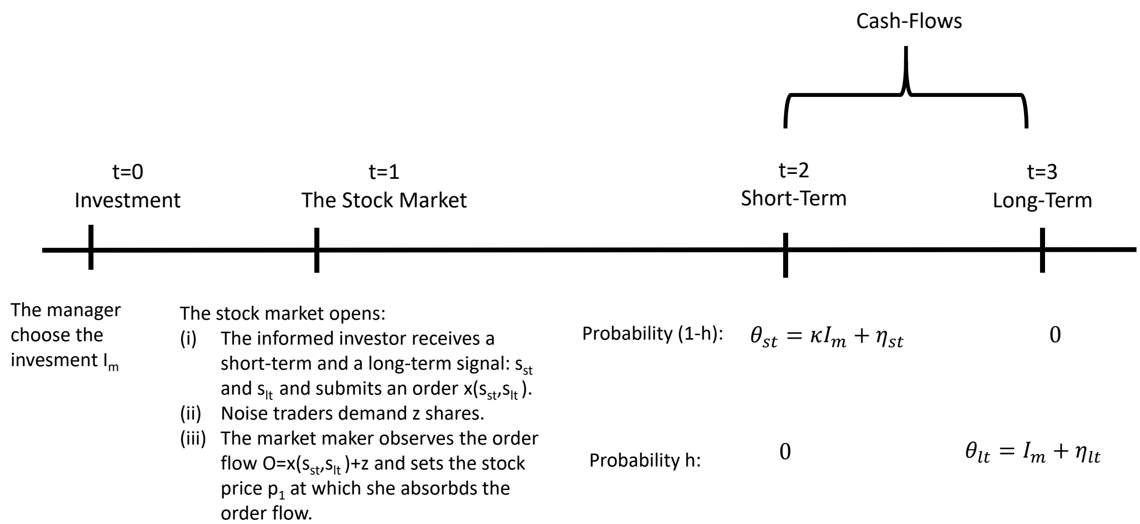
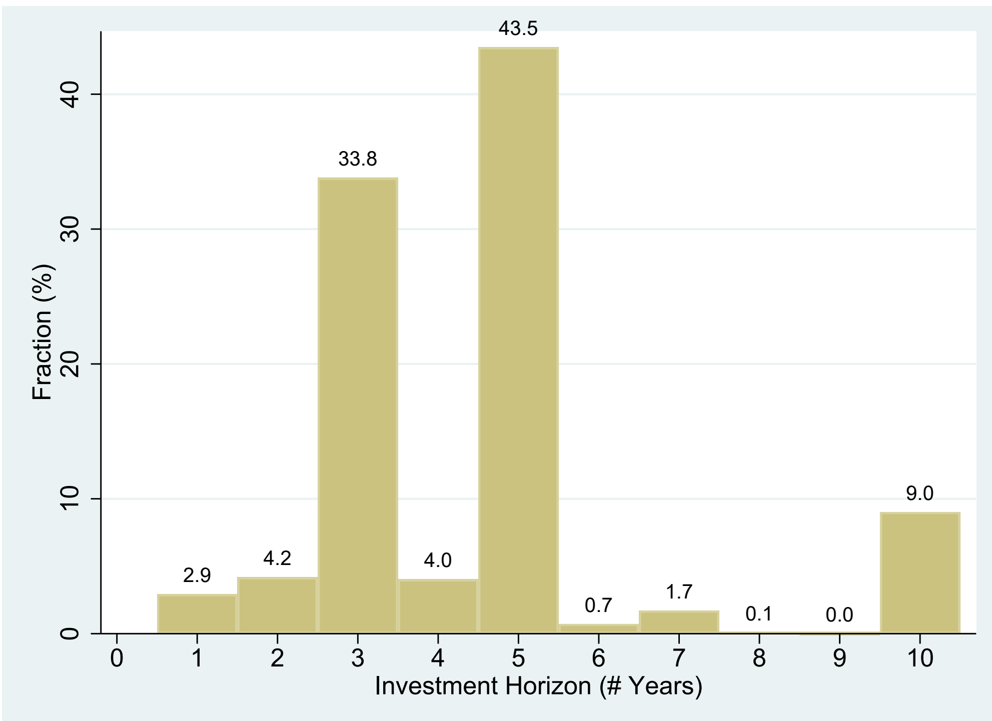
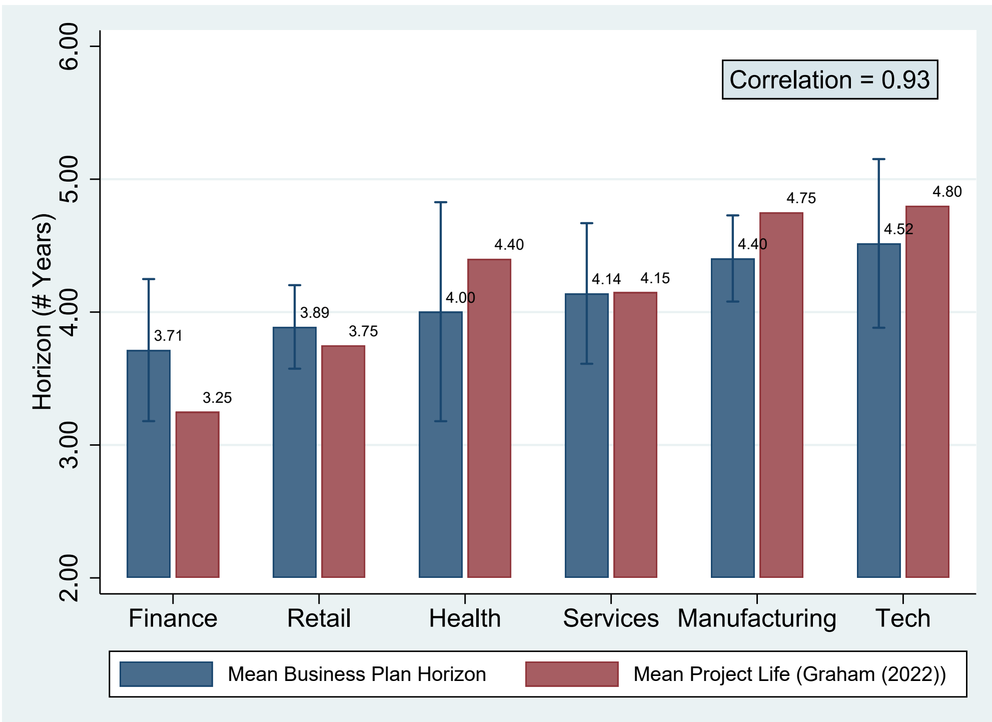


Figure II: The distribution of business plan horizon



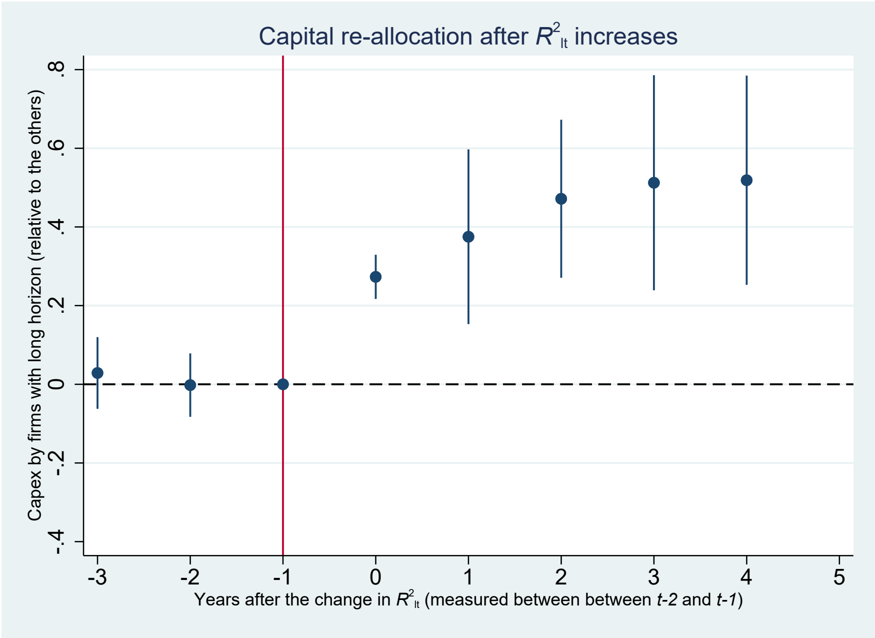
This figure shows the distribution of the horizon of the business plan that managers expect for their firms. The data is collected from the text of SEC filings and includes 13,908 observations of the business plan horizon mentioned or reported by 3,925 firms between 1994 and 2020. The "10-year Horizon" bin in the graph includes business plan horizons of 10 years and beyond.

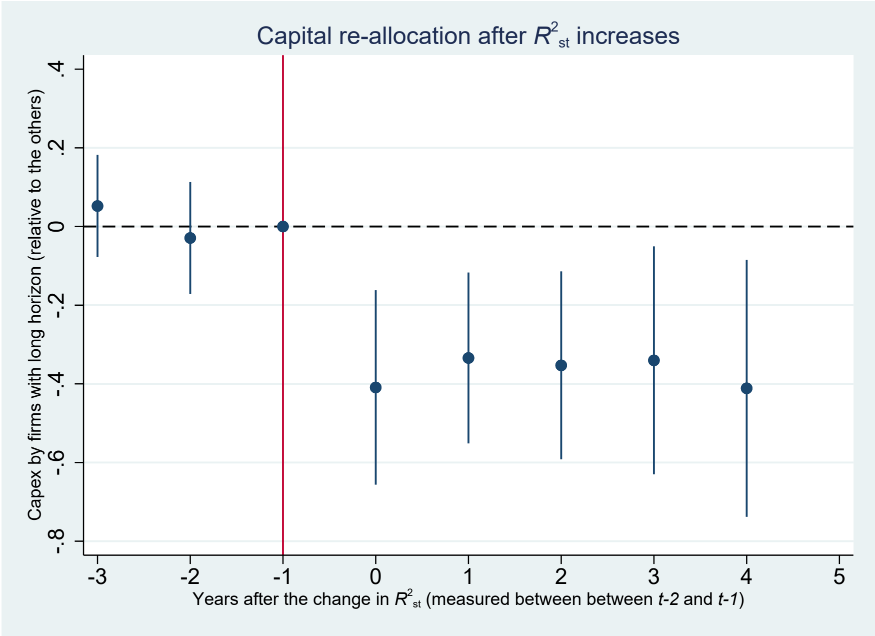
Figure III: Comparison with the average project life by sector from Graham (2022)



This figure compares the average business plan horizon by sector with the survey data of Graham (2022) about the average expected life for new projects by sector as of 2018 (See Figure 7, Panel B on Page 25 in Graham (2022)). Mean business plan horizon is calculated from a sample of 13,908 observations of business plan horizon mentioned in the text of the SEC filings of 3,925 firms between 1994 and 2020. The correlation of 0.93 is the Pearson correlation between the two data series across all 6 sectors. Reported confidence intervals are at 99% level.

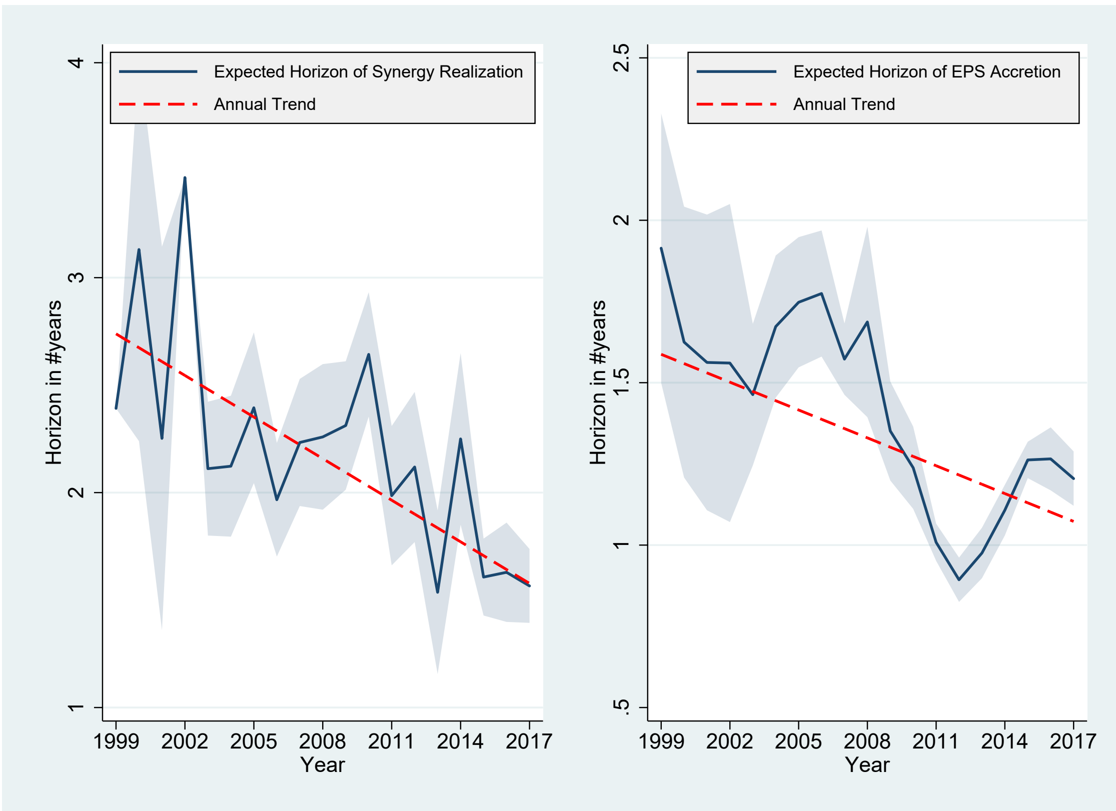
Figure IV: Capital allocation dynamic between firms





This figure plots the regression coefficients reported in online appendix, section 8, Table IA.8. The top graph shows how firms with long-horizon projects change investment every year relative to firms with short-horizon projects after R^2_{lt} improves in a given year, i.e., when the informativeness of long-term forecasts made by all US analysts increases in the reference year (controlling for possible changes in R^2_{lt} in other years). The bottom graph shows how firms with long-horizon projects change investment every year relative to firms with short-horizon projects after R^2_{st} improves in a given year, i.e., when the informativeness of short-term forecasts made by all US analysts increases in the reference year (controlling for possible changes in R^2_{st} in other years). The reference year is t-1, and the improvement in R^2 is measured relative to t-2 (as $R^2_{t-1} - R^2_{t-2}$). Reported confidence intervals are at 90% level.

Figure V: Trend in (M&A) project horizon



This figure plots the evolution of the horizon at which managers of the bidding firm expect their investment to generate synergies (left-graph) and be EPS accretive (right-graph). Reported confidence intervals are at 90% level.

Table I: Mean business plan horizon by Fama-French 49 industry

This table shows the top-15 industries with longest business plan horizon, and the top-15 ones with shortest business plan horizon. Mean business plan horizon by Fama-French 49 industry is calculated from a sample of 13,908 observations of business plan horizon mentioned in the text of the SEC filings of 3,925 firms between 1994 and 2020.

FF49 Industries with Longest Business Plan Horizon

Rank	Industry	Mean Business Plan Horizon
1	Utilities	7.15
2	Mining	5.88
3	Steel Works	5.58
4	Shipbuilding, Railroad Equipment	5.56
5	Coal	5.48
6	Business Supplies	4.94
7	Chemicals	4.93
8	Petroleum and Natural Gas	4.92
9	Communication	4.88
10	Shipping Containers	4.85
11	Personal Services	4.84
12	Construction Materials	4.79
13	Electronic Equipment	4.75
14	Aircraft	4.72
15	Construction	4.68

FF49 Industries with Shortest Business Plan Horizon

Rank	Industry	Mean Business Plan Horizon
1	Defense	3.12
2	Candy & Soda	3.36
3	Banking	3.37
4	Health Services	3.39
5	Consumer Goods	3.54
6	Printing and Publishing	3.59
7	Tobacco Products	3.60
8	Apparel	3.66
9	Retail	3.85
10	Food Products	3.89
11	Restaraunts, Hotels, Motels	3.89
12	Insurance	3.90
13	Recreation	3.91
14	Textiles	3.96
15	Wholesale	4.00

Table II: Sample descriptive statistics

This table presents descriptive statistics for the main variables employed in our main test. The sample includes 66,601 firm-year observations about 8,082 distinct non-financial non-utility US firms in Compustat between 1994 and 2015. Detailed variable definitions are in Appendix I.

	N	Mean	STDV	P10	P25	P50	P75	P90
Main employed variables								
Capex	66,601	0.34	0.34	0.07	0.13	0.23	0.41	0.72
R^2_{st}	66,601	0.59	0.04	0.54	0.56	0.58	0.62	0.65
R^2_{lt}	66,601	0.40	0.05	0.32	0.36	0.40	0.43	0.47
Project Horizon	66,601	4.35	0.51	3.71	3.99	4.38	4.68	4.88
Q	66,601	2.07	1.61	0.93	1.14	1.55	2.35	3.83
Cash Flow	66,601	0.03	0.17	-0.16	0.02	0.08	0.12	0.17
Size	66,601	5.71	1.93	3.32	4.27	5.56	6.98	8.31
Assets	66,601	1,812	5,070	28	72	259	1,073	4,065
Other variables used for cross-sectional analysis								
CEO Wealth Performance Sensitivity	19,449	17.68	28.39	1.81	3.75	7.68	17.03	44.12
CEO Equity Ownership	23,279	2.8%	6.6%	0.0%	0.1%	0.4%	1.7%	8.3%
Short Horizon Institutional Investors	59,219	60.4%	22.6%	29.7%	48.0%	62.9%	76.5%	87.7%
New SEO likelihood	63,350	0.11	0.11	0.03	0.04	0.08	0.13	0.23
Residual Debt Maturity	23,114	2.67	1.07	1.26	1.91	2.60	3.37	4.14
Poison Pill or Class. Board	37,466	0.59	0.49	0.00	0.00	1.00	1.00	1.00
Takeover Defense Score	62,479	0.21	0.15	0.04	0.08	0.18	0.31	0.43
#Mentions of ST vs. LT in SEC filings	54,924	80.5%	10.8%	66.4%	73.1%	80.6%	88.7%	94.7%
Reporting Lag	65,943	31.67	14.05	18.50	23.50	30.00	38.50	45.00
Capex Guidance	66,601	0.15	0.35	0.00	0.00	0.00	0.00	1.00
Expansion Plan Disclosure	66,601	0.17	0.37	0.00	0.00	0.00	0.00	1.00
WACC (Martin (2010))	52,759	8.4%	4.6%	6.3%	7.0%	8.0%	9.2%	10.2%
WACC (Campbell et al. (2008) - In sample)	66,593	11.4%	4.6%	7.8%	9.2%	10.9%	12.6%	14.8%
WACC (Campbell et al. (2008) - Out sample)	66,593	10.6%	4.5%	7.5%	8.7%	10.6%	12.3%	13.3%
WACC (Damodaran (2022))	66,593	8.0%	4.1%	6.6%	7.1%	8.0%	8.7%	9.5%

Table III: Main results

This table presents estimates of firm-level investment specifications (eq.(22)). The dependent variable is $Capex_{i,t}$ defined as capital expenditures scaled by lagged PPENT. Project Horizon$_i$ is the average horizon of firms' projects, which we proxy by the average horizon of the business plan that firms use in the industry. Project Horizon$_i$ is constant by SIC2-industry and is aimed to capture structural differences in project horizon across firms. $R^2_{st,t}$ measures the average informativeness of the short-term forecasts made by all US analysts in a given year. Short-term forecasts are forecasts with horizon between 1 and 2 years. $R^2_{lt,t}$ measures the average informativeness of the long-term forecasts made by all US analysts in a given year. Long-term forecasts are forecasts with horizon between 2 and 5 years. All other variables are defined in Appendix I. Explanatory variables that are collinear with the fixed effects are omitted from the regression. *t*-statistics in parentheses are based on standard errors clustered in two ways, by SIC2-industry and by fiscal year. Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Dep. variable:			$\text{Capex}_{i,t}$		
Specification	(1)	(2)	(3)	(4)	(5)
Project Horizon$_i \times R^2_{lt,t-1}$	0.36***	0.39***	0.34***	0.32***	0.20***
	(4.85)	(3.19)	(3.57)	(3.30)	(9.44)
Project Horizon$_i \times R^2_{st,t-1}$	-0.31**	-0.36**	-0.29**	-0.28**	-0.17***
	(-2.21)	(-2.59)	(-2.41)	(-2.41)	(-6.07)
Project Horizon$_i$	0.04				
	(0.62)				
$1/\text{PPENT}_{i,t-1}$			0.83***	1.05***	0.78***
			(12.43)	(2.73)	(26.06)
$\text{Q}_{i,t-1}$			0.08***	0.11***	0.13***
			(13.63)	(3.46)	(40.36)
Cash $\text{Flow}_{i,t-1}$			0.32***	-0.09	0.25***
			(10.29)	(-0.41)	(17.33)
$\text{Size}_{i,t-1}$			0.01	0.03*	0.02***
			(0.59)	(1.81)	(5.23)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	Yes	Yes
Controls Interacted	No	No	No	Yes	No
Estimation Method	OLS	OLS	OLS	OLS	EW GMM
N	66,601	66,601	66,601	66,601	66,601

Table IV: Differential effects by managerial incentives (w)

This table presents estimates of firm-level investment specifications (eq.(22)). The dependent variable is $Capex_{i,t}$ defined as capital expenditures scaled by lagged PPENT. Project Horizon$_i$ is the average horizon of firms' projects, which we proxy by the average horizon of the business plan that firms use in the industry. Project Horizon$_i$ is constant by SIC2-industry and is aimed to capture structural differences in project horizon across firms. $R^2_{st,t}$ measures the average informativeness of the short-term forecasts made by all US analysts in a given year. Short-term forecasts are forecasts with horizon between 1 and 2 years. $R^2_{lt,t}$ measures the average informativeness of the long-term forecasts made by all US analysts in a given year. Long-term forecasts are forecasts with horizon between 2 and 5 years. In column 1, $w_{i,t}$ indicates whether CEO Wealth Performance Sensitivity$_{i,t}$ is above the sample mean. In column 2, $w_{i,t}$ indicates whether CEO Equity Ownership$_{i,t}$ is above the sample mean. In column 3, $w_{i,t}$ indicates whether the percentage of short-term institutional investors (Long-Horizon Institutional Investors$_{i,t}$) is above the sample mean. In column 4, $w_{i,t}$ indicates whether the probability of a SEO is above the sample mean. In column 5, $w_{i,t}$ indicates whether residual debt maturity$_{i,t}$ is above the sample mean. In column 6, $w_{i,t}$ is equal to one if the firm adopted a poison pill or if the board is classified, and zero if not. In column 7, $w_{i,t}$ indicates whether takeover defense score$_{i,t}$ (relative to SIC4 peers) is above the sample mean. In column 8, $w_{i,t}$ indicates whether the percentage of words in SEC filings referring to "short-term" as opposed to "long-term" is above the sample mean. i indexes firm and t indexes fiscal year. All variables are defined in Appendix I. Explanatory variables that are collinear with the fixed effects are omitted from the regression. t-statistics in parentheses are based on standard errors clustered in two ways, by SIC2-industry and by fiscal year. Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Dep. variable:				Capex$_{i,t}$				
Proxy for w	CEO Wealth-Performance Sensitivity	CEO Equity Ownership	Institutional Investors Horizon	New SEO Likelihood	Residual Debt Maturity	Poison Pill or C. Board	Takeover Defense Score	#Mentions of ST vs. LT
OLS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Project Horizon$_i \times R^2_{lt,t-1} \times w_{i,t-1}$	0.47**	0.42***	0.26**	0.50***	-0.30**	-0.56**	-1.19**	0.36***
	(2.17)	(3.68)	(2.33)	(4.17)	(-2.59)	(-2.42)	(-2.17)	(3.77)
Project Horizon$_i \times R^2_{st,t-1} \times w_{i,t-1}$	-0.55**	-0.50**	-0.32**	-0.54**	0.30*	0.38***	0.70*	-0.37***
	(-2.15)	(-2.18)	(-2.21)	(-2.57)	(2.02)	(3.04)	(1.73)	(-3.10)
Project Horizon$_i \times R^2_{lt,t-1}$	0.07	0.06	0.19***	0.13*	0.45***	0.68***	0.35***	0.17**
	(0.70)	(0.54)	(2.99)	(1.73)	(5.65)	(3.02)	(3.79)	(2.56)
Project Horizon$_i \times R^2_{st,t-1}$	-0.07	-0.06	-0.11	-0.12*	-0.36**	-0.41***	-0.30**	-0.08
	(-0.95)	(-1.25)	(-1.37)	(-1.93)	(-2.11)	(-2.91)	(-2.45)	(-1.07)
$R^2_{st,t-1} \times w_{i,t-1}$	2.16*	2.04**	1.21*	1.81**	-1.23*	-1.59***	-3.15*	1.43***
	(2.01)	(2.07)	(1.99)	(2.15)	(-1.88)	(-3.06)	(-1.74)	(2.94)
$R^2_{lt,t-1} \times w_{i,t-1}$	-1.93**	-1.86***	-0.64	-1.75***	1.05**	2.33**	5.30**	-1.37***
	(-2.18)	(-2.98)	(-1.39)	(-3.65)	(2.42)	(2.41)	(2.25)	(-2.86)
Project Horizon$_i \times w_{i,t-1}$	0.16	0.14	0.08	0.12	-0.06	-0.02	0.15	0.08
	(1.24)	(1.13)	(1.32)	(0.96)	(-0.68)	(-0.35)	(0.66)	(1.21)
$w_{i,t-1}$	-0.59	-0.51	-0.44	-0.37	0.31	0.08	-0.49	-0.32
	(-1.06)	(-0.99)	(-1.57)	(-0.73)	(0.81)	(0.38)	(-0.50)	(-1.07)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	19,449	23,279	59,219	63,350	23,114	37,466	62,538	54,924

Table V: Differential effects by investment observability

This table presents estimates of firm-level investment specifications (eq.(22)). The dependent variable is $Capex_{i,t}$ defined as capital expenditures scaled by lagged PPENT. Project Horizon$_i$ is the average horizon of firms' projects, which we proxy by the average horizon of the business plan that firms use in the industry. Project Horizon$_i$ is constant by SIC2-industry and is aimed to capture structural differences in project horizon across firms. $R^2_{st,t}$ measures the average informativeness of the short-term forecasts made by all US analysts in a given year. Short-term forecasts are forecasts with horizon between 1 and 2 years. $R^2_{lt,t}$ measures the average informativeness of the long-term forecasts made by all US analysts in a given year. Long-term forecasts are forecasts with horizon between 2 and 5 years. In column 1, $\psi_{i,t}$ indicates whether the log of Reporting Lag$_{i,t}$ is above the sample median. In column 2, $\psi_{i,t}$ indicates whether a guidance was made in I/B/E/S for the corresponding capex (i.e., for the same firm and the same fiscal period). In column 3, $\psi_{i,t}$ indicates whether expansion plans were disclosed. Expansion plans are disclosed if at least one news item#31 is recorded in Capital IQ. Capital IQ defines news item#31 as news related to "the growth of a company, usually by means of increasing their current operations through internal growth, like entering into new markets with existing products, opening a new branch, establishing a new division, increasing production capacity, or investing additional capital in the current business. Growth by acquisition is not covered in this event type." i indexes firm and t indexes fiscal year. All variables are defined in Appendix I. Explanatory variables that are collinear with the fixed effects are omitted from the regression. t-statistics in parentheses are based on standard errors clustered in two ways, by SIC2-industry and by fiscal year. Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Dep. variable:		$Capex_{i,t}$	
Proxy for ψ	Reporting Lag	Capex Guidance	Expansion Plan Disclosure
OLS	(1)	(2)	(3)
Project Horizon$_i$ $\times$ $R^2_{lt,t-1} \times \psi_{i,t-1}$	0.36**	-0.69***	-0.74***
	(2.25)	(-8.09)	(-3.00)
Project Horizon$_i$ $\times$ $R^2_{st,t-1} \times \psi_{i,t-1}$	-0.31*	0.31*	0.37**
	(-1.95)	(1.96)	(2.46)
Project Horizon$_i$ $\times$ $R^2_{lt,t-1}$	0.16*	0.36***	0.38***
	(1.80)	(3.44)	(3.81)
Project Horizon$_i$ $\times$ $R^2_{st,t-1}$	-0.15	-0.34*	-0.34**
	(-1.63)	(-2.00)	(-2.58)
$R^2_{st,t-1} \times \psi_{i,t-1}$	1.36**	-1.32*	-1.56**
	(2.08)	(-1.86)	(-2.39)
$R^2_{lt,t-1} \times \psi_{i,t-1}$	-1.66**	2.67***	3.27***
	(-2.57)	(6.10)	(3.24)
Project Horizon$_i$ $\times \psi_{i,t-1}$	0.05	0.08	0.07*
	(0.52)	(1.27)	(1.87)
$\psi_{i,t-1}$	-0.17	-0.24	-0.35**
	(-0.45)	(-0.90)	(-2.06)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
N	65,925	66,601	66,601

Table VI: Differential effects by cost of capital (r)

This table presents estimates of firm-level investment specifications (eq.(22)). The dependent variable is $Capex_{i,t}$ defined as capital expenditures scaled by lagged PPENT. Project Horizon$_i$ is the average horizon of firms' projects, which we proxy by the average horizon of the business plan that firms use in the industry. Project Horizon$_i$ is constant by SIC2-industry and is aimed to capture structural differences in project horizon across firms. $R^2_{st,t}$ measures the average informativeness of the short-term forecasts made by all US analysts in a given year. Short-term forecasts are forecasts with horizon between 1 and 2 years. $R^2_{lt,t}$ measures the average informativeness of the long-term forecasts made by all US analysts in a given year. Long-term forecasts are forecasts with horizon between 2 and 5 years. $WACC_{i,t}$ is the Weighted Average Cost of Capital, first calculated by firm, then averaged by SIC2-year. Calculation details are provided in the text and in Appendix I. $WACC_{i,t}$ is centered at the mean (for readability of the baseline terms in the regression). In column 1, the source for the equity risk premium is Martin (2016). In column 2 (3), the equity risk premium is estimated every year in-sample (out-of-sample) using the same predictors and the same approach as Campbell and Thompson (2008). In column 4, the source for the equity risk premium is the implied equity risk premium from Damodaran website. i indexes firm and t indexes fiscal year. All variables are defined in Appendix I. Explanatory variables that are collinear with the fixed effects are omitted from the regression. t-statistics in parentheses are based on standard errors clustered in two ways, by SIC2-industry and by fiscal year. Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Capex$_{i,t}$			
Proxy for *wacc*	Martin (2017)	Campbell & Thomson (2008)-In	Campbell & Thomson (2008)-Out	Damodaran (2022)
OLS	(1)	(2)	(3)	(4)
Project Horizon$_i \times R^2_{lt,t-1} \times (1 + wacc_{i,t-1})^{-1}$	12.75***	13.99**	7.63*	10.77
	(2.84)	(2.39)	(2.01)	(1.13)
Project Horizon$_i \times R^2_{st,t-1} \times (1 + wacc_{i,t-1})^{-1}$	-10.02**	-9.19***	-8.50***	-12.23**
	(-2.41)	(-3.49)	(-2.82)	(-2.16)
Project Horizon$_i \times R^2_{lt,t-1}$	0.26**	0.23**	0.32***	0.28**
	(2.30)	(2.30)	(3.09)	(2.19)
Project Horizon$_i \times R^2_{st,t-1}$	-0.28*	-0.36***	-0.37***	-0.30**
	(-1.84)	(-2.89)	(-2.72)	(-2.20)
$R^2_{st,t-1} \times (1 + wacc_{i,t-1})^{-1}$	44.6	38.03***	35.63**	48.02**
	(1.55)	(3.19)	(2.65)	(2.16)
$R^2_{lt,t-1} \times (1 + wacc_{i,t-1})^{-1}$	-63.78*	-67.28**	-39.29**	-59.55
	(-1.88)	(-2.56)	(-2.35)	(-1.42)
Project Horizon$_i \times (1 + wacc_{i,t-1})^{-1}$	0.79	-0.15	1.72**	2.43
	(0.44)	(-0.13)	(2.28)	(0.86)
$(1 + wacc_{i,t-1})^{-1}$	-0.26	4.5	-4.07	-1.86
	(-0.02)	(0.85)	(-1.29)	(-0.16)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
N	52,759	66,593	66,593	66,593

Table VII: Investment allocation within firms

This table presents estimates of division-level investment specification (eq.(23)). The dependent variable is $Capex_{d,i,t}$ defined as capital expenditures scaled by depreciation at the division-firm-year level. Project Horizon$_{d,i}$ is the average horizon of projects by division, which we proxy by the average horizon of the business plan that firms use in the industry of the division. Project Horizon$_{d,i}$ is constant by SIC2-industry and is aimed to capture structural differences in project horizon across divisions operating different SIC2 industries. $R^2_{st,t}$ measures the average informativeness of the short-term forecasts made by all US analysts in a given year. Short-term forecasts are forecasts with horizon between 1 and 2 years. $R^2_{lt,t}$ measures the average informativeness of the long-term forecasts made by all US analysts in a given year. Long-term forecasts are forecasts with horizon between 2 and 5 years. i indexes firm and t indexes fiscal year. All variables are defined in Appendix I. Explanatory variables that are collinear with the fixed effects are omitted from the regression. t-statistics in parentheses are based on standard errors clustered in two ways, by SIC2-industry and by fiscal year. Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Division Capex$_{d,i,t}$			
Specification	(1)	(2)	(3)	(4)
Project Horizon$_{d,i}\times R^2_{lt,t-1}$	1.26***	1.19***	1.22***	0.75**
	(3.73)	(3.66)	(3.82)	(2.21)
Project Horizon$_{d,i}\times R^2_{st,t-1}$	-1.09***	-1.02***	-1.03***	-0.36**
	(-3.44)	(-3.31)	(-3.62)	(-1.96)
Project Horizon$_{d,i}$	0.17	0.15	0.15	-0.15
	(0.81)	(0.72)	(0.71)	(-1.25)
1/D&A		0.02	-0.01	0.02
		(0.70)	(-0.03)	(1.18)
Division Q$_{d,i,t-1}$		0	-0.48**	0.06*
		(-0.20)	(-2.63)	(1.74)
Division Cash Flow$_{d,i,t-1}$		0.40***	-1.81**	0.19***
		(3.68)	(-2.63)	(5.39)
Division Size$_{d,i,t-1}$		0.03	-0.14	0.03***
		(1.67)	(-0.82)	(3.19)
Firm x Year FE	Yes	Yes	Yes	Yes
Controls Interacted	No	No	Yes	No
Estimation Method	OLS	OLS	OLS	EW GMM
N	17,416	17,416	17,416	17,416

Table VIII: Implication for firm value

This table presents estimates of deal-level regressions. The dependent variable is Bidder CAR$[t-1,t+1]_{d,t,y}$. Project Horizon$_d$ is the average horizon of the projects in the *target* industry (which we proxy by the average horizon of the business plan that firms use in this industry). Project Horizon$_d$ is constant by SIC2-industry and is aimed to capture structural differences in project horizon across targets operating in different SIC2 industries. $R^2_{st,y}$ measures the average informativeness of the short-term forecasts made by all US analysts in the (calendar) year of deal announcement y. Short-term forecasts are forecasts with horizon between 1 and 2 years. $R^2_{lt,y}$ measures the average informativeness of the long-term forecasts made by all US analysts in the (calendar) year of deal announcement y. Long-term forecasts are forecasts with horizon between 2 and 5 years. d indexes deal, y indexes calendar year of deal announcement and t indexes deal announcement date. All variables are defined in Appendix I. t-statistics in parentheses are based on standard errors clustered by deal announcement date. Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Bidder CAR$[t-1,t+1]_{d,t,y}$			
Specification	(1)	(2)	(3)	(4)
Project Horizon$_d\times$ $R^2_{lt,y-1}$	0.06***	0.05**	0.04**	0.04*
	(3.13)	(2.21)	(2.09)	(1.84)
Project Horizon$_d\times$ $R^2_{st,y-1}$	-0.05**	-0.06**	-0.06**	-0.05*
	(-2.00)	(-2.23)	(-2.09)	(-1.83)
Same Industry$_d$			0.00	0.00
			(1.59)	(1.42)
Cross Border$_d$			0.00	0.00
			(-1.37)	(-1.47)
Stock Paid$_d$			0.00	0.00
			(1.54)	(1.03)
Hostile$_d$			0.03***	0.03***
			(2.50)	(2.62)
Relative Size$_d$			0.01*	0.01
			(1.64)	(1.60)
Toehold$_d$			-0.02*	-0.02*
			(-1.74)	(-1.81)
Acquirer Size$_d$			-0.00***	-0.00***
			(-3.85)	(-5.45)
Acquirer Q$_{d,y-1}$				0.00***
				(3.29)
Acquirer Cash Flow$_{d,y-1}$				0.01
				(1.11)
Acquirer Debt$_{d,y-1}$				0.00
				(-0.78)
Acquirer Cash$_{d,y-1}$				-0.01*
				(-1.91)
Year FE	Yes	Yes	Yes	Yes
Acquirer SIC2 FE	Yes	-	-	-
Target SIC2 FE	Yes	-	-	-
Target SIC2 x Acquirer SIC2 FE	No	Yes	Yes	Yes
N	10,497	10,497	10,484	10,206

VIII Appendices

Appendix I – Variable Definitions

A – Firm-level variables

Variable	Definition
Main variables	
Capex	*capx/ppent* (from last available financial statements in Compustat). *ppent* is measured at the end of the previous fiscal year ($fyear$).
Project Horizon	Average horizon of projects which we proxy by the average horizon of the business plan that firms use in the industry. Data on firm business plan horizon are collected from SEC filings and averaged by 2-digit SIC industry. Project Horizon is time-invariant by SIC2-industry.
R^2_{lt}	Average informativeness of the long-term forecasts made by all US analysts in I/B/E/S in a given year. Long-term forecasts are forecasts with horizon between 2 and 5 years. R^2_{lt} is obtained by averaging the measure of analysts' forecasts informativeness of Dessaint, Foucault, and Fresard (2021) across all US analysts by fiscal year. Dessaint, Foucault, and Fresard (2021) measure forecasts informativeness by analyst-day-horizon using the R^2 of a regression of realized earnings on predicted earnings across the stocks the analyst covers. A higher R^2 indicates that the forecasts of this analyst on that date at this horizon explain a larger fraction of the variation in realized earnings (e.g., if $R^2 = 1$, the analyst has perfect foresight).
R^2_{st}	Average informativeness of the short-term forecasts made by all US analysts in I/B/E/S in a given year. Short-term forecasts are forecasts with horizon between 1 and 2 years. R^2_{st} is obtained by averaging the measure of analysts' forecasts informativeness developed by Dessaint, Foucault, and Fresard (2021) across all US analysts by fiscal year.
Other variables used as controls and/or for cross-sectional analysis	
#Mentions of ST vs. LT	Percentage of words in SEC filings referring to "short-term" as opposed to "long-term" and defined as $\#ST$ words/($\#ST$ words + $\#LT$ words), where $\#ST$ words (resp. $\#LT$ words) is the total number of occurrences of the words "short-term", "short-run", "current" and "currently" (resp. "long-term" 'and "long-run") in all regulatory forms filed by the company over the fiscal year.
Assets	*at* (from last available financial statements in Compustat).
Capex Guidance	Dummy equal to one if a guidance was made about the dollar amount of capex in I/B/E/S for the corresponding fiscal year.
Cash Flow	$(ib + dp)/at$ (from last available financial statements in Compustat).
CEO Wealth Performance Sensitivity	Scaled Wealth-Performance Sensitivity from Edmans, Gabaix, and Landier (2009). This is the dollar change in CEO wealth for a 100 percentage point change in firm value, divided by annual flow compensation. We ignore observations with values over 200.
CEO Equity Ownership	Percentage of equity shares owned by the CE0 (Item *shrown_excl_opts_pct* from last available record in Execucomp).
Expansion Plan Disclosure	Indicator variable equal to 1 if the company voluntarily discloses information over the fiscal year about its investment policy and/or its expansion plans (i.e., if one or more News item#31 are recorded in Capital IQ Key Development). According to Capital IQ, news item#31 refers to news related to "the growth of a company, usually by means of increasing their current operations through internal growth, like entering into new markets with existing products, opening a new branch, establishing a new division, increasing production capacity, or investing additional capital in the current business. Growth by acquisition is not covered in this event type."

Variable	Definition
Institutional Investors Horizon	Percentage of institutional investors with short horizon from Derrien, Kecskes, and Thesmar (2013). The horizon of investors is measured based on their portfolio turnover.
New SEO likelihood	Predicted SEO probability over the next 12 months are estimated from a probit model with a dummy equal to one if equity capital is raised as a dependent variable and the lags of Leverage, Cash Flow, Q, Sales Growth, 2-digit SIC Industry Growth, Size, Age, Cash, and an indicator variable equal to one if a dividend was paid as model predictors. Equity capital is raised in a given fiscal year if the total dollar amount of new equity issues ($sstk$) exceeds 5% of the firm market capitalisation ($chso * prcc_f$) at the end of the previous (fiscal) year. Leverage is measured as $(dlc + dltt)/(dlc + dltt + ceq)$. Cash Flow is $(ib + dp)/at$. Q is $(at - ceq + chso * prcc_f)/at$. Sales growth is the growth of sales ($sale$). 2-digit SIC Industry Growth is the average sales growth by 2-digit SIC industry. Size is the log of assets (at). Age is the log of the number of years in Compustat since inception. Cash is the amount of cash (che) as a percentage of total assets (at).
Poison Pill or Class. Board	Dummy equal to one if the company adopted a poison pill and/or its board is a classified board. The primary source of information on a firm statute is ISS. When no information is available in ISS, we use Capital IQ.
Q	$(at - ceq + chso * prcc_f)/at$ (from last available financial statements in Compustat).
Residual Debt Maturity	Average maturity of debt amortization defined as $(dd1 + 2 \times dd2 + 3 \times dd3 + 4 \times dd4 + 5 \times dd5)/(dd1 + dd2 + dd3 + dd4 + dd5)$ (from last available financial statements in Compustat).
Size	Log of Assets.
Takeover Defense Score	Takeover Defense Score from Capital IQ. Capital IQ determines the strength of a company's takeover defenses by assigning values to various aspects of its corporate governance and takeover defenses it has adopted and averaging these weighted points. The resulting score is between 0 and 1, with a higher number indicating stronger takeover defenses. The calculation is determined by a proprietary formula by Capital IQ.
WACC (Martin (2016))	Median weighted average cost of capital ($WACC$) by SIC2 industry and fiscal year. Before we calculate this median, $WACC$ is estimated by firm i at every fiscal year-end date t as $WACC_{i,t} = [Ke_{i,t} \times (chso_{i,t} * prcc\_f_{i,t}) + Kd_{i,t} \times (1 - \text{top statutory tax rate}_{i,t}) \times (dltt_{i,t} + dlc_{i,t})]/[(chso_{i,t} * prcc\_f_{i,t}) + dltt_{i,t} + dlc_{i,t}]$. $Ke_{i,t} = rf_t + \beta_{i,t} \times ERP_t$ and $Kd_{i,t} = rf_t + \text{Corporate Spread}_t$. rf_t is the yield of the 10-year US Treasury bill at t (from FRED St Louis website). Corporate Spread$_t$ is the average spread on BB corporate bonds at t (from FRED St Louis website). $\beta_{i,t}$ is the company 3-year weekly equity beta obtained by regressing weekly (excess) stock returns on (excess) market returns over the last 3 years. We drop negative betas and betas below 0.1, as well as the same number of observations on the right-hand side of the distribution. ERP_t is the equity risk premium from Martin (2016) at t. All Compustat items are from the last available financial statements.
WACC (Campbell and Thompson (2008) - In)	Same as WACC (Martin (2016)) except that the source for the equity risk premium (ERP_t) is the in-sample predicted excess market return based on the predictors of Campbell and Thompson (2008).
WACC (Campbell and Thompson (2008) - Out)	Same as WACC (Martin (2016)) except that the source for the equity risk premium (ERP_t) is the out-of-sample predicted excess market return based on the predictors of Campbell and Thompson (2008).
WACC (Damodaran (2022))	Same as WACC (Martin (2016)) except that the source for the equity risk premium (ERP_t) is the implied equity risk premium from Damodaran website (https://pages.stern.nyu.edu/ adamodar/)

B – Division-level variables

Variable	Definition
Main variables	
Division Capex	$capxs/dps$ aggregated by 2-digit SIC division (from last available financial statements in Compustat Segments).
Project Horizon	Project Horizon for the corresponding 2-digit SIC division. Average horizon of projects by the division which we proxy by the average horizon of the business plan that firms use in the industry operated by the division. Data on firm business plan horizon are collected from SEC filings and averaged by 2-digit SIC industry. Project Horizon is time-invariant by SIC2-industry.
Other variables used as controls	
Division Assets	ias aggregated by 2-digit SIC division (from last available financial statements in Compustat Segments).
Division Cash flow	ops/ias aggregated by 2-digit SIC division (from last available financial statements in Compustat Segments). ias is measured at the end of the previous fiscal year ($fyear$)
Division Q	Industry Q for the corresponding 2-digit SIC division. Industry Q is the average Q (defined as $(at - ceq + chso * prcc_f)/at$ from last available financial statements in Compustat) across all firms from the same 2-digit SIC industry.
Division Size	Log of Assets.

C – Deal-level variables

Variable	Definition
Main variables	
Bidder CAR[t-1;t+1]	Cumulative abnormal return of the bidder's stock over the three-day window around the bid announcement (i.e., from $t = -1$ to $t = +1$ for a bid announced on date t). Abnormal returns are market-adjusted returns using the CRSP value-weighted portfolio as the market proxy. Outliers are dropped by trimming the final distribution of CARs at the 1% level in each tail.
Project Horizon	Average horizon of projects in the SIC2 industry operated by the target.
$R^2_{lt,y}$	Average informativeness of the long-term forecasts made by all US analysts in I/B/E/S in the calendar year of deal announcement y.
$R^2_{st,y}$	Average informativeness of the short-term forecasts made by all US analysts in I/B/E/S in the calendar year of deal announcement y.
Other variables used as controls	
Acquirer Cash	Cash holdings of the acquiring firm computed as cash and cash equivalents divided by total assets (from Compustat).
Acquirer Cash flow	Cash Flow of the acquiring firm computed as $(ib + dp)/at$ (from Compustat).
Acquirer Debt	Leverage ratio of the acquiring firm computed as total debt divided by total assets (from Compustat).
Acquirer Q	Tobin's Q of the acquiring firm computed as book value of assets minus book value of common equity (from Compustat) plus the market value equity (from CRSP) divided by the book value of assets (from Compustat).
Acquirer Size	Market capitalization of the acquiring firm two days prior to the announcement (in U.S. $million), computed as the stock price times the number of shares outstanding (from CRSP).
Cross Border	Indicator variable taking the value of one when the target firm is foreign and zero otherwise (from Thomson Reuters SDC).
Hostile	Indicator variable taking the value of one when the transaction is flagged as hostile or unsolicited (from Thomson Reuters SDC).
Relative Size	Deal value divided by the market capitalization of the bidder two days prior to the bid announcement.
Same Industry	Indicator is equal to one if the bidder and target operate in the same SDC mid-industry.
Stock Paid	Indicator variable taking the value of one when consideration offered includes acquiring firm stock and zero otherwise (from Thomson Reuters SDC).
Toehold	Fraction of the target's equity held by the bidder before the bid.

Appendix II – Derivations in the Model

Proof of Lemma 1.

The equilibrium stock price. We first show that the equilibrium stock price is given by eq.(9) when the informed' trading strategy is given by eq.(8). In equilibrium, the dealer's price must satisfy (see eq.(5)):

$$p_1^*(O; I_b^*, I_m^*, h) = \mathrm{E}(V(I_b^*, h)\,|O = z + x^*(s_{st}, s_{lt}))\,. \tag{24}$$

As $x^*(s_{st}, s_{lt}) = \beta_{st}(s_{st} - \kappa I_b) + \beta_{lt}(s_{st} - I_b)$, we deduce that O is normally distributed with mean $E(O) = 0$ from the viewpoint of the dealer (since the dealer expects the signal s_{st} to be normally distributed with mean κI_b and the signal s_{lt} to be normally distributed with mean I_b). Therefore

$$p_1^*(O; I_b^*, I_m^*, h) = \mathrm{E}(V(I_b^*, h)) + \lambda O, \tag{25}$$

with $\lambda = \frac{Cov(V(I_b^*,h),O)}{Var(O)}$. From eq.(3), we deduce that $\mathrm{E}(V(I_b^*, h)) = \Delta(h, r, \kappa)I_b$. Moreover, using this equation and the fact that $E(O) = 0$, we obtain

$$Cov(V(I_b^*, h), O) = E(V(I_b^*, h)O) = \frac{(1-h)}{1+r}E(\theta_{st}(I_b^*)O) + \frac{h}{(1+r)^2}E(\theta_{lt}(I_b^*)O). \tag{26}$$

Thus, as $\theta_{st}(I_b^*) = \kappa I_b^* + \eta_{st}$ and $\theta_{lt}(I_b^*) = I_b^* + \eta_{st}$, we have (observe that I_b^* is a constant):

$$Cov(V(I_b^*, h), O) = \frac{(1-h)}{1+r}\beta_{st}\sigma^2_{\eta st} + \frac{h}{(1+r)^2}\beta_{lt}\sigma^2_{\eta lt}. \tag{27}$$

Moreover

$$Var(O) = Var(x^*(s_{st}, s_{lt}) + z) = \sigma_z^2 + \beta_{st}^2 Var(s_{st}) + \beta_{lt}^2 Var(s_{lt}), \tag{28}$$

where the second equality comes from (i) the fact that $x^*(s_{st}, s_{lt}) = \beta_{st}(s_{st} - \kappa I_b) + \beta_{lt}(s_{st} - I_b)$, (ii) the independence of z and the informed investors' signals, and (iii) the independence of the informed investors' short-term and long-term signals. Using the expressions for β_j and observing that $Var(s_j) = \frac{\sigma^2_{\eta_j}}{R_j^2}$ for $j \in \{st, lt\}$, we obtain:

$$Var(O) = \sigma_z^2 + (\frac{(1-h)}{1+r})^2\frac{R_{st}^2}{4\lambda^2}\sigma^2_{\eta^2_{st}} + (\frac{h}{(1+r)^2})^2\frac{R_{lt}^2}{4\lambda^2}\sigma^2_{\eta^2_{lt}} \tag{29}$$

Thus, we deduce that:

$$\lambda = \frac{Cov(V(I_b^*, h), O)}{Var(O)} = \frac{\frac{(1-h)}{1+r}\beta_{st}\sigma^2_{\eta st} + \frac{h}{(1+r)^2}\beta_{lt}\sigma^2_{\eta lt}}{\sigma_z^2 + (\frac{(1-h)}{1+r})^2\frac{R_{st}^2}{4\lambda^2}\sigma^2_{\eta^2_{st}} + (\frac{h}{(1+r)^2})^2\frac{R_{lt}^2}{4\lambda^2}\sigma^2_{\eta^2_{lt}}} \tag{30}$$

Substituting β_{st} and by β_{lt} by their expressions in the numerator and solving the previous equation for λ, we obtain the expression for λ in Lemma 1.

The informed investor's optimal trading strategy. We now show that if the stock price is given by eq.(9) then it is optimal for the informed investor to use the trading strategy given by eq.(8). The informed investor's optimal order solves:

$$x^* \in Argmax_x E(x(V(I_b, h) - p(x+z)) \mid s_{st}, s_{lt}). \tag{31}$$

Using the expression for the equilibrium price given in eq.(9) and writing the FOC of this optimization problem, we deduce that:

$$x^*(s_{st}, s_{lt}) = \frac{E(V(I_b^*, h) \mid s_{st}, s_{lt}) - E(V(I_b^*, h))}{2\lambda}, \tag{32}$$

where $E(V(I_b^*, h)) = \Delta(h, r, \kappa)I_b^*$. Moreover, using eq.(3), we obtain:

$$E(V(I_b^*, h) \mid s_{st}, s_{lt}) = \frac{1-h}{1+r}E(\theta_{st} \mid s_{st}) + \frac{h}{(1+r)^2}E(\theta_{lt} \mid s_{lt}). \tag{33}$$

As all variables are normally distributed, standard calculations yield:

$$E(\theta_j \mid s_j) = E(\theta_j) + R_j^2(s_j - E(\theta_j)), \quad for \quad j \in \{st, lt\}. \tag{34}$$

We deduce from eq.(33) that

$$E(V(I_b^*, h) \mid s_{st}, s_{lt}) = E(V(I_b^*, h)) + \frac{(1-h)R_{st}^2}{(1+r)}(s_{st} - E(\theta_{st})) + \frac{hR_{lt}^2}{(1+r)^2}(s_{lt} - E(\theta_{lt})). \tag{35}$$

Hence, substituting this expression for $E(V(I_b^*, h) \mid s_{st}, s_{lt})$ in eq.(32) and observing that $E(\theta_{st}) = \kappa I_b$ and $E(\theta_{lt}) = I_b$, we deduce that:

$$x^*(s_{st}, s_{lt}) = \beta_{st}(s_{st} - \kappa I_b) + \beta_{lt}(s_{st} - I_b), \tag{36}$$

where β_j is as given in the lemma.

Proof of Proposition 1. Eq.(13) which characterizes the optimal investment level for the firm follows directly from substituting eq.(11) into the manager's optimal investment problem given by eq.(7) and taking the FOC of this problem. The claims regarding the effect of R_j^2 and h on optimal investment follows directly from the expressions for $\gamma(R_{st}^2, R_{lt}^2, h)$ in eq.(12) and the fact that $C'(.)$ is strictly increasing in I_m^* since $C(.)$ is strictly convex.

Proof of Corollary 1. The efficient level of investment is obtained from eq.(14) when

$\omega = 0$ (the manager maximizes the long-term value of the firm). Thus

$$I^e = \frac{\kappa}{1+r} + \frac{h}{(1+r)^2}, \tag{37}$$

that is the firm efficiently invests up to the point where the marginal cost of \$1 of investment (I^e) equal the marginal benefit (present value) of \$1 of investment. We deduce from eq.(14) that:

$$U = I^e - I^*_m = (\frac{\omega}{(1+r)})(1-(1-h)R^2_{st}) + (\frac{\omega h}{(1+r)^2})(1-R^2_{lt}). \tag{38}$$

Thus, $U > 0$ (the firm underinvests) when $\omega > 0$ since $R^2_j \leq 1$ and $0 < h < 1$. Moreover, the level of underinvestment decreases with the informativeness of the short-term and the long-term signals. Last it is direct that $\frac{\partial U}{\partial h \partial R^2_{st}} = \frac{\omega\kappa}{(1+r)} = -2\alpha_3 > 0$ while $\frac{\partial U}{\partial h \partial R^2_{lt}} = -\frac{\omega}{(1+r)^2} = -2\alpha_4 < 0$.

Proof of Proposition 2. Following steps that are very similar to those followed to derive Lemma 1, one can show that the expected equilibrium stock price when the firm has two projects is:

$$\mathrm{E}(p^*_1(O, I_{bst}, I_{blt}, I_{st}, I_{lt})) = \Delta(I_{bst}, I_{blt}) + \frac{\kappa}{2(1+r)}R^2_{st}(I_{st} - I_{bst}) + \frac{1}{2(1+r)^2}R^2_{lt}(I_{lt} - I_{blt}), \tag{39}$$

with $\Delta(I_{bst}, I_{blt}) = \frac{\kappa I_{bst}}{1+r} + \frac{I_{blt}}{(1+r)^2}$ (I_{bh} is the market maker and the informed investor's conjecture about the firm's investment in the short-term and the long-term projects, respectively).

At date 0, the manager chooses I_{st} and I_{lt} so that:

$$\{I^*_{st}, I^*_{lt}\} \in Argmax_{\{I_{st}, I_{lt}\}} \quad \omega \mathrm{E}(p^*_1(O; I_{b,st}, I_{b,st}, I_{st}, I_{lt})) + (1-\omega)\mathrm{E}(V(I_{st}, I_{lt})) + M - C(I_{st}, I_{lt}), \tag{40}$$

under the constraint that $\bar{I} = I_{st} + I_{lt}$ and where $\mathrm{E}(V(I_{st}, I_{lt})) = \frac{\kappa I_{st}}{1+r} + \frac{I_{lt}}{(1+r)^2}$. The first-order condition of this problem yields:

$$I^*_{st} = I^e(\bar{I}) + \frac{\omega}{2}(\frac{\kappa}{1+r}(\frac{R^2_{st}}{2} - 1) - \frac{1}{(1+r)^2}(1 - \frac{R^2_{lt}}{2}), \tag{41}$$

where $I^e(\bar{I}) = \frac{\bar{I}}{2} + \frac{\kappa}{1+r} - \frac{1}{(1+r)^2}$. Thus, $I^e(\bar{I})$ is the efficient level of investment in the short-term project (the one obtains when $\omega = 0$ so that the manager only cares about the long-run value of the firm). The rest of the proposition is immediate.

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