Agency Costs and Misrepresentation in Leveraged Firms

Sharon Hannes and Avraham Tabbach*

ABSTRACT

The financial crisis that began in the United States in 2007 and spread into a deep worldwide recession focused attention on agency costs in leveraged firms. Particular attention was given to the incentives of shareholders in such firms to overinvest (known as the "risk-shifting" problem) or underinvest (known as the "debt-overhang" problem). Besides these problems, the earlier financial crisis of 2002 brought to light shareholders' incentives to misrepresent the financial condition of the firm. Interestingly, to date the interactions between these adverse incentives have not been analyzed in either the legal or finance literatures. The aim of this Article is to fill that gap. Its main conclusion is that misrepresentation of the firm's financial results alleviates the classic agency costs between shareholders and debt-holders, leading to less overinvestment (less risk-taking) and less underinvestment due to the debt-overhang problem. In a nutshell, the explanation is that shareholders in leveraged firms can be viewed as holding a call option on the firm's assets, and misrepresentation pushes the option into the money, leading to better alignment between the interests of shareholders and the interests of all stakeholders of the firm. Our theoretical results shed new light on the causes of the financial crisis of 2007 and the ensuing slow recovery. The Article also offers policy recommendations.

* Tel Aviv University, Faculty of Law. For their helpful comments, we wish to thank Lucian A. Bebchuk, Zohar Goshen, Luigi Franzoni, Jesse Fried, Assaf Hamdani, Ehud Kamar, Ariel Porat and Omri Yadlin, as well as the participants in the law and economics seminar at Tel Aviv University, and the faculty seminar at the school of economics at Bologna University. We also thank Dana Goldstein, Ori Bustanai and Dvir Ben-Ami for their able research assistance, the Cegla Center for Interdisciplinary Research of the Law for financial assistance, and Bologna University for its hospitality during part of the work on this paper.

I. INTRODUCTION

The financial crisis that began in the United States in 2007 and spread into a deep worldwide recession focused attention on leveraged firms and their agency costs. Prior to the recession, financial companies in the United States broke all leverage records.[1] The five largest U.S. investment banks—Goldman Sachs, Merrill Lynch, Bear Sterns, Lehman Brothers, and Morgan Stanley—attained a leverage ratio of 40 to one.[2] For example, at the end of 2007 Bear Sterns had $11.8 billion in shareholders capital while its debts amounted to $383.6 billion, of which $70 billion were short-term debts that had to be repaid or renewed on a daily basis. As the congressional committee that investigated the economic crisis explained, this situation was equivalent to a small business owner investing a minimal sum of $50,000 in his business and taking gigantic loans totaling $1.6 million, of which $296,750 would be due daily.[3]

In this Article, we investigate the unexplored interaction among different agency costs in leveraged firms and financial misrepresentation problems. Each of these issues has been

1. Sebnem Kalemli-Ozcan et al., *Leverage Across Firms, Banks and Countries*, 88 J. INT'L. ECON. 284, 288 (2012).

2. This means that every $40 of assets was financed by $39 of debt, and only one dollar of capital belonged to the shareholders. FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT, xix (Jan. 2011), *available at* http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_full.pdf.

3. *Id.* at xx. For understandable reasons, the leverage ratios of financial companies are usually high. For example, among commercial banks, leverage ratios of up to 20 to one are not considered excessive. *See also* RICHARD A. POSNER, THE CRISIS OF CAPITALIST DEMOCRACY 251 (2010) (describing the crisis of democratic capitalism as American and world economies recover from the recession). For justifications as to why banks have an especially financially leveraged structure, see Harry DeAngelo & Rene M. Stulz, *Liquid-Claim Production, Risk Management, and Bank Capital Structure: Why High Leverage is Optimal for Banks* (Eur. Corp. Fin. Inst., Working Paper No. 356, 2014), *available at* http://ssrn.com/abstract_id=2254998.

individually analyzed quite extensively in the literature. This Article, however, is uniquely significant as the first to investigate the interaction among the different problems.

To begin, firms with excessive leverage face two significant agency costs between shareholders and bondholders.[4] One such problem is the incentive for shareholders (and the executives acting on their behalf) to channel a company's capital into risky assets and projects, known in finance literature as the "risk-shifting," "asset-substitution," or "overinvestment problem" (throughout this Article we will use these terms interchangeably).[5] The intuition is quite straight-forward. In the case of business success, the shareholders—as holders of the residual rights to the firm's profits—enjoy its fruits. In contrast, in case of business failure, part of the loss is borne by bondholders, and the more leveraged the firm is, the larger the share of the loss that bondholders have to bear. This convex structure of shareholders' payoffs in a leveraged firm—that is, the asymmetry between success and failure—therefore induces shareholders to take risks they would not have otherwise assumed.

Another agency cost in the sphere of relations between shareholders and bondholders is a mirror image of the over-investment problem. Shareholders in a leveraged firm have inadequate incentive to invest in beneficial or "positive net present value" (NPV) projects. This is known in finance literature as the "debt-overhang" or "underinvestment problem" (throughout the Article we will use these terms interchangeably).[6] When a firm's debts are greater than its assets, its shareholders may lack proper incentive to invest in certain positive NPV projects that require additional investment because the fruits of that investment will fall in whole or in part into the hands of the bondholders, who are the first in line to receive the firm's assets.[7] This lack of adequate incentive drives shareholders and potential investors away and makes it difficult for a firm to recover from its distress.

In addition to these agency costs between bondholders and shareholders, another problem in leveraged firms is the incentive of existing shareholders to present the financial status and business results in an artificially rosy light. This is a manifestation of a more general problem regarding owners of assets who often have an interest in misrepresenting the true value of their assets. This problem exists whether assets are held by individuals or by firms and regardless of leverage, but it is aggravated by debt financing. A misrepresentation of a firm's financial status and business performance may artificially inflate its value. This inflated market value enables existing shareholders to sell their stock at an exaggerated price or to attract additional capital with little dilution of their share in

4. Leveraging also offers a company significant advantages, and therefore, this discussion of agency problems that the debt raises should not be seen as refuting the justifications for the practice of leveraging. In effect, leveraging may also restrain agency problems in the sphere between a company's shareholders and management. *See* Michael C. Jensen, *Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers*, 76 AM. ECON. REV. 323, 324 (1986).

5. Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305, 334–37 (1976); *see generally* OLIVER HART, FIRMS, CONTRACTS AND FINANCIAL STRUCTURE (1995) (providing an overview of firms' financial decisions and companies' capital structures).

6. Stewart C. Myers, *Determinants of Corporate Borrowing*, 5 J. FIN. ECON. 147, 149–55 (1977). The term "over-hang" debt is used to describe certain circumstances where debt in a leveraged firm is greater than the firm's assets, and therefore it "over-hangs" the firm's assets.

7. The bondholders' precedence of right is also called the "absolute priority principle." *See* COLLIER ON BANKRUPTCY 1129–90, 1229–94 (Matthew Bender, ed., 16th ed. 2012).

the firm.[8] In this way, value is transferred from the firm's future shareholders to its existing shareholders, whether they intend to sell their stock during the fraudulent period or to keep it for the long run even after the fraud is discovered. The incentive to manipulate and inflate the share value may be even stronger when a firm is leveraged. The artificial increase in the value of a firm's assets and in its business results brings about a transfer of value from bondholders to shareholders in a number of ways. Under a mistaken impression, bondholders are likely to agree to a lower return on their debt, and it will also be easier for the company to meet restrictive financial conditions and perform a distribution of dividends. This is the misrepresentation problem in its aggravated form in a leveraged firm.

In this Article we do not dispute the existing arguments regarding the agency costs between shareholders and bondholders in leveraged firms. Likewise, we do not deny the incentive for shareholders to inflate the value of their firm artificially. To the contrary, as we shall demonstrate, these are indeed real and significant problems. Our aim in this Article is to analyze the influence of the misrepresentation problem on the classical agency costs between shareholders and bondholders in leveraged firms. The interaction between the various agency costs and the misrepresentation problem has not yet been discussed in the literature. For example, it is clear that a leveraged firm that can conceal the risk level of its business activities from the market in general, and from its bondholders in particular, has an increased incentive both to take excessive risks and then to hide those risks. In this case the misrepresentation problem and the overinvestment problem fuel each other. It is easy to relate this phenomenon to the last financial crisis where risk-taking took the form of investing in especially complex financial instruments. In retrospect, at least, these instruments were so complex that few players in the market actually understood what they meant,[9] and many bodies—including the credit rating agencies—participated in hiding their potential risks.[10]

But what about misrepresentation that does not conceal the risk level of a firm's business dealings but rather artificially inflates the value of its assets or business results? Herein lie the two central innovations of this Article. First, as we shall argue, misrepresentation tends to restrain excessive risk-taking in leveraged firms. On the other hand, we will show that the manipulation does not circumvent the motivation of shareholders to take beneficial risks that are desirable from the viewpoint of the firm as a whole. Second, as we shall argue, the possibility of manipulating the value of a firm's assets moderates the tendency of shareholders in leveraged firms not to choose positive net present value projects that require additional investment.

8. *See infra* note 25 and accompanying text (discussing asset owners' temptation to misrepresent their assets).

9. FIN. CRISIS INQUIRY COMM'N, *supra* note 2, at 28 ("[T]he securities almost no one understood, backed by mortgages no lender would have signed 20 years earlier, were the first dominoes to fall in the financial sector.").

10. U.S. SENATE, STAFF OF PERMANENT SUBCOMM. ON INVESTIGATIONS. 112TH CONG., WALL STREET AND THE FINANCIAL CRISIS: ANATOMY OF A FINANCIAL COLLAPSE 243–44 (Comm. Print 2011), *available at* http://www.hsgac.senate.gov//imo/media/doc/Financial_Crisis/FinancialCrisisReport.pdf?attempt. The report states: "Inaccurate AAA credit ratings introduced risk into the U.S. financial system and constituted a key cause of the financial crisis." *Id.* It further explains that one of the reasons for the failure of the credit rating agencies was the competition among them over the hearts and funds of the rated companies: "Rating standards weakened as each credit rating agency competed to provide the most favorable rating to win business and greater market share." *Id.* at 244.

The following examples demonstrate the gist of our arguments. In all the examples we will ignore the time value of money and risk-adjusted returns by assuming both are equal to zero, although we correct these assumptions in the mathematical appendix to the paper. We shall also temporarily assume that the managers act solely in the interests of existing shareholders.

Example A: Overinvestment in Risky Projects

Assume that a leveraged firm has total assets (net working capital and fixed assets) worth $50 million and outstanding debts of $50 million due next year. In this situation, without further action, the firm will be bankrupt next year. In liquidation, the $50 million debt to the bondholders will be repaid in full, and shareholders will get nothing (see Table 1).

Table 1: Firm Balance No Action (Market Values)

Asset value	$50	$50	Bond
		$0	Stock
	$50	$50	Firm value

Assume further that shareholders face two alternatives. The first is to invest in a conservative, safe project that will, with certainty, raise the value of the company's assets from $50 million to $60 million. The second alternative is to invest in an excessively risky project that has a 50% chance of raising the company's assets' value to $75 million, but also a 50% chance of reducing their value to $15 million, so in expectation the firm value would decline to $45 million. In other words, the conservative project has a net present value of $10 million, whereas the risky project has a negative net present value (minus $5 million).

From the overall viewpoint of all the stakeholders in the firm—and therefore from that of the economy as well—the safe project is the superior one. Nevertheless, shareholders will prefer the inferior risky project. That is because the shareholders of a leveraged firm would enjoy the profits, if any, of the risky project, but not be injured by its failure, which would fall on the bondholders' shoulders. In the above example, the average profit to shareholders from taking the risky project amounts to $12.5 million (50%*(75-50)), whereas the safe project would yield a profit of only $10 million.[11] This bad outcome—the shifting of risk onto the bondholders—is demonstrated in Tables 2 and 3.

11. As mentioned above, shareholders cannot expect profit if they choose to do nothing at all.

Table 2: Firm Balance with Safe Project (Market Values)

Asset value	**$60**	**$50**	**Bond**
		$10	**Stock**
	$60	**$60**	**Firm value**

Table 3: Firm Balance with Risky Project (Market Values)

Asset value	0.5($75)+0.5($15)=	$45	$32.5	=0.5($50)+0.5($15)	Bond
			$12.5	=0.5($25)+0.5($0)	Stock
		$45	$45		Firm value

This classic example regarding the influence of leverage on risk-taking does not take into account the possible effect of manipulation and misrepresentation. If the managers, on behalf of the existing shareholders, cause the market to artificially inflate the value of a firm's assets then, counterintuitively, the tendency to choose an excessively risky project disappears. To demonstrate this novel argument, assume the firm's manager can, for a certain period of time, deceive the market so that the various investors evaluate the firm's assets at 20% more than their fair market value. Likewise, assume for the sake of simplicity, that the firm's shareholders are interested in such a manipulation because they intend to sell their shareholdings.[12] This possibility turns the outcome of our first example on its head and will lead to the risky project being rejected in favor of the superior, safe project. The reason is this: if the safe project is pursued, in the short term the shares' inflated value will amount to $22 million (100%*(120%*60-50)),[13] whereas the average share value would amount to only $20 million (50%*(120%*75-50)), if the risky project is chosen.[14] Note that artificially raising the value of the firm's assets even further would only increase the shareholders' preferences for the safe project over the risky one.[15] Interestingly, such

12. More complex reasons detailed below stem from various benefits of the inflated value in the sphere of relations vis-à-vis bondholders or because the company is about to raise capital. Inflation of the company's share prices may also be due to the personal motivation of a company's managers, whose remuneration directly (through options and stock) or indirectly (through pay and bonuses) depends on share prices in the short term.

13. The assets' value is inflated by 20% and amounts to $72 million, which, with the deduction of the debt totaling $50 million, yields a capital value of $22 million in the market's view.

14. If the risky project should fail, then even after the manipulation, the shareholders will gain no profit (120% of $15 million equals an asset value of $18 million, while the debt amounts to $50 million). Contrarily, if the risky project should succeed, then the assets' value would be inflated to $90 million (120%*75), which with the deduction of the debt totaling $50 million yields a capital value of $40 million in the market's view. Since the project will succeed in only 50% of the cases, the average capital value amounts to $20 million, as noted above in the text.

15. For example, if a company's CEO can inflate its assets' value by 30% more than their fair value, then if the safe project is chosen the capital value of the company's stock will amount to $28 million (100%*(78-50)),

a change of preferences also yields significant profits to the bondholders since they can exact the full debt with the safe project. The losers are future shareholders who will purchase shares at inflated prices. Tables 2a and 3a demonstrate the effects of manipulation on shareholders' incentives to take short-term risks.

Table 1a: Firm Balance No Action (Market Values) Manipulation

Asset value	~~$50~~ $60	~~$50~~ $50	Bond
		~~$0~~ $10	Stock
	~~$50~~ $60	~~$50~~ $60	Firm value

Table 2a: Firm Balance Safe Project (Market Values) Manipulation

Asset value	~~$60~~ $72	~~$50~~ $50	Bond
		~~$10~~ $22	Stock
	~~$60~~ $72	~~$60~~ $72	Firm value

Table 3a: Firm Balance Risky Project (Market Values) Manipulation

Asset	~~(0.5($75)+0.5($15)) =~~	~~$45~~	~~$32.5~~ ~~= 0.5($50)+0.5($15)~~	Bond
value	(0.5($90)+0.5($18)) =	$54	$34 = 0.5($50)+0.5($18)	
			~~$12.5~~ ~~= 0.5($25)+0.5($0)~~	Stock
			$20 = 0.5($40)+0.5($0)	
		~~$45~~ $54	~~$45~~ $54	Firm value

The outcome of this example is generalizable. It stems from a fundamental tradeoff between excessive, harmful risk-taking and manipulation. From the viewpoint of the

whereas if the risky project is chosen it will amount to only $23.75 million (50%*(97.5-50)).

shareholders in a leveraged firm, taking excessively risky projects all too often denies them the (spoiled) fruits of their manipulation. Consequently, they will tend to prefer safe and desirable projects enabling them to benefit more fully from their bad behavior. Ironically, then, the prospect of manipulation alleviates the agency costs between shareholders and bondholders at the expense of future investors. From a normative aspect, our argument means that a reform that improves disclosure requirements and makes manipulation difficult runs the risk of exacerbating agency problems in leveraged firms. One possible solution is to accompany reform in disclosure law with a reform in risk-restraining measures.

Example B: Debt-Overhang Problem—Underinvestment in Positive NPV Projects

While the above example demonstrates how the possibility of manipulation alleviates the overinvestment problem (in excessively risky projects), the following example clarifies how it may also ease the underinvestment problem. Assume that a leveraged firm has total assets (net working capital and fixed assets) worth $50 million and an outstanding debt—due in one year—of $70 million. Without further action, then, the firm will be bankrupt next year. The debt to its bondholders totaling $70 million will be repaid in part. They will receive $50 million while the shareholders will receive nothing.

Assume further that the firm's management faces an attractive business project that has the potential to increase its assets' value. The project requires an immediate investment of $60 million ($10 million on top of the firm's existing assets) but promises to raise the value of the firm's assets to $75 million in a year. The project's net present value, then, is $15 million. In order to invest in this attractive project, the firm has to raise an additional $10 million from its shareholders or from other outside investors since its own assets amount to only $50 million. Existing shareholders or new investors, however, will not agree to invest an additional $10 million in the firm since existing bondholders are first in line to reap the fruits of the investment. The return on investment to new investors therefore would be only $5 million. This is demonstrated in Table 4.[16]

16. Ostensibly, existing bondholders enjoy an advantage from investment in the new project since the project will increase their return on the existing debt from $50 million to $70 million. However, one cannot count on existing bondholders to bring in the new required financing. In companies that reach a situation in which the debt is greater than the assets, there are often bitter feelings between bondholders on one hand and management and shareholders on the other, rendering bondholders' further investment in new projects almost inconceivable.

Table 4: Firm Balance Project (Market Values)

Asset value	$75	$70	Bond
		$5	Stock
	$75	$75	Firm value

This well-known effect of leveraging on underinvestment in positive NPV projects ignores, however, the possibility of manipulation. If the managers, on behalf of shareholders, cause the market to inflate the firm's value, then the incentive not to invest in positive NPV projects disappears. To demonstrate this novel argument, assume once again that the firm's manager can manipulate the market so that various investors evaluate the firm's assets at 20% more than its fair value and that shareholders are interested in such manipulation, as they intend to sell their shareholdings. Now existing shareholders or outside investors will be willing to finance the project since after the manipulation the return on the project grows from $75 million to $90 million, so its net present value balloons to $30 million. From the viewpoint of new investors, on an investment of $10 million they are promised a return of $20 million: a 100% profit—not bad! Note that the firm's existing bondholders are also happy since after investment in the project, the debt will be repaid in full. This is demonstrated by Table 4a:

Table 4a: Firm Balance Project (Market Values)

Asset value	$90	$70	Bond
		$20	Stock
	$90	$90	Firm value

This example too is generalizable. It stems from a fundamental *complementarity* between accepting positive NPV projects and the possibility of manipulating their value beyond their fair market value. From the viewpoint of shareholders (or new outside investors) in a leveraged firm, investing in a positive NPV project is not always desirable for the reason that they bear the full onus of investment but do not fully enjoy its return since bondholders are first in line to reap the fruits of the investment. Manipulation of the fair market value of projects alleviates the agency costs between shareholders and bondholders since it makes projects that require investment look rosier and more attractive than ever.

Together, the two examples cast an additional, new light on the reasons for the crisis in the U.S. capital market and the slow recovery from it. In the last decade, and even before

the economic crisis of 2007 began, there was a major improvement in the United States in the oversight of accounting practices, which partially resolved the manipulation problem.[17] Due to a series of extensive accounting frauds at the beginning of the last decade—including those that led to the infamous collapses of Enron and WorldCom—a profound change in supervising accounting reports took place starting in 2002.[18] There is evidence that after 2002 it became more difficult to perform accounting fraud in the United States than previously.[19] This change, then, partially mitigated the fear of manipulation, but until now, its relation to agency problems that may cause leveraged firms to take excessive risks and avoid investing in good projects has not been examined.

One possibility that our Article suggests is that the overly leveraged financial firms in the United States upped their risk levels when the regulatory environment denied the possibility of manipulation. In the absence of manipulation, restraint was removed from the familiar incentive for excessive risk-taking by leveraged companies. These increased risks eventually materialized in the financial crisis of 2007–08.

Moreover, as a result of the severe financial crisis, many companies found themselves floundering in outstanding debts.[20] In light of the regulatory change in the United States,[21] which made it difficult to manipulate assets value, this path of action as a "solution" to the outstanding debt problem was blocked. This, then, may be one of the reasons for the slow recovery of the U.S. economy.

We should clarify at the outset that we are not arguing that biased disclosure and manipulation are desirable. Manipulation in itself entails high costs. It damages the investors' trust in the capital market and distorts the allocation of resources in the economy. Therefore, the positive side effect of manipulation as a tool that moderates excessive risk-taking is by no means reason to permit manipulation or to prevent regulation that improves transparency and due disclosure. The normative implication of this Article is that the effects of disclosure requirements and anti-manipulation regulatory policies must be tempered by measures directed against excessive risk-taking. Such comprehensive regulation was indeed drafted in the United States in the 2010 Dodd–Frank Act but only as part of the lessons from the crisis.[22] The declared aim of the legislation was to moderate the phenomenon of excessive risk-taking in the financial industry.[23] With hindsight, it can be said that this reform was made necessary by the earlier legislation, which had improved disclosure laws and prevented manipulation. The lesson for the future is that any regulation in the field of disclosure must be accompanied by regulation in the field of risk-taking. Likewise, the lesson is that the prevention of biased disclosure must be accompanied by steps that ensure other solutions to the outstanding debt problem. In the United States,

17. Alexander Dyck et al., *Who Blows the Whistle on Corporate Fraud?*, 65 J. FIN. 2213, 2248–51 (2010).

18. *Id.*; *see also* John C. Coffee, Jr., *Gatekeeper Failure and Reform: The Challenge of Fashioning Relevant Reforms*, 84 B.U. L. REV. 301, 333–45 (2004).

19. Dyck et al., *supra* note 17, at 2248–51.

20. FIN. CRISIS INQUIRY COMM'N, *supra* note 2, at 394–97.

21. Dyck et al., *supra* note 17, at 2248–51. *See also* Coffee, *supra* note 18, at 333.

22. Dodd–Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1376 (2010).

23. *See* S. REP. NO. 111-176, at 2–3 (2010) (to pursue this goal, FDIC and SEC officials advocated for new systems to monitor systemic risk).

indeed, the rescue operation was accompanied by the unusual action of massive government assistance.[24]

This Article proceeds as follows: Part II discusses the incentives of shareholders to engage in manipulation of the firm's financial statements. Part III discusses two classical agency costs between shareholders and bondholders in leveraged firms: the risk shifting, over-investment problem and the debt-overhang, underinvestment problem. Part IV analyzes the different effects of manipulation on the classical agency problems in leveraged firms. Part V examines the relation between this Article's theoretical conclusions and the test case consisting of the collapse of the financial system in the United States and the prolonged recession that came in its wake. This Part then deals with the normative aspects of these conclusions in relation to regulators, investors in bonds and the firm's other creditors. Part VI briefly summarizes. The Mathematical Appendix generalizes our claims, taking into account the time value of money and risk-adjusted returns and contains proofs of our various arguments.

II. INCENTIVES FOR MISREPRESENTATION AND MANIPULATION

Asset owners may be tempted to misrepresent the value of their asset in order to artificially raise its value. If the asset owners succeed in doing so, they may be able to sell the asset at a price higher than its true or fair value, or they may be able to receive more generous loans when they use the asset as collateral.[25] Shareholders are no different in this context than other asset owners, although their incentives to inflate stock prices are possibly more complex. Like any other asset owner, shareholders can profit from an inflated price when they sell their shares. Alternatively, shareholders may profit from exaggerated stock prices even if they do not sell their shares and the firm raises new capital. When the share price is higher, the existing shares will be less severely diluted when new capital is raised.[26] Thus, an incentive is created for shareholders to manipulate the firm's value, even if they intend to keep their shares beyond the period of misrepresentation.[27]

24. Sarah Anderson et al., *Skewed Priorities: How the Bailouts Dwarf Other Global Crisis Spending*, INST. POL'Y STUD. 4–6 (2008).

25. There are also certain circumstances in which an asset owner will want to misrepresent her asset in order to reduce its value artificially. This may be for tax reasons when the tax rate depends on the asset value or when one owner of a commonly held asset purchases from others additional pieces of that asset. As regards to firms, circumstances can be envisioned in which a firm initiates the purchase of its own shares, so the remaining shareholders will benefit from their being bought at the lowest possible price. *See* Jesse M. Fried, *The Uneasy Case for Favoring Long-Term Shareholders*, YALE L.J. (forthcoming 2014) (manuscript at 30–32), *available at* http://ssrn.com/abstract_id=2227080. In this Article, we do not analyze the combination of incentives—the incentive to deflate share prices artificially and the incentive to take excessive risks—but the effects we have exposed in the case of price inflation will presumably be reversed.

26. This incentive is mentioned in a prior publication by one of us: Sharon Hannes, *Compensating for Executive Compensation: The Case for Gatekeeper Incentive Pay*, 98 CAL. L. REV. 385, 406 (2010) ("[B]acked by overvalued equity, the firm can raise additional capital by issuing shares at an inflated value, thereby diluting the stakes of existing shareholders far less than would be the case were issuance set at the accurate price."). This disincentive is also the centerpiece of the article by Prof. Fried, who claims that long-term shareholders also have certain distorted incentives, including an incentive to inflate share prices when a capital issue is expected. *See* Fried, *supra* note 25, at 45–48.

27. The assumption is that misrepresentation in general and accounting fraud, in particular, is limited in time. For example, the inflation of sales cannot raise a firm's value significantly over any great length of time even if it is not discovered directly because ultimately there is an expectation of payment for those sales. *See*

Therefore, a leveraged firm has an aggravated incentive to misrepresent the firm's assets, business opportunities, and outcomes. If bondholders are convinced the firm is more solid, the more opportunity there is to take on additional debt on better terms. With regard to existing bondholders, misrepresentation may prevent a firm from stumbling into violation of a loan agreement since many such agreements include covenants that depend on accounting figures or the firm's value.

In any case, misrepresentation of the firm financial statements and business results is no idle fear. Despite extensive regulation,[28] harsh punishments, and constant activity by gatekeepers—such as accountants—misrepresentation is a widespread phenomenon among firms. A prominent example of that was the wave of U.S. corporate fraud scandals in the late 1990s and early 2000s.[29] During that period, there was a wave of financial statement restatements, a typical symptom of distorted reporting. Whereas in the first half of the 1990s, there were on average 50 restatements of financial statements by public corporations yearly,[30] by the start of the 21st century, that number had quadrupled.[31] Eventually the phenomenon was huge, with one out of every ten public corporations in the United States making at least one restatement of its financial statements during the years 1997–2002.[32] Some scholars claim that the actual number of financial statement restatements was even higher, and that restatement filings grew tenfold from 1990 to 2000.[33] One must keep in mind that restatements of financial reports are required only in cases of the most severe accounting failures. Most accounting errors simply disappear without being noticed or do not reach the extreme threshold of error which necessitates a restatement of the financial reports.[34]

The permissive accounting had a devastating impact on the U.S. market.[35] The federal government's accounting unit, the General Accounting Office (GAO), estimated the total

Hannes, *supra* note 26, at 420 (stating that long-term misrepresentation of value is not possible); *see also* Coffee, *supra* note 18, at 333 (misrepresenting values to enrich controlling shareholders).

28. *See generally* Jonathan M. Karpoff et al., *The Consequences to Managers for Financial Misrepresentation*, 88 J. FIN. ECON. 193 (2008) (discussing the regulatory and private sanctions imposed on an officeholder who has misled investors).

29. *See* John C. Coffee, Jr., *What Caused Enron? A Capsule Social and Economic History of the 1990s*, 89 CORNELL L. REV. 269, 280 (2004) ("In this light, the deeper question underlying Enron and related scandals is not: Why did some managers engage in fraud? Rather, it is: Why did the gatekeepers let them?").

30. George B. Moriarty & Philip B. Livingston, *Quantitative Measures of the Quality of Financial Reporting*, 17 FIN. EXECUTIVE 53, 53–54 (2001) (reporting a yearly average of 50 financial statement restatements by public corporations during the years 1990–1997).

31. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-03-138, FINANCIAL STATEMENT RESTATEMENTS: TRENDS, MARKET IMPACTS, REGULATORY RESPONSES, AND REMAINING CHALLENGES 12 (2002), *available at* http://www.gao.gov/new.items/d03138.pdf [hereinafter GAO, FINANCIAL RESTATEMENTS] (reporting 201 financial statement restatements in 2000 and 225 restatements in 2001). *But see* Karen M. Hennes et al., *The Importance of Distinguishing Errors from Irregularities in Restatement Research: The Case of Restatements and CEO/CFO Turnover*, 83 ACCT. REV. 1487, 1487 (2008) (noting the importance of distinguishing innocent mistakes from among the irregularities in the GAO database regarding financial statement restatements).

32. GAO, FINANCIAL RESTATEMENTS, *supra* note 31, at 4.

33. *See* John C. Coffee, Jr., *A Theory of Corporate Scandals: Why the USA and Europe Differ*, 21 OXFORD REV. ECON. POL'Y 198, 200–01 (2005) (citing a study calculating the increase in financial statement restatements).

34. Coffee, *supra* note 2929, at 283.

35. The discussed consequences underappreciate the amount of fraud that actually took place. A prominent issue disclosed only several years later was the practice of stock-option backdating, which flourished in the late

losses to the market as a result of the restatement of financial statements at $100 billion at least,[36] and an academic study showed that firms that issued a restatement of their financial statements lost on average 25% of their market value.[37] Nonetheless, these numbers also underestimate the true loss. When the scandals concerning Enron, WorldCom, and other firms unfolded, many investors believed that there were many other cases of fraud and financial wrongdoing that had not been uncovered. One study showed that a restatement of financial statements by one firm led to a drop in the share prices of other firms in the same industry that had not made a restatement.[38] Furthermore, firms that had not made a restatement but had been assisted by auditors who also served firms that had made a restatement experienced a steeper drop in share prices, in comparison to other firms that had not made a restatement and had used other auditors.[39] It is worth noting that in the great majority of cases, the accounting deceptions were of the kind either exaggerating a firm's income and the value of its assets or diminishing its expenditures and the value of its commitments, thereby contributing to an artificial rise in share prices.[40]

Ultimately, the direct and indirect consequences of the financial frauds and reports' misrepresentation contributed to the crisis in the U.S. capital markets, which plummeted at an average rate of 32% from 2001 to 2002.[41] As is well known, Congress took swift action in response to these events, and in 2002, enacted the Sarbanes–Oxley Act.[42] This legislation was meant, and apparently has in appreciable measure succeeded in its goal, to improve accounting practices.[43]

III. AGENCY COSTS BETWEEN SHAREHOLDERS AND BONDHOLDERS IN LEVERAGED FIRMS

In a leveraged firm, the shareholders who control the firm through the management also control the bondholders' destiny. Agency costs therefore arise from the different interests of the two parties. In particular, two classic problems, with opposite features, have been revealed.[44] First, shareholders sometimes have an interest to invest in inimical, risky

1990s and early 2000s. *See* David Walker, *Unpacking Backdating: Economic Analysis and Observations on the Stock Option Scandal*, 87 B.U. L. REV. 561, 563 (2007) ("In the year since the scandal was uncovered, the SEC has launched investigations into suspicious timing and pricing of stock options granted during the go-go years of the late 1990s and early 2000s at more than one hundred companies. . . . [R]ecent papers suggest that this figure represents only the tip of the iceberg—that perhaps 10% to 20% of options issued to senior executives during this period may have been backdated in order to reduce option exercise prices.") (citation omitted).

36. GAO, FINANCIAL RESTATEMENTS, *supra* note 31, at 24.

37. Scott A. Richardson et al., *Predicting Earnings Management: The Case of Earnings Restatements* 16 (Oct. 2002) (unpublished), *available at* http://ssrn.com/abstract=338681.

38. Cristi A. Gleason et al., *The Contagion Effects of Accounting Restatements*, 83 ACCT. REV. 83 (2008).

39. *Id.* at 93.

40. *See* Coffee, *supra* note 29, at 277 (stating that mangers in the 1990's shifted their focus to bring forward the date of revenue recognition, a method aimed to exaggerate the firm's income); *see also* GAO, FINANCIAL RESTATEMENTS, *supra* note 31, at 21 (stating that most of the reasons for restatements between the years 1997–2002 were revenues or expenses recognition).

41. Bengt Holmstrom & Steven N. Kaplan, *The State of US Corporate Governance: What's Right and What's Wrong*, 15 J. APPLIED CORP. FIN. 8 (2003).

42. Coffee, *supra* note 33, at 204.

43. Dyck et al., *supra* note 17, at 2249–51(noting that prior to the change in legislation auditors were responsible for exposing only six percent of accounting fraud cases, and after the change in legislation, the rate of exposures by accountants rose to 24% of all frauds uncovered).

44. There are other agency costs in the sphere of relations between bondholders and shareholders that we

projects which have expected returns that do not compensate for the risk involved.[45] This is called the "asset-substitution" or "risk-shifting" problem.[46] In addition, shareholders in a leveraged firm may lack incentive to choose positive NPV projects requiring additional investment because bondholders will enjoy some of the fruits of that investment.[47] This is known as the "debt-overhang" problem.[48] Together, these problems entail agency costs that may lead to overinvestment in some cases and to underinvestment in others. We shall briefly expand on each of these two problems. In so doing, we shall assume, as the literature does, that the shareholders control the business decisions of the firm. Later we shall discuss and partially justify this assumption.

A. The Asset-Substitution, Risk-Shifting, Overinvestment Problem

The risk-shifting problem stems from the fact that in a leveraged firm, the profit and loss to the firm's shareholders deriving from risky projects are not symmetrical.[49] Due to the limited liability feature, the bondholders are the ones who bear the most loss in case of failure. As a result, the shareholders can generally expect to profit from the success of a project more than they would lose from materialization of its risk.[50] We illustrated this problem in the Introduction to this Article by means of Example A and the accompanying tables.[51]

Like the misrepresentation problem discussed in the previous chapter, the risk-shifting problem is no abstract issue and takes many forms in reality. Many, including the popular press, regulators, and academic scholars assign it a central role in the great economic crisis in the United States that began in 2007,[52] a result of the unprecedented leveraging of U.S. financial institutions and the decisions to invest in particularly risky

shall not discuss here. In particular, shareholders have an interest to smuggle assets out of the firm or to increase the leverage (increasing leverage on its own is a kind of augmented risk, but here we focus on the incentive to take excessively risky projects). *See* RICHARD A. BREALEY ET AL., PRINCIPLES OF CORPORATE FINANCE 452–54 (10th ed. 2011).

45. Jensen & Meckling, *supra* note 5, at 334–37. *See also* Franklin Allen & Douglas Gale, *Bubbles and Crises*, 110 ECON. J. 236, 236 (2000) (attributing investors choosing risky investments as one cause of a financial bubble); BREALEY ET AL., *supra* note 44, at 453 ("Stockholders of leveraged firms gain when business risk increases. Financial managers who act strictly in their shareholders' interest (and *against* the interest of creditors) will favor risky projects over safe ones. They may even take risky projects with negative NPV." (emphasis in original)).

46. Jensen & Meckling, *supra* note 5, at 334–37.

47. Myers, *supra* note 6, at 149–55. *See also* BREALEY ET AL., *supra* note 4444, at 454 ("The value of any investment opportunity to the firm's *stockholders* is reduced because the project benefits must be shared with bondholders. Thus it might not be in the stockholders' self-interest to contribute fresh equity capital even if that means forgoing positive-NPV investment opportunities." (emphasis in original)).

48. Myers, *supra* note 6, at 149–55.

49. *See also* BREALEY ET AL., *supra* note 44, at 452–54.

50. It can be said that the shareholders' profit function is convex in relation to the firm's success—they benefit from success more than they suffer from failure. A convex profit (benefit) function is the opposite of the ordinary benefit function that characterizes people averse to risk who benefit from success less than they suffer from failure.

51. *Supra* Part I, Example A.

52. FIN. CRISIS INQUIRY COMM'N, *supra* note 2, at xix ("[A] combination of excessive borrowing, risky investments, and lack of transparency put the financial system on a collision course with crisis."); Edouard Challe, *Leverage, Excessive Risk-Taking, and Financial Instability*, in CORPORATE SOCIAL RESPONSIBILITY: FROM COMPLIANCE TO OPPORTUNITY 41 (Patricia Crifo & Jean-Pierre Ponssard eds., 2010).

financial assets.[53] Between 1978 and 2007, just prior to the crisis, the U.S. financial sector's debt ballooned incomprehensibly from $3,000 billion to $36,000 billion.[54] Of that sum, hundreds of billions of dollars were recklessly invested in derivative financial instruments of the booming U.S. real-estate market at the start of the 21st century. In the short term, this activity yielded huge profits. In 2006, on the eve of the crisis, the U.S. financial sector's profits comprised 27% of the total profits of all U.S. public corporations versus only 15% in 1980.[55] These profits, however, were quite similar to the profits of an insurance company that collects premiums on rare catastrophic events, yet fails to acknowledge that these are not actual profits, but premiums on great and uncalculated risk.[56]

The tremendous financial crisis in the United States offered a golden opportunity for empirical research attesting to the Gordian knot that ties leveraging and risk-shifting. We reference two recent studies dealing with the topic. The first study tracks U.S. financial firms during the period 1993–2010.[57] The focus on the financial sector stemmed from the especially high leverage of this sector.[58] The researchers discovered that riskier investments raise the value of a firm's shares but only when it concerns a bank with high leverage (a leverage ratio higher than 30).[59] They also show that after the Lehman Brothers crisis, highly leveraged financial firms chose a high-risk profile, whereas moderately leveraged financial firms chose a low risk profile.[60] Likewise, banks and financial firms whose shares fell particularly steeply during the financial crisis augmented their businesses' risk level in an attempt to compensate their shareholders for the losses.[61] The authors concluded their study with an unequivocal recommendation concerning the need to restrict the leverage of the banking system in order to reduce the level of risk in the economy.[62]

The second study tracked 5057 U.S. firms during the years 2005 to 2010 and did not focus on the financial industry alone.[63] It did not examine the effect of leverage on the firms' behavior but classified firms according to the degree of financial stress they were subject to.[64] The study focused on the behavior of firms that arrived at the peak of the financial crisis in 2008 with an appreciable share of their debt due to be repaid within a

53. *See infra* Part V (explaining that the leveraged financial institutional created new securities tied to the U.S. real estate market, which collapsed when the real estate market collapsed, contributing to the financial crisis).

54. FIN. CRISIS INQUIRY COMM'N, *supra* note 2, at xvii.

55. *Id.*

56. Douglas W. Diamond & Raghuram G. Rajan, *The Credit Crisis: Conjectures about Causes and Remedies*, 99 AM. ECON. REV. 606, 607–08 (2009) (making the analogy described in the text).

57. Martin Koudstaal & Sweder Van Wijnbergen, *On Risk, Leverage and Banks: Do Highly Leveraged Banks Take on Excessive Risk?* (Duisenberg School of Finance-Tinbergen Institute, Working Paper No. 12-022, 2012), *available at* http://ssrn.com/abstract=2170008.

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.*

62. Koudstaal & Van Wijnbergen, *supra* note 57.

63. Bo Li, *Refinancing Risk, Managerial Risk Shifting, and Debt Covenants: An Empirical Analysis* 12 (2012), *available at* http://2013.ckgsb.com/Userfiles/doc/Refinancing%20Risk,%20Managerial%20Risk Shifting%20and%20Debt%20Covenants%20An%20Empirical%20Analysis.pdf.

64. *See generally id.* (discussing a study that divided firms into groups based on the degree of financial stress the firm was experiencing).

short time (one year).[65] The study revealed that these firms in particular had a propensity to take risks through exaggerated investments.[66] While other firms did not increase their investments during the crisis period, precisely those stressed firms decided to increase their investments at a rate of 25% relative to the scope of their investments prior to the crisis.[67] In line with the theory, these excessive investments, according to the study, were inefficient and led to a significant drop in those firms' total value.[68]

B. The Debt-Overhang, Underinvestment Problem

The debt-overhang problem stems from the fact that in a highly leveraged firm the bondholders enjoy some of the fruits of a prospective positive project. The bondholders' partaking in the fruits of the future project reduces the interest of existing shareholders (or other potential investors) in investing in that project. In extreme cases, this may lead to the abandonment of positive NPV projects that the firm would have taken in the absence of leverage. This problem was demonstrated in the Introduction by Example B and the accompanying tables.[69]

Like the overinvestment problem, the underinvestment problem is palpably real. For example, it is considered to have played a central role in the stagnation of the Japanese economy in the 1990s.[70] During the 1980s in Japan there was a sharp rise in leverage, with frequent use of mortgaging land whose value was rising at the time.[71] When land values in Japan fell in the 1990s, firms were caught in a situation where their debt outweighed their assets, creating a huge problem of overhanging debt that put a stop to new investments and disrupted the Japanese economy for years.[72] One of the studies of the Japanese economy in that period clearly shows that the greater a firm's debt-overhang problem was (more liabilities than assets), the more it avoided new investments.[73]

Numerous other studies have empirically substantiated the debt-overhang problem. For example, Zingales, in his well-known article on U.S. trucking firms in the 1970s, found tangible evidence of the debt-overhang problem.[74] At the time this industry experienced

65. *Id.* at 12.
66. *Id.* at 12–13.
67. *Id.*
68. *Id.* at 32.
69. *See supra* Part I, Example B (explaining the debt-overhang problem).
70. *See* Kazuo Ogawa, *Financial Distress and Corporate Investment: The Japanese Case in the 90s* 1 (Osaka University Institute of Social and Economic Research, Working Paper No. 584, 2003), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=414980. During the 1990s Japan suffered from an unwillingness to extend credit and the period was dubbed "the credit crunch" long before the term was used to describe the choking-off of American credit in 2007–2008. *Id.* at 5–6.
71. *See generally* Kazuo Ogawa et al., *Borrowing Constraints and the Role of Land Asset in Japanese Corporate Investment Decision*, 10 J. JAPANESE & INT'L ECONS. 122 (1996) (examining whether Japanese firms face borrowing constraints in investment decisions).
72. Ogawa, *supra* note 70, at 4.
73. *Id.* at 13. Large firms did not suffer from the problem for several reasons, the most prominent being their belonging to corporate groups (*keiretsu*) with an internal capital market making it possible to overcome credit difficulties. *Id.* at 3.
74. Luigi Zingales, *Survival of the Fittest or the Fattest? Exit and Financing in the Trucking Industry*, 53 J. FIN. 905, 933–34 (1998). *See also* Jie Cai & Zhe Zhang, *Leverage Change, Debt Overhang, and Stock Prices*, 17 J. CORP. FIN. 391, 391 (2011) (examining significant and negative effects of the change in a firm's leverage ratio on its stock prices).

deregulation leading to increased competition, which demanded efficiency measures and additional investments.[75] The study shows that the firms that were able to make new investments and survive the increased competition were those whose capital structure at the start of the period was conservative and included low levels of debt.[76] The debt-overhang problem, then, derailed the required investments.[77] Further studies have shown that the underinvestment problem is significant not only for firms which have excess liabilities over assets, but also for countries in similar situations,[78] and even for homeowners whose property values have fallen below the mortgage values.[79] All these cases feature a disincentive to invest in assets due to the debt holders' share of the fruits of future success. The debt-overhang problem, then, is as palpably and disturbingly present in reality as the risk-shifting problem.

C. Optional View: Shareholders as Holders of a Call Option on the Firm's Asset

Thus far we have demonstrated and explained the agency costs between shareholders and bondholders in terms of the asymmetrical, convex structure of payoffs to shareholders. But another revealing way of thinking about the risk-shifting problem and the debt-overhang problem is to look at the shareholders of a leveraged firm as holders of a call option on the firm's assets option that was written to them by the bondholders who are, according to this view, the owners of the assets.[80] The option the shareholders hold is to buy the firm's assets from the bondholders upon the date and at the price of the debt's repayment to the firm's bondholders. By virtue of the limited liability feature, the shareholders are not obliged to pay the firm's debts to the extent the debts surpass the firm's assets, whereupon their right can be seen as a call option. In the same vein of metaphor, the remaining time until repayment of the debt can be likened to the time in which the option can be exercised.

Such a view of the relations between shareholders and bondholders can be illuminating in the context of the agency costs we have described. Like any option holder, shareholders have an interest in increasing the firm's risk level since as the value of an option rises, the higher the risk level of the asset on which the option is written. This, then, is the fundamental reason for the risk-shifting problem. The larger the asset value in relation to the debt, the more the shareholders' option can be said to be "in the money," whereupon the risk-shifting problem is diminished. By contrast, the smaller the asset value in relation

75. Zingales, *supra* note 74, at 933–34.

76. *Id.*

77. *Id.*

78. Marco Arnone et al., *External Debt Sustainability: Theory and Empirical Evidence* 31 (2005), *available at* http://128.118.178.162/eps/if/papers/0512/0512007.pdf.

79. *See generally* Brian T. Melzer, *Mortgage Debt Overhang: Reduced Investment by Homeowners with Negative Equity* (Aug. 2012) (Kellogg School of Management, Northwestern University) *available at* http://www.kellogg.northwestern.edu/faculty/melzer/Papers/CE_debt_overhang_08_16_2012.pdf. Melzer shows that homeowners caught in a situation of overhanging debt regarding their home avoid investing in repairs but do not avoid investing in cars or electronic appliances that remain with the owner when the residential home is foreclosed. *Id.* Another empirical study presents the extensive consequences of the debt-overhang problem for a group of Austrian ski lodges in financial distress. *See generally* Xavier Giroud et al., *Snow and Leverage*, 25 REV. FIN. STUD. 680 (2012). Debt forgiveness led to significant improvement in their business performance. *Id.*

80. Looking at the shareholders as holders of an option on a firm's assets in exchange for repayment of the debt to bondholders originated in the Black and Scholes' famous article on option pricing. *See* Fischer Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973).

to the debt, the greater the shareholders' incentive to take risks, as for any option holder whose option lies "out of the money." Looking at shareholders as holders of a call option on the firm's assets also sheds light on the debt-overhang problem. Since option payoffs are fundamentally asymmetric (i.e., option payoffs have convex structure), the underinvestment problem exists even when a firm's debts do not outweigh its assets. When a firm's debts outweigh its assets, however, the shareholders' option lies "out of the money," and the more out of the money the option lies, the less incentive an option holder (shareholder) has to make an effort and invest. Thus, viewing shareholders as holders of a call option on a firm's assets reveals the circumstances and the conditions under which the two problems are likely to emerge. The Mathematical Appendix that contains the formal proofs to the arguments found in this Article, in fact, uses the option view on the value of stock in a leverage firm.

D. Shareholders, Bondholders and Managers

Before moving on to the next section, which deals with the integration between the misrepresentation problem and the agency costs detailed in this section, we ought to devote a few comments to the triangle of relations among shareholders, managers, and bondholders. Running a firm is entrusted to its management, not its shareholders, but it is no wonder that management implements policy convenient to the shareholders. As in our explanation with respect to misrepresentation, here, too, it bears mention that the shareholders are the ones who appoint the directors, who in turn choose a CEO.[81] In effect, this contention is all the more salient with respect to materialization of the damage potential of the agency costs described in this section. The bondholder is the only victim (whereas the misrepresentation problem is harmful also to future shareholders, who may retaliate against the manager). Furthermore, in this case, too, management's compensation plays a central role. Compensation by means of capital-based instruments,[82] or any other convex compensation (e.g., yearly bonuses according to short-term performance), will make managers act to heighten a firm's risk profile, to the bondholders' dissatisfaction.[83]

To conclude, shareholders do not manage public corporations, and certainly not those whose ownership is dispersed. Nonetheless, the incentive to misrepresent also projects onto management because shareholders appoint the firm's board of directors, who serve the shareholders' will. Furthermore, common compensation tools such as stock options or restricted share units make the manager himself a shareholder, with an emphasis on the short term.[84] For all of these reasons, it is clear that the shareholders' interest in

81. Bondholders usually refrain from playing any role in how a firm is run. For example, lenders avoid asking for a seat on a firm's board of directors for fear of having an equitable sanction imposed on them. Such a sanction is sometimes imposed on a bondholder actively involved in a firm's management and causes the debt owed to that bondholder to be demoted to the end of the line.

82. *See infra* Part V (discussing management compensation as related to misrepresentation and excessive risk-taking).

83. Dodd–Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1901 (2010) (augmenting the shareholders' power to influence managerial compensation may therefore exacerbate the agency costs between shareholders and bondholders in leveraged firms).

84. In light of this, it is not surprising to find numerous studies discussing the link between capital compensation for officeholders and accounting deception. *See* Coffee, *supra* note 33, at 201 (analyzing the central role of managerial compensation in securities fraud); Coffee, *supra* note 18, at 280 (discussing the central role of managerial compensation in the Enron scandal). *See also* Sharon Hannes, *Managers vs. Regulation: Post-Enron Regulation and the Great Recession*, 3 HARV. BUS. L. REV. 279, 297–301 (2013) (discussing the link between

misrepresentation, to some extent, is passed on to the managerial echelon.[85] We return to this discussion after we put forth the main argument of our paper.[86]

IV. THE EFFECTS OF MANIPULATION ON AGENCY COSTS IN LEVERAGED FIRMS

In the previous Parts we presented misrepresentation and agency costs between shareholders and bondholders in a leveraged firm as separate problems. However, as demonstrated in the Introduction, there are important interrelations between the various problems that have not yet been discussed in the literature. In particular, the misrepresentation problem can alleviate and even nullify the other classical agency problems. In the Introduction, we provided simple numerical examples (Examples A and B) to illustrate these claims. In the Mathematical Appendix to this Article, we prove these claims in a more general setting, using a formal model that takes into account, among other things, the time value of money and the required risk-adjusted rate of return on the firm's assets with the various projects. This model utilizes the famous Black–Scholes option pricing formulae for assessing the value of shares in a leveraged firm.[87] In light of the complexity of both the Black–Scholes equation, and the general proofs of our claims, this Part provides more intricate numerical examples to clarify our major points. For the sake of simplicity and clarity, we will again ignore the time value of money and the risk-adjusted rate of return in all of the numerical examples.

A. Manipulation and the Risk-Shifting Problem

Perhaps counter-intuitively, manipulation may alleviate the risk-shifting problem. To be more precise, we argue that *sufficient* manipulation—that is, manipulation beyond a certain threshold level—cancels out the overinvestment problem. In a comparison between any two projects, where one is riskier but less valuable than the other,[88] the incentive to take the riskier, less valuable project due to high leverage disappears when the possibility of misrepresentation exceeds a certain threshold. This holds true for any misrepresentation that inflates the value of a firm's assets by a certain rate or size or both.[89]

Let us turn, then, to a slightly different example from that given in the Introduction. The following example (Example C) concerns a highly leveraged firm that, unlike the one in Example A, does not face immediate bankruptcy. In other words, the value of the firm's assets is higher than the value of its liabilities.

Example C: Leverage Is Less Than 100%

Assume that a leveraged firm has overall assets worth $50 million and outstanding debts of $40 million (due next year). In this situation, as opposed to Example A, without further action, the firm will not be bankrupt next year; the outstanding debts of $40 million

capital compensation and fraud comprehensively).

85. Likewise, officeholders' yearly bonuses are in large measure dependent on a firm's accounting performance.

86. *See infra* notes 108–113 and accompanying text (discussing the effect of compensation on managerial interest in misrepresentation).

87. *See supra* Part III.C (discussing option nature of shares in leverage firms).

88. The second project has a negative NPV while the first one has a positive NPV.

89. In other words, the misrepresentation we are discussing is an affine transformation of the original asset prices. If the assets' original value is X, after the misrepresentation their inflated value is set at aX+b, where "a" is bigger than or equal to one, and "b" is bigger than or equal to zero.

will be paid in full, and the shareholders will be left with assets worth $10 million (see Table 5).

Table 5: Firm Balance No Action (Market Values)

Asset value	$50	$40	Bond
		$10	Stock
	$50	$50	Firm value

Assume further that the firm's management, acting on the shareholders' behalf, faces two alternative investment opportunities. The first possibility is to invest in a conservative project, which will certainly raise the value of the company's assets from $50 million to $60 million. The second possibility is to invest in a risky project that has a 50% chance of raising the company's assets' value to $85 million, and a 50% chance of reducing their value by $45 million, to $5 million. The conservative project has an NPV of $10 million, whereas the risky project has a negative NPV (minus $5 million). As compared to Example A, the projects have an identical NPV, though in this example, the risky project is riskier than its counterpart in Example A.

Likewise, in this example the safe project is superior from the standpoint of all stakeholders in the firm. Nonetheless, shareholders prefer the bad, excessively risky project. That, as noted above, is because the shareholders of a leveraged company would enjoy the full profits, if any, of the risky project, but not suffer the full consequences of its failure, which would fall on the bondholders' shoulders. In the above example, the average profit to shareholders from taking the risky project stands at $22.5 million (50%*(85-40)). By contrast, the safe project yields a profit of only $20 million. This bad motivation, which diverts the risk onto the bondholders, is demonstrated in Tables 6 and 7 below.

Table 6: Firm Balance Safe Project (Market Values)

Asset value	$60	$40	Bond
		$20	Stock
	$60	$60	Firm value

Table 7: Firm Balance Risky Project (Market Values)

Asset value	0.5($85)+0.5($5) =	$45	$22.5	= 0.5($40)+0.5($5)	Bond
			$22.5	= 0.5($45)+0.5($0)	Stock
		$45	$45		Firm value

As we have already argued, however, this result does not take into account the possibility of artificial inflation of the company's assets' value. In particular, if the company's manager can, for a certain period of time, deceive the market so that the various investors evaluate its assets at 20% or more above their fair market value, the incentives will change, and shareholders will reject the risky project in favor of the safe project. That is because if the safe project is chosen, the shares' capital value in the market's view will amount to $32 million in the short term (100%*(72-40)),[90] whereas the average capital value would amount to only $31 million (50%*(102-40)), if the risky project were chosen.[91]Again, misrepresentation that artificially raises a company's assets' value by more than 20% would only increase the preference for the safe project over the risky project in shareholders' eyes.[92] Such a change of preference also leads to significant profit to bondholders since with the safe project they can always exact the full debt. The change for the better in the shareholders' and bondholders' situation comes of course at the expense of the firms' future shareholders, who buy its stock at an inflated price. Tables 6a and 7a demonstrate the influence that the possibility of manipulating assets value has on shareholders' incentives to take short-term risks.

90. The assets' value is inflated and amounts to $72 million (120%*60), from which debts totaling $40 million are subtracted, leaving capital value in the market's view of $32 million.

91. If the risky project fails, then even after the manipulation it would not yield anything to the shareholders (5*120%) = $6 million assets' value, while the debt amounts to $40 million. On the other hand, if the risky project succeeds, the assets' value will be inflated to $102 million (120%*85), which, after subtraction of the $40 million debt, leaves capital value of $62 million. Since the project will succeed in only 50% of cases, the average capital value amounts to $31 million (50%*62), as noted above in the text.

92. For the sake of demonstration, with a 50% artificial rise in value the capital value with the safe project will amount to $50 million (100%*(90-40)), whereas the capital value with the risky project would amount to $43.75 million (50%*(127.5-40)).

Table 5a: Firm Balance No Action (Market Values) Manipulation

Asset	~~$50~~	~~$40~~	Bond
Value	$60	$40	
		~~$10~~	Stock
		$20	
	~~$50~~	~~$50~~	Firm Value
	$60	$60	

Note: In Millions of Dollars

Table 6a: Firm Balance Safe Project (Market Values) Manipulation

Asset	~~$60~~	~~$40~~	Bond
Value	$72	$40	
		~~$20~~	Stock
		$32	
	~~$60~~	~~$60~~	Firm Value
	$72	$72	

Note: In Millions of Dollars

Table 7a: Firm Balance Risky Project (Market Values) Manipulation

Asset	~~(0.5($85)+0.5($5)) =~~	~~$45~~	~~$22~~	~~= 0.5($40)+0.5($5)~~	Bond
Value	(0.5($102)+0.5($6)) =	$54	~~5~~	= 0.5($40)+0.5($6)	
			$23		
			~~$22~~	~~= 0.5($45)+0.5($0)~~	Stock
			~~5~~	= 0.5($62)+0.5($0)	
			$31		
		~~$45~~	~~$45~~		Firm
		$54	$54		Value

Note: In Millions of Dollars

A similar outcome will be obtained if the misrepresentation inflates the firm's assets' value not by a certain rate but by a fixed sum that is not dependent on profits stemming from the various projects.[93]

Example D: Two Risky Projects

In Examples A and C, the safe project promises full repayment of debts to bondholders and yields certain return to shareholders. The following example shows that this situation is not a necessary condition for our general claim. In other words, misrepresentation that raises a firm's assets' value above a certain threshold negates the shareholders' tendency to take excessive risks at the expense of bondholders, even if the alternative and desirable project itself is risky, as long as its risk level is lower than that of the other project. The proof of this claim can be found in the Mathematical Appendix; here we suffice with demonstrating it.

Assume, then, as in Example A, that a leveraged firm has total assets worth $50 million and an outstanding debt, due in one year, of $50 million. With no further action, the debt

93. For the sake of demonstration, assume that the company's manager can, for a certain time, deceive the market so that the various investors assess the company's assets' value at $10 million more than their market value in all states of the world. Here, too, assume for the sake of simplicity that the shareholders are interested in such a deception since they intend to sell their stock holdings. Such a misrepresentation will again turn the tables, and the risky project will be rejected in favor of the safe and attractive project. That is because if the safe project is chosen, in the short-term the shares' capital value in the market's view will amount to $30 million (100%*(70-40)), whereas the average capital value would amount to only $27.5 million (50%*(95-40)) if the risky project is chosen. Artificially raising the value higher would only increase the preference for the safe project compared to the risky project in the shareholders' eyes.

to its bondholders totaling $50 million will be repaid in full, and the shareholders will get nothing (see Table 1).

Assume, again, that two projects are available. The first project is a moderately risky project, which has an 80% chance of raising the firm's assets' value to $70 million, and a 20% chance of reducing their value to $20 million, so in expectation the firm's assets' value would rise to $60 million (0.8*70 + 0.2*20). The standard deviation of the value of the firm's assets if they are channeled into this project amounts to $20 million.[94] The second project is an excessively risky project, which has a 50% chance of raising the company's assets' value to $85 million, and a 50% chance of reducing their value to $5 million, so in expectation the firm's assets' value would drop to $45 million. The standard deviation of the value of the firm's assets if it is decided to channel them into this project amounts to $40 million.[95] The NPV of the moderately risky project (relatively safe project) is $10 million, whereas the excessively risky project has a negative net present value (minus $5 million). In comparison to Example A, the NPV of each of the projects in this example remains the same. Nonetheless, contrary to Example A, here the relatively safe project entails risk as well.[96]

Again, although the moderately risky project is superior to the excessively risky one, shareholders nonetheless prefer the latter. The average profit to shareholders from taking the excessively risky project amounts to $17.5 million (50%*(50-85)). By contrast, the moderately risky project yields them a profit of only $16 million. This outcome is shown in Tables 8 and 9 below.

Table 8: Firm Balance Moderately Risky Project (Market Values)

Asset value	0.8($70)+0.2($20)=	$60	$44.0 = 0.8($50)+0.2($20)	Bond
			$16.0 = 0.8($20)+0.2($0)	Stock
		$60	$60	Firm value

Note: In Millions of Dollars

94. The standard deviation is the square root of the difference between the value of the assets in every state of the world and their average value in the power of two, multiplied by the probability of occurrence of such state of the world. Calculation of the difference in this case is as follows: 0.8(70-60)^2+0.2(20-60)^2=80+320=400.

95. Calculation of the difference in this case is as follows: 0.5(85-45)^2+0.5(5-45)^2=1600.

96. In this example, we measure risk by the standard deviation of the company's assets. In the formal model, the risk is measured by the degree of variability.

Table 9: Firm Balance Excessively Risky Project (Market Values)

Asset value	0.5($85)+0.5($5) =	$45	$27.5	= 0.5($50)+0.5($5)	Bond
			$17.5	= 0.5($35)+0.5($0)	Stock
		$45	$45		Firm value

Note: In Millions of Dollars

But as in the previous examples, sufficient manipulation will change shareholders preference. In particular, if the firm's manager can, for a certain period of time, deceive the market so that the various investors assess the firm's assets at 20% more than their fair or market value, then shareholders will reject the excessively risky project in favor of the moderately risky project. That is because if the moderately risky project is taken, in the short-term, average share value in the market's view will amount to $27.2 million (80%*(84-50)),[97] whereas the average share value would amount to only $26 million (50%*(102-50)), if the excessively risky project were chosen.[98] Tables 8a and 9a demonstrate these effects.[99]

97. The assets' value is inflated by 20% and amounts to $84 million, which, after subtraction of the $50 million debt, leaves a capital value of $34 million in the market's eyes.

98. If the excessively risky project fails then even after manipulation it will yield nothing to the shareholders (5*120%=$6 million assets' value while the debt amounts to $50 million). By contrast, if the excessively risky project succeeds then the assets' value will be inflated to $102 million (85*120%) which, after subtraction of the $50 million debt, leaves a capital value of $52 million in the public's eyes. Since the project will succeed in only 50% of cases, the average capital value amounts to $26 million, as noted in the text above.

99. Here, too, artificially raising the value any higher would only increase the preference for the moderately risky project over the excessively risky project in the shareholders' eyes.

Table 8a: Firm Balance Moderately Risky Project (Market Values) with Manipulation

Asset value	~~0.8($70)+0.2($20) =~~ ~~$60~~ 0.8($84)+0.2($24) = $72	~~$44 = 0.8($50)+0.2($20)~~ $44.8 = 0.8($50)+0.2($24)	Bond
		~~$16.0 = 0.8($20)+0.2($0)~~ $27.2 = 0.8($34)+0.2($0)	Stock
	~~$60~~ $72	~~$60~~ $72	Firm value

Table 9a: Firm Balance Excessively Risky Project (Market Values) with Manipulation

Asset value	~~0.5($85)+0.5($5) = $45~~ 0.5($102)+0.5($6) = $54	~~$27.5~~ $28	~~= 0.5($50)+0.5($5)~~ = 0.5($50)+0.5($6)	Bond
		~~$17.5~~ $26	~~= 0.5($35)+0.5($0)~~ = 0.5($52)+0.5($0)	Stock
	~~$45~~ $54	~~$45~~ $54		Firm value

The fundamental reason why manipulation restrains risk taking is that the riskier project frequently denies shareholders the (spoiled) fruits of misrepresentation. As a result, shareholders in leveraged firms will tend to prefer less risky but more valuable projects that enable them to benefit more fully from artificially inflating the value of the firm's asset. Thus, there is a fundamental element of substitutability between manipulation and risk taking.

Example E: Beneficially Risky Project

To this point, we have shown that the misrepresentation problem can overcome the incentive of shareholders to take the excessively risky project. Of course, not every

risky project contemplated by the firm is an inferior one. Some projects might be very risky, but at the same time, these projects can offer very good returns. Therefore, the question is whether the misrepresentation problem generally induces conservatism even at the price of forestalling beneficially risky projects, that is, projects which offer a rate of return which more than compensate for the risk involved. The answer to this question is no. Misrepresentation will never give rise to a situation where the shareholders' preference for a risky but superior project will switch in favor of a more conservative but inferior project. We prove this claim in the Mathematical Appendix and illustrate it by the following example.

Assume, as in Example C, that a leveraged firm has overall assets worth $50 million and outstanding debts of $40 million due next year. If no action is taken by the firm, the firm's debts to bondholders totaling $40 million will be repaid in full, and the shareholders will be left with $10 million (see Table 5). Further assume the firm's management should choose between two alternative investment opportunities. The first possibility is to invest in a conservative, safe project, which will with certainty raise the value of the firm's assets from $50 million to $60 million. The second possibility is to invest in a risky project which has a 50% chance of raising the value of the firm's assets to $100 million, and a 50% chance of reducing their value to $30 million, so in expectation the value of the firm's assets would drop to $65 million. The safe project has an NPV of only $10 million, whereas the risky project's NPV is positive and preferable to the safe project ($15 million).

In this example, from the overall viewpoint of all stakeholders in the firm, the risky project ought to be chosen. Similarly, a manager who is completely loyal to the shareholders will optimally choose the risky project. In the above example, the average profit to shareholders from taking the risky project amounts to $30 million (50%*(100-50)). By contrast, the safe project yields them a profit of only $20 million. This convergence of the shareholders' narrow interest with that of all the investors in the company together is illustrated in Tables 10 and 11.

Table 10: Firm Balance Safe Project (Market Values)

Asset value	$60	$40	Bond
		$20	Stock
	$60	$60	Firm value

Table 11: Firm Balance Risky Project (Market Values)

Asset value	(0.5($100)+0.5($30)) =	$65	$35	=0.5($40)+0.5($30)	Bond
			$30	=0.5($60)+0.5($0)	Stock
		$65	$65		Firm value

The question at hand is whether a certain level of misrepresentation will divert the shareholders from the risky but superior project to the conservative but inferior one. As we shall see, even if the firm's asset value can be artificially boosted, shareholders' preference for the risky but superior project will never be reversed. To partially illustrate this, suppose that the value of the firm's assets can be inflated, for a certain period of time, by 20% above their fair or market value. As usual, assume for the sake of simplicity that the shareholders are interested in this manipulation since they intend to sell their stock holdings. The tables will not be turned as a result of such manipulation, and the risky but worthwhile project would not be rejected in favor of the safe but less worthwhile project. That is because if the safe project is chosen, in the short term the shares' value in the market's view will amount to only $32 million (120%*(60-40)),[100] whereas the average share value would amount to $40 million (50%*(120-40)) if the risky project were pursued.[101] It should be observed that with misrepresentation the difference in the shares value between the two projects drops from $10 million to $8 million, but the shareholders nonetheless would still distinctly prefer the risky, superior project. Greater misrepresentation won't change matters either, as we prove in the Mathematical Appendix.[102] It should also be noted that, in this example the bondholders do not profit ex post from the misrepresentation problem. The risky project that is taken, however, is preferable from an economic standpoint. Tables 10a and 11a demonstrate the influence that the possibility of manipulating the assets' value has on shareholders' incentives to take short-term risks in this example.

100. The assets' value is inflated by 20% and amounts to $72 million (120%*60), which after subtraction of the $40 million debt, leaves a capital value of $32 million in the market's eyes.

101. If the risky project fails, then even after manipulation it will yield nothing to the shareholders ((30*120%) = $36 million assets' value while the debt amounts to $50 million)). By contrast, if the risky project succeeds, then the assets' value will be inflated to $120 million (100*120%), which after subtraction of the $40 million debt, leaves a capital value of $80 million in the public's eyes. Since the project will succeed in only 50% of cases, the average capital value amounts to $40 million, as noted in the text above.

102. For example, this situation won't change even if the shareholders can inflate the value by 50%. With the safe project, the value to shareholders will be $50 million (1.5*60-40). With the risky project, the value to shareholders will be $57.5 million (0.5(150-40)+0.5(45-40)).

Table 10a: Firm Balance Safe Project (Market Values) Manipulation

Asset value	~~$60~~	~~$40~~	Bond
	$72	$40	
		~~$20~~	Stock
		$32	
	~~$60~~$72	~~$60~~	Firm value
		$72	

Table 11a: Firm Balance Risky Project (Market Values) Manipulation

Asset value	~~0.5($100)+0.5($30) =~~	~~$65~~	~~$35~~ ~~= 0.5($40)+0.5($30)~~	Bond
	0.5($120)+0.5($36) =	$78	$38 = 0.5($40)+0.5($36)	
			~~$30~~ ~~= 0.5($60)+0.5($0)~~	Stock
			$40 = 0.5($80)+0.5($0)	
		~~$65~~	~~$65~~	Firm value
		$78	$78	

To summarize, manipulation of the value of the firm's assets lessens the tendency of shareholders to engage in excessively risky projects, but it does not hamper shareholders incentive to take beneficially risky projects. We now turn to the interrelations between manipulation and the debt-overhang underinvestment problem.

B. Manipulation and the Debt-Overhang Problem

Misrepresentation, as we explain, alleviates the underinvestment problem. To be more precise, we argue that misrepresentation beyond a certain threshold nullifies the underinvestment problem. With sufficient misrepresentation of the value of assets, investors will prefer projects with a positive net present value. This is true for any misrepresentation that inflates a firm's assets' values by a certain rate or size, or by both.

Example F: Risky Investment

In Example B in the Introduction, we demonstrated our claim regarding the effect of misrepresentation on the underinvestment problem in a case concerning a definite project

that has a positive NPV. We will now show that the claim also holds true when the case concerns a risky project.

Assume that a leveraged firm has overall assets worth $50 million and outstanding debts of $70 million due next year. Without further action the firm will be bankrupt next year. In liquidation, the $70 million debt to bondholders will be repaid in part (bondholders will receive $50 million), and shareholders will get nothing.

Assume further that the firm's management comes across an attractive project that can significantly appreciate the value of all of the firm's assets. The project requires an immediate additional investment of $10 million (total $60 million, including the firm's existing assets), but promises with equal probability to appreciate the firm's assets' value to $85 million, or alternatively, appreciate the value to only $65 million in one year.

Accordingly, the project's NPV is $15 million (0.5*85+.5*65-60). In order to invest in this attractive project the company must raise $10 million from its shareholders or from other outside investors, since it has overall assets worth only $50 million. The existing shareholders or new investors are unwilling to invest $10 million in the firm, however, because existing bondholders are first in line to reap the fruits of the investment. Thus, the return on investment to new investors is only $7.5 million (50%(85-70)). As the following table demonstrates, that sum does not justify the required capital investment of $10 million.[103]

Table 12: Firm Balance (Market Values)

Asset value	$75	$67.5	Bond
		$7.5	Stock
	$75	$75	Firm value

But what would have happened if the firm's asset value could be inflated by 20% or more above its market fair value? In this case, the shareholders incentive not to invest in the project would disappear. With a 20% boost in the asset value, the existing shareholders or outside investors will be willing to finance the attractive project since after the artificial raise of value, the return on investment will amount to $102 million or $78 million, with equal probability. The project's NPV will artificially rise to $30 million. New investors expect that for every $10 million invested, they are guaranteed an expected return of $20 million (0.5(102-70)+.5(78-70)). Here there is a handsome return of 100%, justifying the capital investment in the project that would be forgone in the absence of misrepresentation.

It is worth noting that the firm's existing bondholders are also satisfied. This is because without the investment, the debt is worth only $50 million, while with the investment it is worth $67.5 million (see Table 12 above). Moreover, bondholders may enjoy the misrepresentation itself if they sell their bonds before it is exposed. The value of the bond before misrepresentation is exposed should be $70 million. The price will be borne by the firm's future shareholders and bondholders who will be holding its stock and bond when the market discovers the misrepresentation. The advantage of investing in the

103. The calculation of the value to the bondholders is 50%*65+50%*70=$67.5 million.

positive NPV project, from a global economic standpoint, stands counter to the harm to those shareholders. The following table demonstrates the incentives to the firm's existing shareholders as well as the benefit that accrues to its bondholders.

Table 12a: Firm Balance (Market Values) with Manipulation

Asset value	$90	$70	Bond
		$20	Stock
	$90	$90	Firm value

Example G: Bad Investment

Misrepresentation may provide suitable incentives to overcome the underinvestment problem by enabling a company to invest in positive NPV projects that would otherwise be foregone. This is what we showed so far. It is also necessary, of course, to examine the opposite question: whether misrepresentation is likely to provide shareholders with incentives to invest in a negative NPV project (apart from the question concerning the risk level of the project that we discussed in the first part of this chapter)? The answer is negative: there is no such fear.

The following example accordingly demonstrates that misrepresentation does not incentivize shareholders to opt for a bad project, i.e., a project that has a net present value lower than the company's assets' value in the ordinary course of business. To illustrate this point, let us return to the classic example of the underinvestment problem presented at the beginning of the Article (Example B). Assume that a leveraged firm has total assets worth $50 million and an outstanding debt of $70 million, due in one year. The firm will be bankrupt next year without further action. Assume further that the firm's management is offered a bad project. The project requires an additional investment of $10 million, which in another year will slightly appreciate the firm's assets' value to $55 million. The additional investment, then, has a negative net present value of minus $5 million. It is also clear that the firm's shareholders or other investors will not agree to invest $10 million in the project, since from their standpoint that would be equivalent to the full loss of the investment ($5 million simply goes down the drain, and another $5 million is in effect transferred to the bondholders). The following table presents the situation after the potential investment.

Table 13: Firm Balance (Market Values)

Asset value	$55	$55	Bond
		$0	Stock
	$55	$55	Firm value

Can misrepresentation change this? The answer, as indicated above, is no. To demonstrate this, assume that the shareholders can inflate the firm's assets' value by 50% in all states of the world. The value of the project would consequently artificially rise to $82.5 million, whereupon the shareholders would contemplate $12.5 million, which, upon subtraction of the $10 million investment, leaves them a profit of $2.5 million. Nonetheless, the shareholders would choose not to invest in the project. That is because of the assumption that the firm's assets' value can also be inflated in the ordinary course of business. Therefore, after misrepresentation, the firm's assets' value without the additional investment is $75 million. Consequently, the shareholders' share value is artificially inflated to $5 million, beyond their value with the inimical project ($2.5 million). As we prove in the Mathematical Appendix, this example is generalizable as long as the risk level of the project requiring investment is equal to or lower than that of the company's ordinary projects and as long as the assumption persists that the firm's assets' value can be artificially inflated even without taking the new project.

V. Discussion, Normative Conclusions, and the Test Case of the Financial System's Collapse

We have seen, then, that there are reciprocal relations between agency costs and misrepresentation problems in leveraged firms. In particular, the misrepresentation problem may alleviate the risk-shifting problem and dampens the debt-overhang problem. Likewise, misrepresentation does not create an incentive to avoid beneficially risky projects or adopt excessively risky projects that would have not been otherwise taken. Nonetheless, it bears emphasis at the very outset that we are not moved by these findings to recommend that misrepresentation be allowed. Misrepresentation in itself imposes heavy costs on the economy. It leads to distortion of securities prices in the market, from which it is but a short road to distorted allocation of resources in the economy and a major harm to the attractiveness of the capital market. Among other things, firms that misrepresent their assets' value are able to raise equity and debt too easily at the expense of other firms worthy of investment. Misrepresentation might also deter investors from participating in the capital market because they are unable to rely on its integrity. In the capital market, as in any other market, investors are leery of being exposed to the possibility of buying flawed products at inflated prices.

The lesson to be drawn from this Article's findings, then, is more subtle. First, the firm's debt-holders, foremost its bondholders and banks, must adapt their contractual protections to the firm's disclosure environment. Counterintuitively, perhaps, in an improved disclosure environment more stringent protections in the debt contracts, such as encumbrances or appropriate financial covenants, may be necessary to prevent the risk-

shifting problem from arising. Second, regulators and economic leaders must recognize the reciprocal relations between agency costs and the misrepresentation problem in leveraged firms and respond accordingly. For example, if regulators are taking action to improve firms' disclosure environment—a welcome change in itself—they must also take complementary steps. First, regarding the risk shifting problem, regulators must take into account that an improvement in the rules of disclosure and accounting practices may cause leveraged firms to take excessive risks. It follows that the overall handling of disclosure and accounting practices must be accompanied by regulation of the risk level, in particular that of especially leveraged firms such as those in the finance sector. Furthermore, since misrepresentation enables firms to encourage investment and thus alleviates the underinvestment problem, it should be expected that an improvement in disclosure rules will make it more difficult for extremely leveraged firms to recover. Such situations will be more frequent in times of economic recession or depression. Economic leaders should therefore consider providing assistance to companies in these conditions through the variety of fiscal and monetary instruments at their disposal. Ironically, in an exceptionally improved disclosure environment, these steps will have to be particularly intensive.

These lessons take us back to the economic crisis in the United States that began in 2007 and to the Great Recession following in its wake. As noted above, in 2002, in response to the discovery of many cases of accounting fraud on a huge scale, the U.S. Congress passed extensive legislation with the aim of tightening the supervision of accounting practices.[104] That legislation and accompanying steps apparently brought about a significant improvement in the U.S. disclosure environment and alleviation of the misrepresentation problem.[105] The economic crisis of 2007 was focused on the inordinately leveraged U.S. financial sector. The latter created and invested in novel and complex securities that collapsed with the collapse of the U.S. real estate market and became "toxic" assets. One possibility, unrelated to this Article, is that the improved disclosure environment after 2002 was not sufficiently improved to deter the financial institutions from the perilous adventure they were undertaking. A second possibility, on which this article sheds some light, is that it was precisely the improved environment itself that brought the financial sector, so prominent in its level of leverage, to raise its risk level even higher. As we have shown, misrepresentation is a deterrent to excessive risk-taking by leveraged firms. When inflating the assets' value is no longer possible, the risk shifting, overinvestment problem appears in full force. Ultimately, the U.S. Congress responded with further extensive legislation in 2010, the main aim of which was to moderate excessive risk-taking in the financial sector.[106] This legislation, then, may be the complementary step to the legislation of 2000, which did much to improve the disclosure regime for public corporations in the United States.

Furthermore, our findings may also cast light on the prolonged recession into which the U.S. economy has fallen in the wake of the 2007 crisis. As we have shown, misrepresentation can partially mitigate the underinvestment problem. This is, of course, a warped solution to the problem, but in its absence it is more difficult to make efficient and necessary investments. Following a great economic crisis and a steep fall in assets' value,

104. *See* Coffee, *supra* note 33, and accompanying text (stating that Congress enacted the Sarbanes–Oxley Act in 2002).

105. Hannes, *supra* note 26, at 412–13.

106. Dodd–Frank Wallstreet Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1376 (2010).

many firms find themselves in an overleveraged situation, including where their debts outweigh their assets. In such a situation, the recovery of firms depends on being able to raise capital for investing in new, efficient projects, but the outstanding debt may prevent such investment. In the absence of manipulation, getting out of the crisis may require government support. This may perhaps explain the difficulties in the U.S. economy on the road to recovery and the need to rely on governmental intervention, both by direct transfers to the financial sector[107] and by way of massive and unprecedented monetary intervention.[108] In any event, in the present Article it is not our intention to try to prove the connection between our theoretical argument and recent events in the United States, and we suffice with pointing to its possibility.

Finally, further discussion ought to be devoted to the triangle of relations among stockholders, debt-holders, and managers. In the above examples and in the Mathematical Appendix, we have assumed for the sake of simplicity that the company has only short-term shareholders. This simplification is meant to focus attention on the shareholders who enjoy the full effect of misrepresentation because they sell their shares before its effect can dissipate. We also mentioned that the firm has long-term shareholders. The advantages of misrepresentation to these shareholders are indirect. No direct benefit accrues to long-term shareholders from the artificial movement in stock prices because they will not be selling their holdings during the period of market deception; however, they can profit from the firm's raising of capital and debt under better conditions than the company would enjoy if not for the misrepresentation.[109] Because the benefit accruing to long-term shareholders is smaller than that accruing to short-term shareholders, the overall benefit to the firm's shareholders is smaller than that reflected in the simplified examples. Accordingly, the management group, which is responsible de facto for the firm's risk level and quality of disclosure, ostensibly has a lesser incentive to dabble in misrepresentation if it wants to serve all of its shareholders faithfully. Furthermore, it could be argued that in their conduct, managers are influenced more by long-term shareholders because they are the ones whom the managers will be meeting again down the road. In light of that, management's incentive to engage in misrepresentation may appear to be even smaller than as presented to this point.

The truth of the matter, though, is that due to the prevalent patterns of executive compensation in the United States, managers, to a large extent, act according to the interests

107. The most massive intervention was in the framework of the American government's TARP program, which channeled the unprecedented sum of $475 billion from public funds to the financial sector. *See generally TARP Program*, U.S. DEPT. OF THE TREASURY, *available at* http://www.treasury.gov/initiatives/financial-stability/TARP-Programs/Pages/default.aspx# (last visited Aug. 28, 2014).

108. The most striking action in this context is the Federal Reserve's "quantitate easing" program, in the framework of which the United States' central bank bought large quantities of long-term government bonds and other securities in the capital market. The quantitate easing program marks a sharp shift from the central bank's usual monetary steps, which for decades consisted of no more than adjusting the interest rate. For an extensive review of the exceptional monetary steps that the Federal Reserve took to help the American economy recover from the crisis, see Mark Gertler & Peter Karadi, *Central Banking Before, During and After the Crisis Conference - QE 1 vs. 2 vs. 3 . . . A Framework for Analyzing Large Scale Asset Purchases as a Monetary Policy*, FEDERAL RESERVE BOARD (Mar. 2012), *available at* http://www.federalreserve.gov/Events/conferences/2012/cbc/confpaper1/confpaper1.html.

109. Actually, according to the argument presented in the previous Part, a long-term shareholder is harmed by misrepresentation because it prevents the company from choosing especially risky projects, a significant portion of whose costs would be borne by debt-holders.

of short-term shareholders. The lion's share of the average U.S. manager's compensation package is made up of the firm's options and restricted shares for the relatively short period of a few years.[110] It should come as no surprise, then, that in U.S. companies that often compensate their managers in this way, we find many problems relating to misrepresentation[111] and excessive risk-taking.[112] It turns out, then, that management is, in effect, compensated in such a way that it will try to maximize the benefit to short-term shareholders. This diminishes the importance of the precise analysis regarding the motivations of firms' long-term shareholders. Simply put, firms are run by short-term shareholders. Finally, the fact that firms are run by managers holding stock-options exacerbates the effect of our argument. Recall that we previously mentioned that shareholders can be seen as option-holders that have the option to "purchase" the assets of the firm by paying off its debt.[113] This means that the incentives of the shareholders in their interaction with the bondholders are quite similar to those of a manager holding stock-options in her interaction with the shareholders. It implies then, that the patterns of incentives for shareholders in leveraged firms revealed in this paper would be quite similar to those of managers holding stock-options. Similar to shareholders in leveraged firms, these managers would have a tendency to take on excessively risky projects. Additionally, one could also show that misrepresentation may ease this problem in a similar manner to the mechanism identified by this paper in leveraged firms.[114]

VI. SUMMARY

This Article has consolidated the discussion in the literature of some familiar negative phenomena concerning leveraged firms. Whereas the literature discusses each of these phenomena separately, we claim that a better understanding of them requires an acknowledgment of the reciprocal relations among them. In particular, we have argued that typical agency costs in the sphere of shareholders' relations with bondholders and the

110. *See* Kevin J. Murphy, *Executive Compensation: Where We Are, and How We Got There* 69 (Aug. 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2041679 (noting that for the "[f]irst time since the 1950s, stock options have re-emerged as the dominant form of incentives compensation"). For a critique of the setting of capital compensation in the United States for the short-term, see Sanjai Bhagat & Roberta Romano, *Reforming Executive Compensation: Focusing and Committing to the Long-term*, 26 YALE J. ON REG. 359, 366 (2009); Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 GEO. L.J. 247, 249 (2010).

111. *See, e.g.*, Jap Efendi et al., *Why Do Corporate Managers Misstate Financial Statements? The Role of Option Compensation and Other Factors*, 85 J. FIN. ECON. 667, 668 (2007); Shane A. Johnson et al., *Managerial Incentives and Corporate Fraud: The Sources of Incentives Matter*, 13 REV. FIN. 115, 115 (2009); Qiang Cheng & Terry D. Warfield, *Equity Incentives and Earnings Management*, 80 ACCT. REV. 441, 441 (2005).

112. *See, e.g.*, Jeffrey L. Coles et al., *Managerial Incentives and Risk-Taking*, 79 J. FIN. ECON. 431 (2006). In this article, the authors show that capital compensation causes managers to elevate a company's risk level. Among other things, it leads to greater investment in research and development, less investment in fixed property, higher leveraging and concentration on a narrower range of business activities. The excessive risk-taking problem is exacerbated in such cases because asymmetric benefits accrue to the manager from some of the compensation instruments—significant profit in case of success versus the lack of any sanction for failure. Stock options, which are a common compensation instrument, are a prominent example of this.

113. *See supra* note 80 and the accompanying text (discussing shareholders as holding options to purchase the firm's assets by purchasing its debt).

114. *See generally* Sharon Hannes & Avraham Tabbach, *Executive Stock Options: The Effects of Manipulation on Risk Taking*, 38 J. CORP. L. 533 (2013) (discussing the trade-off between risk and manipulation for managers holding stock options).

misrepresentation problem are, in essence, interchangeable. Misrepresentation of the kind examined in this Article, which artificially inflates a firm's assets' value, alleviates the risk-shifting problem and offers relief of the debt-overhang problem in leveraged firms. Furthermore, as we have shown, misrepresentation does not impair shareholders' motivation to take beneficial risks nor does it encourage unnecessary investments.

We have also raised the possibility of a connection between our theoretical argument and happenings in the U.S. economy over the past decade. The case may be that the significant improvement in the disclosure environment of the U.S. economy a decade ago paved the way for excessive risk-taking by overleveraged firms. Likewise, after the economic crisis and the fall in value of the toxic assets on the financial companies' balance sheets, many firms found themselves in an overleveraged situation. In such a situation, the recovery of firms may be seriously hindered by the debt-overhang problem. Whereas firms in the past had the option of relieving the problem and encouraging the flow of capital by means of misrepresentation, today, recovery has become more difficult. This may explain the prolonged duration of the recovery and the need for massive governmental assistance in a variety of ways.

Finally, it is important to acknowledge the reciprocal relations between the misrepresentation problem and agency costs because the social planner must prepare accordingly. To prevent a slide into excessive risk-taking, any reform in the sphere of disclosure, monitoring of disclosure, or sanctions for misrepresentation must be accompanied by an appropriate reform that prevents excessive risk-taking. Such a reform actually took place in the United States only after a dramatic collapse as a result of excessive risk-taking in the most leveraged industry—the financial sector.

MATHEMATICAL APPENDIX

In this Appendix, we will generalize the examples in this Article. The first part will deal with the overinvestment problem while the second part will focus on the underinvestment problem.

A. Overinvestment Problem

A manager of a firm acting on behalf of existing shareholders should choose between two alternative projects, each lasting one year and having the following characteristics:

Projects	NPV	Rate of Return	Volatility
Safer Project (*S*)	s^s	r_s	σ_s
Riskier project (*R*)	s^r	r_r	σ_r

We assume there is one to one correspondence between the characteristics of the projects and the firm value (the value of the firms' assets). Suppose the *R* project is riskier than the *S* project in both total and systematic risk. This means that the annual volatility of a project is greater for the *R* project than for the *S* project, $\sigma_r > \sigma_s$, and also that the annual required rate of return is higher for the *R* project than for the *S* project, $r_r > r_s \geq r_f$, where r_f is the annual risk free rate of return. We assume that both projects have non-negative NPV, but we impose no restriction on their ranking, so that the NPV of the *R* project may be higher, lower or equal to the NPV of the *S* project. This assumption captures the notion that risk may be, but by no means is, bad. We will say that the *R* project is "excessively risky" if its NPV is lower or equal to the NPV of the *S* project, that is, if $s^s \geq s^r$. Otherwise, we will say that the *R* project is "beneficially risky." We assume that the firm is leveraged, and that its outstanding debt is due next year with a value of *k*. We impose no restriction on the value of *k* in comparison to the firm's asset value.

Under these circumstances, the value of equity (that is of shares) in the firm is derived from the value of a European call option on the firm's assets with a strike price *k* and exercise time of one year. According to Black and Scholes option pricing formula, the value of a share if project $i \in \{s, r\}$ is taken is therefore:

(1) $c^i = \gamma s^i N(d_1^i) - k e^{-r_f} N(d_2^i)$

Where

(2) $d_1^i = \frac{\ln\left(\frac{\gamma s^i}{k}\right) + r_f + \sigma_i^2/2}{\sigma_i}$ and $d_2^i = d_1^i - \sigma_i$

and where γ, which is defined below, is equal to 1.[115]

115. Black & Scholes, *supra* note 80, at 647–49 (discussing option pricing under the Black and Scholes

Roughly speaking, the Black–Scholes formula says that the value of a call option can be decomposed to two elements $s^i N(d_1^i)$ and $ke^{-r_f} N(d_2^i)$.[116] The former reflects the expected net present value of receiving the underlying asset, and the latter reflects the expected net present value of paying the strike price. The expectation for both terms reflects the risk adjusted probability that the option finishes in the money, and both use the risk-free rate of return as the discount factor. As it turns out, one beautiful aspect of the Black–Scholes formula is that instead of using the real probability that the option finishes in the money and the real discount factor that should apply to the option payoff (which is hard and tricky to measure since options are riskier than the underlying asset on which they are written and therefore require a higher discount factor than the one applied to the underlying asset), one can adjust the probability distribution of stock prices in such a way that the present value of any stock-price contingent claim is equal to the expected future payoff, computed using the adjusted probabilities and discounted at the risk-free rate of return. Therefore, $N(d_2^i)$ reflects the risk-adjusted (or risk-neutral) probability that the option finishes in the money. On the other hand, $s^i N(d_1^i)$ reflects the expected net present value of receiving the underlying asset, but $N(d_1^i)(> N(d_2^i))$ does not reflect the risk-adjusted probability. The reason is that the value of receiving the underlying asset is not independent from the probability of receiving the underlying asset. In other words, the conditional expectation is that the value of the underlying asset is greater than the value of the strike price.

We turn to analyze the decision to take the *S* or *R* project, how it differs from the interests of the firm (shareholders and bondholders together), and how it is affected by the possibility to artificially inflate the value of the firm's assets. For clarity, we distinguish between excessively to beneficially risky projects.

1. Excessively Risky Projects

Suppose that the NPV of the *S* project is higher than the NPV of the *R* project, that is, $s^s > s^r$. The interests of shareholders and those of the firm are not necessarily aligned. In particular, shareholders may prefer the *R* project over the *S* project, the *S* project over the *R* project, or may be indifferent between the projects, all according to:

(3) $c^r \geq\leq c^s$.

The explanation for this possible misalignment is straightforward and well known. *Ceteris paribus*, a call option is more valuable the higher the price is and the greater the volatility of the underlying asset is. Therefore, if the NPV of the *S* project is only slightly higher than the NPV of the *R* project, while the volatility of the *R* project is sufficiently greater than the volatility of the *S* project, shareholders will prefer the *R* project over the *S* project. If the reverse is true, and the NPV of the *S* project is sufficiently higher than the NPV of the *R* project, while the volatility of the *R* project is only slightly greater than the volatility of the *S* project, shareholders like the firm will prefer the *S* project.

Consider the effects of possible manipulation of the value of the different projects resulting in a proportional increase in the firm's asset value in all states of the world. Let $\gamma>1$ be the manipulation coefficient. If the artificial increase in the value of the projects were real, the firm value would immediately increase from s^i to γs^i. Such a change would not alter the ranking of the projects from the perspective of all the firm's stakeholders.

model).

116. *Id.*

However, from the perspective of existing shareholders, who by assumption are planning to sell their shares upon completion of the project, the situation is different, as stated in the following proposition:

Proposition 1. Suppose that $s^s > s^r$. *Then:*

(1) if shareholders are indifferent between the projects or if they prefer the S project over the R project, that is, if $c^s \geq c^r$, *then any manipulation in the value of the projects will make the shareholders strictly prefer the S project;*

(2) if the S project is less valuable to shareholders than the R project, $c^s < c^r$ *, then for manipulation levels* γ *exceeding a cut-off value* $\bar{\gamma}$ *defined implicitly by* $c^s(\bar{\gamma}) = c^r(\bar{\gamma})$, *shareholders will prefer the S project and maximize firm value.*

To prove the first part we will show that, under its conditions, the rate of change of the option value with respect to the manipulation coefficient is greater for the *S* project than for the *R* project. The rate of change in the value of the option as γ is $s^i N(d_1^i)$. Now, by assumption $c^s \geq c^r$, or using (1) and rearranging, $s^s N(d_1^s) \geq s^r N(d_1^r) + ke^{-r_f}(N(d_2^s) - N(d_2^r))$. Therefore, to prove the first part, it is enough to prove that $N(d_2^s) > N(d_2^r)$.

Lemma: If $s^s > s^r$ and $\sigma_r > \sigma_s$, then $N(d_2^s) > N(d_2^r)$.

Proof: Since $N(.)$ monotonically increases with its argument, it follows that $d_2^s > d_2^r \leftrightarrow N(d_2^s) > N(d_2^r)$. Now, the requirement $c^s \geq c^r$ imposes a restriction on the relationship among the four parameters s^s, s^r, σ_s and σ_r. In particular, if $c^s = c^r$, then the values of any three parameters determine the value of the fourth parameter (while if $c^s > c^r$, the values of any three parameters determine an inequality regarding the value of the fourth parameter). Unfortunately, however, it is not possible to express explicitly any one parameter using the other parameters. Instead, the relationship among the four parameters is implicitly determined by $c^s \geq c^r$.

To tackle this problem, we will look at incremental changes in the value and the volatility of a risky project, leading from the risky project to the safer one while maintaining the inequality $c^s \geq c^r$. In other words, any *S* project with s^s and σ_s and which satisfies $c^s \geq c^r$ can be obtained by starting from the *R* project with s^r and σ_r and then increasing the value of the *R* project slightly and decreasing its volatility appropriately so as to hold constant or increase the value of a call option on the project, and then repeating the process. Let ds and $d\sigma$ be the differentials applied to the *R* project. Maintaining $c^s \geq c^r$ requires that the total differential, dc, will satisfy (suppressing sub and superscripts):

(4) $\mathrm{dc} = \frac{\partial c}{\partial s}\mathrm{ds} + \frac{\partial c}{\partial \sigma}\mathrm{d}\sigma \geq 0.$

But (for T=1)

$$\frac{\partial c}{\partial s} = N(d_1) \text{ and } \frac{\partial c}{\partial \sigma} = sN'(d_1).$$

Plugging $\frac{\partial c}{\partial s}$ and $\frac{\partial c}{\partial \sigma}$ into (4) and rearranging, we have:

(5) $\mathrm{d}\sigma \geq -\frac{N(d_1)}{sN\prime(d_1)}\mathrm{ds}.$

We will now use this inequality to analyze how d_2 is affected by changes ds and $d\sigma$. This is given by the total differential:

$$\mathrm{d}d_2 = \frac{\partial d_2}{\partial s}\mathrm{d}s + \frac{\partial d_2}{\partial \sigma}\mathrm{d}\sigma.$$

But

$$\frac{\partial d_2}{\partial s} = \frac{1}{s\sigma} \text{ and } \frac{\partial d_2}{\partial \sigma} = -\frac{1}{\sigma}d_1.$$

Therefore,

$$(6)\ \mathrm{d}d_2 = \frac{1}{s\sigma}\mathrm{d}s - \frac{1}{\sigma}d_1\mathrm{d}\sigma.$$

Now, since $\mathrm{d}\sigma < 0$, then (6) is clearly positive for $\mathrm{d}_1 > 0$. The difficult part is to show that (6) is positive even for $\mathrm{d}_1 < 0$. Utilizing inequality (5) we have that

$$\frac{1}{s\sigma}\mathrm{d}s - \frac{1}{\sigma}d_1\mathrm{d}\sigma \geq \frac{1}{s\sigma}\mathrm{d}s(1 + \frac{d_1 N(d_1)}{N'(d_1)}).$$

But (for any finite $\mathrm{d}_1 < 0$):

$$N(d_1) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{d_1} \mathrm{e}^{-\frac{t^2}{2}}\,\mathrm{d}t < \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{d_1} \mathrm{e}^{-\frac{t^2}{2}}(\frac{t}{d_1})\,\mathrm{d}t = \frac{1}{d_1}\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{d_1} \mathrm{e}^{-\frac{t^2}{2}}t\,\mathrm{d}t = -\frac{N\prime(d_1)}{d_1}.$$

That is,

$$\frac{d_1 N(d_1)}{N'(d_1)} > -1.$$

Therefore,

$$\frac{1}{s\sigma}\mathrm{d}s(1 + \frac{d_1 N(d_1)}{N'(d_1)}) > 0.$$

It follows then that starting from the *R* project, increasing s and decreasing σ while maintaining $c^s \geq c^r$ leads to an increase in d_2. Thus, $d_2^s > d_2^r$, as required.

The proof of part (2) follows from the continuity of option prices with respect to γ. In particular, if $c^s < c^r$, then sufficiently small changes in γ will not alter shareholders' preference for the *R* project. At the same time, for a sufficiently large change in γ, shareholders will switch their preference towards the *S* project, that is, c^s will become larger than c^r. The reason is that for a sufficiently large increase of γ, the call option becomes deep in the money, and therefore its value converges to the value of the underlying asset minus the present value of the strike price (that is, $s^i - e^{-r_f}k$). In other words, for a sufficiently large increase of γ, a call option holder stands in the same position as the owner of the underlying asset (but for the present value of the strike price). Since, by assumption, the *S* project is superior to the *R* project, shareholders will prefer the *S* project. Moreover, from part (1) it follows that once the shareholders are indifferent between the projects, further increase of γ will make them strictly prefer the *S* project and will also make the *S* project become relatively more and more valuable than the *R* project. Therefore, there

exists $\bar{\gamma}$ such that $c^r = c^s$, which defines a cutoff value of manipulation such that for minor manipulation (i.e., $\gamma < \bar{\gamma}$) the shareholders still prefer the *R* project over the *S* project; but for major manipulation (i.e., $\gamma \geq \bar{\gamma}$) the shareholders prefer the *S* project over the *R* project. This proves Part 2.

2. Beneficially Risky Projects

Suppose alternatively that the NPV of the *R* project is weakly higher than that of the *S* project, that is, $s^r \geq s^s$. Then the interests of shareholders and those of the firm are aligned in the sense that the shareholders never prefer a project that is not in the best interest of the firm as a whole. Indeed, shareholders will prefer the *R* project. The explanation is simple. As pointed above, *ceteris paribus*, a call option is more valuable when the price is higher and the volatility of the underlying asset is greater. Since the *R* project has a higher NPV and greater volatility than the *S* project, its value for shareholders is greater than the value of the *S* project.

Consider again the effects of inflating the value of the projects proportionally. This would only (weakly) increase the value of the *R* project relative to the *S* project. As a result, shareholders will maintain their preferences for taking the *R* project. We state this in the following proposition without proof.

Proposition 2. If the NPV of the R project is (weakly) higher than the NPV of the S project then shareholders in a leveraged firm will always prefer the R project over the S project even if the value of the projects can be manipulated and inflated.

B. Under Investment Problem

A manager of a firm acting on behalf of existing shareholders should choose between two alternative projects that last for one period, say, a year, having the following characteristics:

Projects	NPV	Rate of Return	Volatility
Normal (*N*)	s^{N}	r_N	σ
Investment (*I*)	s^I	r_I	σ

The *N* project is normal in the sense that it reflects the usual rate of return and volatility of the firm and does not require any additional investment. The NPV of the firm with this project is denoted s^N. The *I* project, on the other hand, requires an additional, immediate investment of *I*, and with it, the NPV of the firm asset is s^I. We will say that the *I* project is an "attractive investment" if $s^I - I > s^N$, otherwise we will say that the *I* project is a "bad investment." To emphasize the difference between the overinvestment and the underinvestment problems, we assume that the volatility of the projects is the same. Like the overinvestment scenario, assume that the firm is leveraged and that its outstanding debt is due next year with a value of *k*. We impose no restriction on the value of *k* in comparison to the firm's asset value.

Under these circumstances, the value of equity if the *N* project is selected is c^N, whereas it is $c^I - I$, if the *I* project is selected because shareholders are required to finance this project.

We turn to analyze the decision to take the *N* or *I* project, how it differs from the interests of the firm (shareholders and bondholders together), and how it is affected by the possibility to artificially inflate the value of the firm's assets. We distinguish between an attractive investment and a bad investment.

C. Attractive Investment

Suppose that $s^I - I \geq s^N$. In such a case, the interests of shareholders and those of the firm are not necessarily aligned. In particular, shareholders may prefer to invest in the *I* project, to continue with the *N* project, or be indifferent between the two projects, all according to

(7) $c^I - I \geq\leq c^N$.

The reason for this possible misalignment is simple. From the perspective of the firm, increasing the value of its asset by one dollar is equal to one dollar. Therefore, as long as the additional investment required to increase the value of the firm's asset by one dollar is less than one dollar, the investment is desirable and attractive. On the other hand, from shareholders' perspective, increasing the value of the firm's asset by one dollar is worth less than one dollar. Indeed, it is worth $-\Delta = N(d_1) < 1$. Therefore, if the investment *I* is negligible in comparison to the increase in the firm's asset value, and if the debt is relatively low, the shareholders will prefer to pursue the *I* project, even though they do not fully benefit from it. In contrast, if the investment *I* is significant in comparison to the increase in the firm's asset value, and if the debt is relatively high, the shareholders will prefer not to invest in the project.

It is worth noting that the underinvestment problem can arise in any leveraged firm, that is, for any $k>0$. However, the more leveraged a firm is, the more severe the underinvestment problem. This is because $N(d_1)$, which reflects the rate of change in the option value with respect to the value of the underlying asset, decreases monotonically with *k*.

We examine now how manipulation of the projects' value will affect the shareholders preference.

Proposition 3. Suppose that $s^I - I > s^N$. *Then, if shareholders are indifferent between the projects or if they prefer the I project over the N project, that is, if* $c^I - I \geq c^N$, *then any manipulation in value of the projects will make the shareholders strictly prefer the I project. If the I project is less valuable to shareholders than the N project,* $c^I - I < c^N$, *then for manipulation levels* γ *exceeding a cut-off value* $\bar{\gamma}$ *defined implicitly by* $c^I(\bar{\gamma}) - I = c^N(\bar{\gamma})$, *shareholders will prefer the I project and maximize firm value.*

The proof of the first part follows straightforwardly from the fact that the higher the rate of change in the value of a call option, with respect to the manipulation coefficient, the higher the value of the underlying asset, formally, $\frac{\partial^2 c}{\partial s \partial \gamma} = \frac{1}{\sigma\gamma\sqrt{2\pi}} e^{-d_1^2/2} > 0$. Therefore, if shareholders weakly prefer the *I* project over the *N* project, any manipulation will make them strictly prefer the *I* project.

The second part follows from the fact that the option value is continuous with respect to the manipulation coefficient. Thus, if $c^I - I < c^N$, then sufficiently small changes in the manipulation coefficient will maintain the inequality, so that shareholders will still prefer

not to invest in the *I* project. On the other hand, a sufficiently large change in the manipulation coefficient will reverse the inequality, so that shareholders will prefer to invest in the *I* project. The reason for that is that for a sufficiently large increase in the manipulation coefficient, the option will be deep in the money, so the value will converge to the value of the underlying asset less the present value of the strike price ($s^i - e^{-r_f}k$). Since by assumption the *I* project is attractive, it follows that shareholders will prefer it. Moreover, according to Part 1, when shareholders weakly prefer the *I* project, manipulation will make them strictly prefer it. It follows then that there is a cut off value of γ defined implicitly by $c^I(\bar{\gamma}) - I = c^N(\bar{\gamma})$, such that for manipulation levels exceeding $\bar{\gamma}$, shareholders will prefer the *I* project and maximize firm value. This completes the proof of Part 2.

1. Bad Investment

Suppose alternatively that $s^I - I < s^N$. In this case, the interest of shareholders and the firm are aligned. In particular, shareholders will prefer not to invest in the *I* project but rather to maintain the usual business of the firm.

The reason is identical to the one discussed above. From the perspective of all stakeholders of the firm, increasing the value of the firm's asset by one dollar is equal to one dollar. Therefore, if the investment required for increasing the value of the firm's asset by one dollar is greater than one dollar, it follows that the investment is undesirable. It is a bad investment. From the perspective of shareholders, the situation is even worse because as the owners of a call option on the firm's asset, increasing the value of the firm's asset by one dollar is worth less than one dollar. It is equal to $\Delta = N(d_1) < 1$. Therefore, shareholders will never invest in a bad investment.

We examine now the effects of manipulation on shareholders' preferences. Since the *N* project is superior to the *I* project, artificially inflating the value of the projects will merely increase the relative value of the *N* project over the *I* project. Thus, manipulation cannot change shareholders' preference not to invest in the bad project. We will state this as a proposition without proof.

Proposition 4. Suppose that $s^I - I < s^N$. Then shareholders in a leverage firm will not invest in the I project, even if they can artificially increase the value of the firm's asset.