Managerial optimism: New observations on the unifying theory

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Abstract
Managerial optimism theory is behavioral finance’s greatest achievement. It explains two prominent features of corporate financial behavior – over-investment and pecking-order capital structure preferences – that otherwise require two different theories with mutually incompatible assumptions about managerial loyalties to shareholder-value maximization. After reviewing the development of managerial optimism as a unifying theory, I use a simple change of measure to transform risk-averse optimism to risk-neutral probabilities that can be pessimistic or optimistic depending on wealth changes. This unexplored feature has implications for, among other things, pay for performance when managers are excessively optimistic.

KEYWORDS
agency cost theory, asymmetric information theory, behavioral corporate finance, managerial optimism, pay for performance

JEL CLASSIFICATION
G30; G31; G32; G34

1 | INTRODUCTION

A unifying theory accounts for empirical phenomena that otherwise require multiple theories (Myrvold, 2003). It is most attractive when the theories it unifies make “mutually incompatible
assumptions about the system” under study (Rueger, 2005, p. 579). Managerial optimism is a unifying theory of corporate finance.

Managerial optimism theory, starting with Heaton (2002) and Malmendier and Tate (2005a, 2005b), accounts for two prominent features of corporate financial behavior (over-investment and pecking-order capital structure preferences) that otherwise require two different theories (agency cost theory and asymmetric information theory). Moreover, those two theories make mutually incompatible assumptions about managerial loyalties to shareholder-value maximization: disloyal managers in agency cost theory and loyal managers in asymmetric information theory. Managerial optimism also has proven to be a more parsimonious theory than those alternative theories, one that delivers predictions with far simpler models. The assumptions of managerial optimism theory also rest on better empirical evidence: a well-established psychological bias found in numerous experiments rather than merely conjectured (but unobservable) agency costs and information asymmetries.

In this paper I explore the development of managerial optimism as a unifying theory from its antecedents in agency cost theory and asymmetric information theory. Agency cost theory and asymmetric information theory continue as active research paradigms. I suggest three reasons for their survival. First, researchers sometimes seek to study a problem that actually requires those assumptions, though I believe this is a minor reason for the survival of these theories. Second, there is a continuing resistance to behavioral approaches in some quarters due to the failure of behavioral finance to advance very much our understanding of asset pricing. Third, and probably most important, academic corporate finance, like every field, suffers a form of path dependence where there is little urgency to abandon old theories that have already enjoyed acceptance and can explain the observed facts whether or not the theories are inconsistent and without good support for their assumptions.

In the second part of the paper, I propose that researchers focus on an unexplored but intriguing interaction of optimism and risk aversion. I develop this interaction in a simple change-of-measure approach. The interaction of optimism and risk aversion provides a parsimonious explanation for behavior – risk-averse purchase of unfairly priced insurance and risk-seeking purchase of unfairly priced lottery tickets – that has previously been attributed to Friedman–Savage utility functions (Friedman & Savage, 1948) or, most commonly, prospect theory preferences (Kahneman & Tversky, 1979). I show that simultaneous risk aversion and risk seeking arise naturally in an expected-utility framework with concave utility functions and optimistic beliefs. I explore this feature of optimism for managerial decision-making and pay for performance when managers are excessively optimistic.

Section 2 explores the antecedents of managerial optimism theory: agency cost theory and asymmetric information theory. Section 3 describes the development of managerial optimism theory. Section 4 discusses the survival of agency cost theory and asymmetric information theory in light of the superiority of managerial optimism theory. Section 5 develops insights into risk-averse optimism with an emphasis on implications for pay for performance. Section 6 concludes.

2 | ANTECEDENTS

Managerial optimism unifies two different theories of corporate finance: agency cost theory and asymmetric information theory.

2.1 | Agency cost theory

Agency cost theory evolved from early objections to the profit-maximization assumption of neoclassical economics. Several economists, most notably Oliver Williamson (1963), asserted
(without any real empirical evidence) that managers maximizing their own utility would intentionally divert value to themselves and shirk the job of maximizing profits. Until the mid-to late 1970s, however, finance scholars mostly rejected this idea, remaining committed to the assumption that managers maximized current market values. For example, Fama and Miller (1972, p. 75) stated that “despite many years of controversy, [it has not] yet been demonstrated that the market value rule leads to predictions that are so widely at variance with observed management behavior as to rule it out, even as a first approximation.”

The first step toward agency theory in finance was taken almost as an afterthought by Stephen Ross, who advanced a general economic analysis of agency theory along with a suggestion that it might apply to managers and shareholders:

To mention one more path of interest – in a world of true uncertainty where adequate contingent markets do not exist, the manager of the firm is essentially an agent of the shareholders. It can, therefore, be expected that an understanding of the agency relationship will aid our understanding of this difficult question.

Michael C. Jensen and William H. Meckling pursued Ross’s suggestion at full speed in a landmark paper four years later. They claimed that “the relationship between the stockholders and manager of a corporation fit the definition of a pure agency relationship” (Jensen & Meckling, 1976, p. 309). This is incorrect as a legal matter, of course. Shareholders are not principals, and directors, officers, and managers are not shareholders’ agents. Corporations own assets; shareholders own shares. As lawyers have understood for hundreds of years, incorporation is special precisely because it allows for separateness: a partitioning of a set of assets, locked in by shareholders who then cannot pull them out, where those assets are shielded from the claims of shareholders’ creditors who otherwise might rip the corporation apart to satisfy their claims.¹

The incorrect assumption that shareholders are principals and managers are agents is less important, however, than the idea that shareholders and managers may have different objectives. Jensen and Meckling (1976, p. 308) call the costs of controlling managers’ actions in light of these different objectives “agency costs,” defined “as the sum of: (1) the monitoring expenditures by the principal, (2) the bonding expenditures by the agent, [and] (3) the residual loss” (p. 308).² The power of agency cost theory is the theoretical flexibility this three-pronged concept allows. As Jensen and Meckling put it (p. 328):

The magnitude of the agency costs discussed above will vary from firm to firm. It will depend on the tastes of managers, the ease with which they can exercise their own preferences as opposed to value maximization in decision making, and the costs of monitoring and bonding activities. The agency costs will also depend upon the cost of measuring the manager’s (agent’s) performance and evaluating it, the cost of devising and applying an index for compensating the manager which correlates with the owner’s (principal’s) welfare, and the cost of devising and enforcing specific behavioral rules or policies.

¹These benefits of incorporation were recognized by the seventeenth century along with all other well-known features of corporate personality, such as limited liability (see Hunt, 1936, pp. 3–4). This view was rediscovered and developed much further in the late 1990s and early 2000s. See, for example, Rock and Wachter (1999), Hansmann and Kraakman (2000), and Blair (2003).

²The insights were not new, except for the idea of bonding expenditures. See Heaton (2019a).
Of course, this statement comes close to an admission that the agency-cost paradigm is too flexible, with too many degrees of freedom, and therefore capable of explaining anything. That may help explain its success. An outcome that seems optimal can be explained by solutions to the asserted agency-cost problem; an outcome that seems suboptimal can be explained by residual losses from agency costs that could not be controlled. For example, managers who use cash flow to acquire companies can be characterized as empire builders wasting shareholder funds, while managers who do not expand their businesses can be characterized as being unfaithful by enjoying the “quiet life.”

Beyond the problem that agency cost theory lacks constraints, there are two more serious problems. First, neither Jensen and Meckling (1976) nor subsequent researchers in the agency cost paradigm adequately confronted the fact that real-world managers face brutal business competition that constrains their ability to shirk and divert. Jensen and Meckling admitted the problem in a footnote: “Where competitors are numerous and entry is easy, persistent departures from profit maximizing behavior inexorably leads to extinction. Economic natural selection holds the stage.” But having admitted the possibility, they dismiss it with a circular argument, claiming that:

> the existence of competition in product and factor markets will not eliminate the agency costs due to managerial control problems as has often been asserted .... If my competitors all incur agency costs equal to or greater than mine I will not be eliminated from the market by their competition.

Assuming that agency costs will exist despite competition because agency costs exist everywhere is unpersuasive.4

Second, agency problems are easily controlled by existing corporate law. Early experimental evidence suggested that investigation and sanctions eliminate most shirking of the kind asserted by Jensen and Meckling (see DeJong, Forsythe, Lundholm, & Uecker, 1985). This matters because “[m]ost of corporate law is concerned with the array of substantive rules and procedural devices that are aimed at controlling managerial slack and diversion while preserving adequate discretion to carry out business operations efficiently” (Clark, 1986, p. xxiii). The plain-vanilla constraints of corporate law are too powerful to leave much to do for debt, large shareholders, and takeovers in controlling intentional managerial disloyalty, certainly among large US corporations.

Despite thousands of articles invoking agency theory, there is virtually no evidence that managers do not maximize current shareholder value because of managerial disloyalty.

### 2.2 Asymmetric information theory

The development of asymmetric information theory rested on more plausible foundations than agency cost theory. After all, there is nothing controversial in the assertion that corporate managers have information that outside investors do not have. Proof of this assertion is on display on any given day with earnings announcements. The question, instead, is whether these

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3The same problem exists with the Coase theorem (Coase 1960) used so widely in law and economics, by which any existing allocation can be justified either as the outcome of efficient bargaining when “transactions costs” are low enough, or the failure to reach an efficient outcome because transactions costs are too high. Such theories can explain everything and so effectively nothing.

4See Allen and Gale (2000) for an in-depth analysis of the constraint that product market competition places on agency problems.
information asymmetries predict anything interesting about corporate financing activities. The answer has been mostly no, with one important exception.

While the agency cost theory had its impetus in the notion that managers might serve their own objectives and not those of shareholders or the profit-maximization criterion, asymmetric information theory had its roots in George Akerlof’s (1970) path-breaking work on the “lemons problem” and the notion that information asymmetries could generate interesting outcomes in markets. Asymmetric information theory in finance – like agency cost theory in finance – starts again with Stephen Ross (1977), who developed a theory of asymmetric information where a manager’s choice of incentives and capital structure could signal firm value. Subsequent work on information asymmetries was directed largely at the problem of explaining the existence of financial intermediaries which, it came to be argued (see, for example, Campbell & Kracaw, 1980; Leland & Pyle, 1977) could emerge naturally when information asymmetries existed between firms and markets. Other work developed theories of information disclosure by firms of the information they had that markets did not (see, for example, Diamond, 1985). None of this work generated strong empirical predictions.

One promising empirical prediction from asymmetric information theory was that firms could use dividend increases to signal future profitability (see, for example, Bhattacharya, 1979; Miller & Rock, 1985). Unlike most predictions of asymmetric information theory that were untestable (largely because the information asymmetry had to continue to generate the assumed behavior), signaling through dividend changes was testable. But much evidence now shows that dividend increases do not signal future performance (see, for example, Bulan, Subramanian, & Tanlu, 2007; DeAngelo, DeAngelo, & Skinner, 2009).

The sole empirical success of asymmetric information theory in finance was the pecking-order capital structure theory of Myers (1984) and Myers and Majluf (1984). In that theory, managers with asymmetric information that future returns are better than the market expects (so that shares are undervalued) prefer to issue performance-sensitive securities last in order to act in the best interest of current shareholders.

3 | MANAGERIAL OPTIMISM THEORY

3.1 | Roll’s hubris hypothesis

The first flicker of managerial irrationality in modern academic corporate finance appears in Richard Roll (1986). Although Roll never uses the words “optimism,” “optimistic” or “overconfidence” in his writing, he does cite a 1965 paper from the psychology literature that has the term “overconfidence” in its title, one of three papers he cites in explaining why economists tended to ignore psychology results even as he was prepared to make an exception for corporate takeovers (p. 199):

*Psychologists are constantly bombarding economists with empirical evidence that individuals do not always make rational decisions under uncertainty .... Among psychologists, economists have a reputation for arrogance mainly because this evidence is ignored; but psychologists seem not to appreciate that economists disregard the evidence on individual decision making because it usually has little predictive content for market behavior. Corporate takeovers are, I believe, one area of research in which this usually valid reaction of economists should be abandoned; takeovers reflect individual decisions.*

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The insight that corporate takeovers reflect individual behavior was critical because it suggested the possibility that in the short-term at least—it irrational managerial behavior might not be subject to the “arbitrage objection” that rational actors would eliminate irrationality (see, for example, Friedman, 1953). Roll’s insight implied that such objections could not be raised as easily regarding the behavior of corporate managers. To my knowledge, Roll was the first to make this critical observation, one that offered a far better justification for behavioral approaches in corporate finance than in asset pricing.

Roll’s thesis was that “hubris” – a term he seems to have adopted without grounding it in any psychology literature, but which is more related to notions of excessive certainty than optimism – would prevent acquiring-firm managers from taking appropriate account of the possibility of suffering a winner’s curse (see Bazerman & Samuelson, 1983; Capen, Clapp, & Campbell, 1971; Kagel & Levin, 1986) in an auction of a target firm. As a result, the acquiring firm’s managers would – having failed to appropriately adjust down their valuation of the target for potential overvaluation error – overpay for the target firm, generating losses for their own (acquiring-firm) shareholders and excess gains for the target, more or less consistent with empirical results that Roll canvassed thoroughly in supporting his conjecture.

Unfortunately, the finance profession of the late 1980s and early 1990s largely rejected Roll’s hubris hypothesis (see, for example, Berkovitch & Narayanan, 1993; Kleidon, 1986; May, 1995; Morck, Shleifer, & Vishny, 1990; Shleifer & Vishny, 1988; Stoughton, 1988) despite the fact that it found solid support in empirical testing (see Giliberto & Varaiya, 1989; Harford, 1999; Kaplan & Weisbach, 1992; Varaiya, 1988). Roll’s hypothesis found a more receptive audience among some legal scholars (see Black, 1989; Langevoort, 1992, 1997).

3.2 | My “Managerial Optimism and Corporate Finance”

I wrote the first drafts of “Managerial Optimism and Corporate Finance” in 1996 and 1997 as part of my dissertation proposal at the University of Chicago business school. I defended the dissertation – which included other work as well (see Brav & Heaton, 2002) – in 1999, the same year I graduated jointly from the University of Chicago Law School. This history is relevant because I do not think anyone planning to interview on the academic finance market in 1999 could have written the paper, given the continuing hostility to behavioral approaches at the time. My plan had been to practice law for a few years and then go on the academic law market, not the finance market. As mentioned above, there was already some acceptance of Roll’s ideas in the legal academy. As such, I felt no career risk writing the optimism paper. I published the paper in Financial Management as Heaton (2002).

From the start, my view of managerial optimism was one of theoretical unification. Like other finance PhD graduate students of the 1990s, I knew only those two approaches to corporate finance described above: the agency cost approach and the asymmetric information approach. I knew that the
former delivered empire building and problems with free cash flow (Jensen & Meckling, 1976; Jensen, 1986) through managerial disloyalty to shareholder-value maximization, while the latter delivered pecking-order capital structure preferences through managerial loyalty to (current) shareholder-value maximization (Myers, 1984; Myers & Majluf, 1984). The inconsistency bothered me. The insight of Heaton (2002) is just a simple unification of those two alternative theories as to those particular predictions: if managers are optimistic, then they will think that some bad projects are good projects and look like disloyal empire builders, but they will also think their firm’s equity is undervalued and so would prefer riskless debt to risky debt to equity and therefore look like asymmetrically informed loyal managers pursuing a pecking-order capital structure preference.

Consider a two-date model where the market is strong-form efficient and the interest rate is 0. There is a firm that has cash on hand of $f$ and a single project. The project requires an investment of $k < 1$ at time $t = 0$ and returns, at time $t = 1$, with probability $p_T$ (“success”) and 0 otherwise (“failure”), where the $T$ subscript denotes the “true” probability. The firm’s manager is loyal to the goal of shareholder-value maximization but is excessively optimistic in the sense that he perceives the probability of success to be $p_O > p_T$, where subscript $O$ denotes the manager’s “optimistic” perception. Suppose $f > k$, so that the manager can finance the project internally. If $p_O > k$, then the manager believes the project has a positive net present value. If the project is, in fact, a bad project, then $p_O < p_T$ and the optimistic manager will take on the bad project, appearing to overinvest with a waste of free cash.

If there is insufficient cash on hand, that is, if $f < k$, but the project can be financed (that is, $k - f < p_T$) because the (risk-neutral) market will loan up to $p_T$ in return for a senior claim on the project’s proceeds, then the manager prefers debt to equity since he perceives the cost of financing with debt to be strictly less than cost of financing with equity. The manager believes the expected value of the debt-financed project to current shareholders is $p_O - (k - f)$. To raise $k - f$ in equity, however, the manager must promise the efficient market $(k - f)/p_T$ of the payoff. The manager believes the expected value to current shareholders is then $p_O - ((k - f)/p_T)p_O < p_O - (k - f)$ since $p_O > p_T$. This illustrates the pecking-order preference.

Since agency cost theory does not deliver pecking-order preferences and the asymmetric information theory does not deliver value-destroying empire building and the waste of free cash flow, managerial optimism theory is a unifying theory, that is, one that accounts for empirical phenomena that otherwise require multiple theories. Moreover, since the agency cost theory and the asymmetric information theory make mutually incompatible assumptions about managerial fidelity to shareholder-value maximization (agency = disloyal; asymmetric information = loyal), the unifying theory is especially valuable. The theory is parsimonious and rests on the well-documented psychological bias of optimism (see Weinstein, 1980; Massey, Simmons, & Armour, 2011; Shepperd, Waters, Weinstein, & Klein, 2015; Garrett & Sharot, 2017).

### 3.3 Theoretical development and empirical advances

Unlike Roll’s hubris hypothesis, managerial optimism theory found some early defenders, including, most importantly, Lemma Senbet, the editor of *Financial Management* (who I understand accepted the paper over the referees’ objections), Jay Ritter (2003), and Jeremy Stein (2003). It became one of the most-cited papers in behavioral corporate finance.

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8Even Tirole’s (2006, p. 9) mention of the paper in a section acknowledging his omission of behavioral treatments was a sort of victory that probably brought the paper to the attention of many who might otherwise not have given it a thought.
But managerial optimism theory would have died on the vine had not Malmendier and Tate (2005a, 2005b) fleshed out and implemented the theory empirically using corporate manager option exercise decisions to detect optimism, a brilliant insight. Malmendier and Tate continued to lead the development of theory and empirical work on managerial optimism in the subsequent years (see Malmendier & Tate, 2008, 2011, 2015), and it is they who deserve the credit for risking careers on what was then a non-existent field: behavioral corporate finance. Since 2002, the managerial optimism literature has grown large. For surveys of behavioral corporate finance, see Baker, Ruback, and Wurgler (2007), Gervais (2010), and Baker and Wurgler (2013). Especially notable contributions (in my view) are Hackethal (2008, 2009), Lin, Hu, and Chen (2005, 2008), Campbell, Gallmeyer, Johnson, Rutherford, and Stanley (2011), Schrand and Zechman (2012), Ahmed and Scott (2013), Deshmukh, Goel, and Howe (2013), Kolasinski and Li (2013), Shu, Yeh, Chiang, and Hung (2013), Wang, Chen, and Yu (2013), Otto (2014), Hilary, Hsu, Segal, and Wang (2016), Ho, Huang, Lin, and Yen (2016), Huang, Tan, and Faff (2016), Huang-Meier, Lambertides, and Steeley (2016), Santos-Pinto and Dell’Era (2017), and Aghazadeh, Sun, Wang, and Yang (2018).

4 | SURVIVAL OF THE ALTERNATIVE THEORIES

While managerial optimism provides a unifying, more parsimonious, and better-grounded theory of corporate finance than agency cost theory and asymmetric information theory, both of those theories continue to survive. I believe there are three reasons for this.

First, sometimes the matter under study actually is the possibility of disloyal agents or managers who have information the market does not have. In those cases, it is necessary to assume that agency costs exist and information asymmetries exist. I suspect, however, that this is a small part of continuing research in those two paradigms.

Second, managerial optimism is behavioral finance and much of behavioral finance has overpromised and underdelivered. We still have no adequate behavioral asset pricing model to test; behavioral asset pricing has largely failed. Managerial optimism, as behavioral corporate finance, is a success in behavioral finance, but arguably its only one. Surrounded by failures, it may be hard for managerial optimism and behavioral corporate finance to fully take the field.

Third, and perhaps most importantly, there is in corporate finance as in all fields considerable path dependence and fidelity to old paradigms. Agency cost theory and asymmetric information theory are not so much constraining theories but unconstrained explanatory frameworks. A modestly talented modeler can predict almost anything with these theories merely by altering the assumptions of whether agency costs are controlled or not or what level of asymmetric information exists. Since none of these assumptions is tied to an observable, the theories are infinitely flexible. That temptation is hard to resist.

5 | NEW OBSERVATIONS: RISK-averse optimism

In a risk-neutral individual, optimism manifests as observationally equivalent to risk-seeking behavior, providing an explanation of, for example, gambling at unfair odds. Of course, risk-neutral

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9In an unfortunate use of terminology, however, Malmendier and Tate refer to optimism as “overconfidence,” notwithstanding that the term “overconfidence” has a separate and distinct meaning in psychology as excessive certainty (excessive precision of belief) rather than overestimating good outcomes. The terms are now used interchangeably in corporate finance, though a few authors have stuck to the correct usage from psychology (see, for example, Gervais, Heaton, & Odean, 2011).
optimism cannot explain why the same people act risk averse in other situations. An early attempt to explain simultaneous risk-seeking and risk-averse behavior is Friedman and Savage (1948) who assume a partly concave, partly convex utility function. More influentially, Kahneman and Tversky (1979, p. 263) developed prospect theory “as a descriptive model of decision making under risk” including simultaneous risk aversion and risk seeking. Their model is a complicated departure from expected-utility maximization, replete with new terms of the authors’ invention: “the certainty effect,” “the reflection effect,” “the isolation effect,” and old terms given new meanings in “coding,” “combination,” “segregation,” and “cancellation.”

In this section I show that a combination of risk-averse and risk-seeking behaviors arises naturally in a simple expected utility framework with a concave utility function and excessively optimistic beliefs. The complications of the less parsimonious prospect theory are unnecessary, as is the ad hoc structure of the Friedman–Savage utility function. Risk-averse optimism generates interesting predictions regarding managerial risk taking and compensation.

5.1 Interaction of risk aversion and optimism

The main insight starts from the fact that correctly calibrated risk aversion (that is, risk aversion under the true probability distribution) is observationally equivalent to risk-neutral pessimism.\(^\text{10}\) When an individual is optimistic and risk averse instead of correctly calibrated and risk averse, the individual’s risk aversion pushes against his optimistic probabilistic beliefs.\(^\text{11}\) For some risks (gambles), risk aversion makes an optimistic, risk-averse individual act as if he were risk-neutral and pessimistic and thus observationally equivalent to some correctly calibrated individual with less risk aversion. For other risks, however, the individual’s optimism is sufficiently high that it overwhelms this effect and makes the individual act as if he were a risk-neutral optimist, though not as optimistic as his beliefs alone would dictate.

Let \(U(\cdot)\) be the optimistic individual \(O\)’s concave utility function over wealth and let \(W\) be the individual’s current wealth. There is a gamble with a “good” outcome \(G\) and a “bad” outcome \(B\) that generates a commensurate change of the individual’s wealth \(W\) to \(W_G\) or \(W_B\), respectively, where \(W_G > W > W_B\). Since the individual is risk averse,

\[
U(p_OW_G + (1 - p_OW_B) > p_OU(W_G) + (1 - p_OU(W_B)).
\]

Let \(C\) be the certainty equivalent of the gamble, so that \(C\) satisfies

\[
U(C) = p_OU(W_G) + (1 - p_OU(W_B).
\]

We can find risk-neutral probabilities easily in this two-state problem. We know (trivially) that the individual is indifferent between the certainty equivalent \(C\) in the event of a good outcome and \(C\) in the event of a bad outcome and the gamble that pays off for the individual as \(W_G\) in the event of a good outcome and \(W_B\) in the event of a bad outcome. This implies there is a risk-neutral (pseudo-)probability \(\pi_O\) such that

\(^{10}\)See, for example, LeRoy (1989), Mansour, Jouini, Marin, Napp, and Robert (2008), Backus, Chernov, and Martin (2011), and Heaton (2018).

\(^{11}\)See Kahneman and Lavallo (1993) for an informal exploration of this idea.
\[ C = \pi_0 C + (1 - \pi_0)C \]
\[ C = \pi_0 W_G + (1 - \pi_0)W_B, \]

which has the solution

\[ \pi_0 = \frac{C - W_B}{W_G - W_B}. \tag{1} \]

It is easy to confirm that \( \pi_0 \) in Equation (1) satisfies the requirement for a probability that \( 0 \leq \pi_0 \leq 1 \), since, as for \( 0 \leq \pi_0 \), all that is required is that \( C - W_B \) and \( W_G - W_B \) are strictly positive. As for \( \pi_0 \leq 1 \), all that is required is that the certainty equivalent \( C \) be no greater than \( W_G \), which is implied by the assumed concavity of \( U(\cdot) \) and the fact that even the optimistic probability is bounded above by 1.

The risk-neutral probability is less than the subjective probability, that is, \( \pi_0 < p_0 \). Since \( C \) is the certainty equivalent of the expected utility of the gamble, \( p_0 U(W_G) + (1 - p_0)U(W_B), U(p_0W_G + (1 - p_0)W_B) > U(C) \) implies that

\[ C < p_0 W_G + (1 - p_0)W_B \]
\[ \Leftrightarrow \]
\[ p_0 > \frac{C - W_B}{W_G - W_B} = \pi_0. \]

Risk aversion always acts as a counterweight to optimism. Depending on the level of risk aversion, wealth, changes in wealth from the gamble, and amount of optimism, the individual may act if he were a well-calibrated risk-averse individual with a lower level of risk aversion, that is, where \( \pi_0 < p_T \), or as if he were an optimistic risk-averse individual who is sufficiently optimistic to act as if risk-neutral and optimistic, that is, \( \pi_0 > p_T \), which is observationally equivalent to risk-seeking behavior. An optimistic, risk-averse individual with a standard concave utility function can act as a risk-neutral risk seeker whenever

\[ p_T < \pi_0 = \frac{C - W_B}{W_G - W_B} < p_0. \]

Consider natural log utility where \( U(W) = \ln(W) \). Suppose that current wealth \( W = 1000, W_G = 1250, W_B = 750 \), the true probability of the good state, \( p_T = 0.50 \), and the optimistic individual’s probability of the good state is \( p_0 = 0.70 \). Then

\[ \ln((0.70)1250 + (0.30)750) = 7.00 > 6.978 = 0.70\ln(1250) + 0.30\ln(750), \]

reflecting risk aversion from the perspective of the optimistic individual. The certainty equivalent is \( C = \exp(6.978) = 1072.40 \). The risk-neutral probability is
\[ \pi_O = \frac{C - W_B}{W_G - W_B} \]
\[ = \frac{1072.40 - 750}{1250 - 750} \]
\[ = 0.6448. \]

That is, while the optimistic individual still acts as risk-neutral optimist, his risk aversion reduces the level of his apparent optimism from \( p_O = 0.70 > p_T = 0.50 \) to \( \pi_O = 0.6448 > p_T = 0.50 \). He acts as if he were a risk-neutral person with excessively optimistic beliefs, but beliefs that are less optimistic than his own.

As the spread of outcomes increases, the optimistic individual can become observably equivalent to a risk-neutral pessimistic individual. For example, if current wealth \( W = 1000, W_G = 2000, W_B = 250 \), the true probability of the good state remains \( p_T = 0.50 \), and the optimistic individual's probability of the good state remains \( p_O = 0.70 \), then

\[
\ln((0.70)2000 + (0.30)250) = 7.296 > 6.977 = 0.70 \ln(2000) + 0.30 \ln(250).
\]

The certainty equivalent is then \( C = \exp(7.296) = 1071.77 \). The risk-neutral probability is

\[ \pi_O = \frac{C - W_B}{W_G - W_B} \]
\[ = \frac{1071.77 - 250}{2000 - 250} \]
\[ = 0.4696. \]

Now, the optimistic individual acts as risk-neutral pessimist, with \( \pi_O = 0.4696 < p_T = 0.50 \). This is not as pessimistic as the individual would act if well calibrated, where \( \pi_T = 0.2612 < p_T = 0.50 \), but is still sufficient make the optimistic, risk-averse individual act as if optimistic with respect to some gambles and pessimistic with respect to others.

Figure 1 demonstrates the change in risk-neutral probabilities for a range of gambles in the domain of losses. The gamble is no change in wealth in the good state, \( W = W_G = 1000 \), and a range of losses from \( W_B = 1 \) to \( W_B = 999 \). The true probability of the good state is \( p_T = 0.50 \), illustrated by the bottom horizontal line. The optimistic individual's probability of the good state is \( p_O = 0.75 \), illustrated by the top horizontal line. The utility function is \( \ln(\text{wealth}) \). For each possible level of lost wealth, I calculate the certainty equivalent and then the risk-neutral probability traced by the concave curve. The optimistic, risk-averse individual is highly risk seeking in the domain on losses except when possible losses become most severe.

Consider an optimistic, risk-averse individual who faces the gamble \( W = W_G = 1000 \) with actual probability \( p_T = 0.90 \) but optimistic probability \( p_O = 0.95 \), and \( W_B = 25 \). Fairly priced full insurance would cost \( 0.10 \times 975 = 97.5 \). The optimistic, risk-aversion (with natural log utility) generates a certainty equivalent of 831.57, implying a willingness to buy insurance for up to 168.43. Although \( p_O = 0.95 > 0.90 = p_T \), the risk-neutral probability is a pessimistic \( \pi_O = 0.8275 \).

Figure 2 demonstrates the change in risk-neutral probabilities for a range of gambles in the domain of gains. The gamble is no change in wealth in the bad state, \( W = W_B = 1000 \), and a range of gains from \( W_B = 1025 \) to \( W_B = 25975 \). The true probability of the good state is \( p_T = 0.50 \), illustrated by the bottom horizontal line. The optimistic individual's probability of
the good state is \( p_O = 0.75 \), illustrated by the top horizontal line. The utility function is \( \ln(\text{wealth}) \). For each possible level of gained wealth, I calculate the certainty equivalent and then the risk-neutral probability traced by the convex curve. The optimistic, risk-averse individual is highly risk seeking in the domain on gains until the gains become quite large.

Consider an optimistic, risk-averse individual with wealth \( W = 1000 \) who faces the gamble \( W_G = 2000 \) with actual probability \( p_T = 0.10\% \) but optimistic probability \( p_O = 1.0\% \), and \( W_B = 998 \), reflecting an unfairly priced lottery ticket awarding 1,000 with probability 0.10\% and 0 with probability 99.9\% costing 2 (a fairly priced lottery ticket would cost 1 and would never be purchased by a well-calibrated, risk-averse individual). Even though risk averse, the optimistic individual with natural log utility has \( \pi_O = 0.695\% \) and so views the lottery ticket as worth \( 1000 \times 0.00695 = 6.95 \) and so will purchase it and take the gamble.

**FIGURE 1** Change in risk-neutral probability in the domain of losses. This graph shows the change in the risk-neutral probability in the domain of losses, from wealth falling from 1,000 to 1 up to 1,000 to 999 under natural log utility. The top horizontal line is the assumed optimistic probability, \( p_O = 0.75 \), of no change in wealth. The bottom horizontal line is the assumed true probability, \( p_T = 0.50 \), of no change in wealth. The concave line is the risk-neutral probability at each level of the gamble, calculated with the certainty equivalent at that level given the optimistic probability. The risk-neutral probability exceeds the true probability for all but the most extreme losses from current wealth [Color figure can be viewed at wileyonlinelibrary.com]
5.2 Implications for risk taking and pay for performance

Figures 1 and 2 demonstrate a feature of risk-averse optimism that is apparent from the formula for the risk-neutral probability: optimism can be extremely strong when gambles (corporate projects) have small impacts on managerial wealth. A corporate manager who has nearly flat compensation regardless of the outcome of the project is likely to be highly risk seeking by contrast with models of risk-averse, well-calibrated corporate managers. In essence, low-powered incentives allow the corporate manager’s risk aversion to play little role in moderating his optimism, increasing his tendency to seek risk. If the manager faces mostly good projects, this may be of little concern. Optimistic managers who are loyal to shareholders do not need high-powered incentives to take truly good projects.

The problem with optimistic managers is to keep them from taking bad projects that they believe are good projects. It is here that high-powered incentives are most beneficial. By making managerial wealth more sensitive to firm value, incentive systems can strengthen the risk
aversion that acts against managerial optimism by driving the risk-neutral probability toward the true probability.

**Prediction 1.** When managers are risk averse and optimistic expected-utility maximizers, projects that change managerial wealth less (have low-powered incentives) are subject to higher levels of optimism; projects that change managerial wealth more (have high-powered incentives) are subject to lower levels of optimism.

We can make another prediction as well, this time by considering the strength of the board of directors in determining optimal incentive systems. Managerial optimism theory assumes that managers are loyal, so the role of pay for performance is preventing excessively optimistic managers from pursuing bad projects. But this is likely only when projects are bad and boards are strong, because optimistic managers loyal to shareholders do not believe they need high-powered incentives to do what is right. We then have the following possibilities. Risk-averse optimism may help explain the lack of strong pay-for-performance sensitivity documented by many scholars (see, for example, Bebchuk & Fried, 2003, 2004; Jensen & Murphy, 1990). The prevalence of low-powered incentives may be more optimal than imagined. High-powered incentives that lead some of the highest pay of CEOs to be at underperforming firms may be explained by incentives that prevent optimistic managers from reducing value even further. The results here also are consistent with the findings of Otto (2014) that optimistic beliefs are associated with lower compensation levels Figure 3.

## 6 | CONCLUSION

While behavioral corporate finance came later than behavioral asset pricing, it has been much more successful. In contrast to the lack of successful behavioral competitors for rational asset pricing models, managerial optimism theory not only competes with the alternatives of agency  

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12See, for example, Fuhrmans (2018) and Francis (2016).
cost theory and asymmetric information theory, it comes out ahead. Managerial optimism theory unifies those disparate theories, generates predictions more parsimoniously, and rests on verifiable and detectable assumptions of managerial beliefs rather than the unsupported assumption of managerial disloyalty or the conjecture of information asymmetries that, by their nature, cannot be confirmed. Much more remains to be done in managerial optimism theory. I highlight one possibility here: the exploration of interactions between risk-aversion and optimism.

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