

FINANCIAL OPTIONS, REAL OPTIONS, AND LEGAL OPTIONS:
OPTING TO EXPLOIT OURSELVES AND WHAT WE CAN DO
ABOUT IT

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Ticket sales for the next Powerball drawing just ended. A man recognized a friend coming out of the store. "How many did you get?" "Two," was the reply. "Let me buy one from you," the first man said. "Ten dollars," his friend told him. The ticketless man was surprised. "But it's only worth five dollars," he protested. His friend smiled. "Now. But in an hour it might be worth two hundred million."

INTRODUCTION

It was merely thirty years ago that the first formula for valuing a stock option was published,¹ and the first stock option was listed on an exchange.² In the short time since that birth, the options market has become a multi-trillion dollar industry.³ Accompanying this phenomenal growth of options markets as an industry has been a rich academic analysis of options.⁴ An expansive academic literature on options has developed, with many scholarly journals devoted to the study of options and other derivative instruments.⁵

Perhaps more importantly, our enhanced understanding of options has provided many important insights into other types of securities and decisions.⁶ When financial economists finally understood that straight debt and equity contained significant option characteristics, obvious solutions to unsolved puzzles appeared.⁷ More recently, financial economists have begun to model ordinary investment decisions as options.⁸ This has developed into a field unto itself known as real options.⁹ Examples of real options are the options to improve or abandon real property.¹⁰ Among other contributions,

1. See Fischer Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973).

2. RICHARD A. BREALEY & STEWART C. MYERS, *PRINCIPLES OF CORPORATE FINANCE* 564 (7th ed. 2003) ("The Chicago Board Options Exchange . . . was founded in 1973 to allow investors to buy and sell options on shares of common stock.").

3. See, e.g., Kimberly D. Krawiec, *Foreward*, 21 NW. J. INT'L L. & BUS. 565, 566 (2001) ("By the middle of 2000, for example, the estimated notional amount of outstanding derivatives contracts exceeded \$105 trillion . . ."). Cf. also Roberta Romano, *A Thumbnail Sketch of Derivative Securities and Their Regulation*, 55 MD. L. REV. 1, 2 (1996) ("Derivative securities—financial instruments whose value derives from some other, more fundamental, asset—have gone from obscurity and the arcane to the front pages of newspapers and the forefront of the legislative agenda in a very short timespan.").

4. Robert A. Jarrow, *In Honor of the Nobel Laureates Robert C. Merton and Myron S. Scholes: A Partial Differential Equation That Changed the World*, J. ECON. PERSP., Fall 1999, at 229, 236.

5. *Id.*

6. See generally STEPHEN A. ROSS ET AL., *CORPORATE FINANCE* 633-44 (6th ed. 2002) (explaining how stocks, bonds, and investments are actually options).

7. See, e.g., Dan Galai & Ronald W. Masulis, *The Option Pricing Model and the Risk Factor of Stock*, 3 J. FIN. ECON. 53, 67-68 (1976) (using options theory to explain why stockholders lose wealth in a conglomerate merger even though their risk is reduced).

8. See MARTHA AMRAM & NALIN KULATILAKA, *REAL OPTIONS* 45 (1999) ("There is no simple fix to traditional valuation tools—only the real options approach to valuation correctly values the managerial opportunities embedded in strategic investment.").

9. LENOS TRIGEORGIS, *REAL OPTIONS IN CAPITAL INVESTMENT* 2-4 (1995) (providing an outline of the evolution of the real options revolution).

10. See Peter H. Huang, *Corporate Finance: Teaching Corporate Law From an Option Perspective*,

the modeling of real options has provided a rational justification for the “high” valuations of high technology firms.¹¹

Legal scholarship has not overlooked these developments.¹² Legal commentators have observed that it is impossible to adequately teach corporate governance without a basic understanding of options.¹³ A sizable literature has developed in law review articles that explains how stock options work and discusses many of the challenges that options pose for securities regulation and corporate law.¹⁴ Interestingly, however, the insights that might be gained from the options literature have not been widely transferred to other areas of law.¹⁵ The law is full of embedded options such as: the option to declare bankruptcy; the option to litigate; the option to waive rights; the option to use alternative dispute resolution; the option to abrogate a duty; and so forth.¹⁶ Many of these situations continue to be modeled purely as what I call primitive decisions, without recognition of the embedded options.¹⁷ But recognition of embedded options, the implicit exercise costs, the expiration dates, and the positive marginal value that increased

34 GA. L. REV. 571, 593 (2000).

Real options involve decisions regarding real activities or real commodities whose risk has not been reduced to financial instruments. Examples of real options include options to expand preliminary investments, options to vary production levels, options to wait and learn before making decisions, options to grow, and options to abandon risky projects.

Id.

11. See AMRAM & KULATILAKA, *supra* note 8, at 70 (“From the real options perspective, Internet start-ups are options on options on options on options to generate cash flow.”).

12. See generally Huang, *supra* note 10, at 593-96 (observing that real options are dispersed throughout the law).

13. As one exhorted:

For scholars who are not persuaded by the above points, I offer one last exhortation: you do not have a choice. Anyone teaching corporate law inevitably confronts derivatives in some form. Options especially play a central role in modern cases, and increasingly in practice. How can anyone teach *United States v. O'Hagan*, *Smith v. Van Gorkom*, or *Revlon, Inc. v. MacAndrews & Forbes Holdings, Inc.* without mentioning options? The trend is clear: in the future, derivatives undoubtedly will invade corporate law in ways no one can anticipate.

Frank Partnoy, *Corporate Finance: Adding Derivatives to the Corporate Law Mix*, 34 GA. L. REV. 599, 603 (2000) (internal footnotes omitted).

14. See, e.g., Peter H. Huang, *A Normative Analysis of New Financially Engineered Derivatives*, 73 S. CAL. L. REV. 471, 482 (2000) (“Many people, including legal academics, regulators, and taxpayers, have an inaccurate and misleading impression of derivatives without really knowing much about, or even really beginning to understand them.”); Partnoy, *supra* note 13, at 600 (stating that the growth of derivatives has left corporate law in the dust); Romano, *supra* note 3, at 4 (“Very few citizens, let alone public officials, are well informed about derivative instruments, despite the recent attention and the large size of the market. The depth of the business community’s knowledge of these instruments is also questionable.”); see also Henry T.C. Hu, *Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism*, 102 YALE L.J. 1457, 1467-69 & 1477 (1993) (discussing some difficulties in measuring and accounting for risk and value of derivatives).

15. See Huang, *supra* note 10, at 593 (“Legal scholars have only recently begun to study the implications of the option perspective for legal rules and institutions.”).

16. *Id.* at 595-96 (listing examples of options familiar to law students).

17. One recent paper attempts to explain certain types of litigation with irrational behavior. Although the author uses the word “option” throughout, it is used solely as a synonym for “choice.” See generally Chris Guthrie, *Framing Frivolous Litigation: A Psychological Theory*, 67 U. CHI. L. REV. 163, 163-216 (2000). While an option does indeed convey a choice, options in the context of this Article generally are defined more narrowly to refer to valuable choices. The value comes from the ability to defer making the choice until after seeing the future. See *infra* Part I.B.

uncertainty adds to options can enhance our understanding of these choices and suggest policy changes for mitigating inefficiencies in the law.¹⁸

This gap in the literature is somewhat anomalous because the law and economics movement has generally applied economic analysis to every aspect of law,¹⁹ and the application of option theory to legal choices would seem to be an obvious extension of the literature. I attribute this anomaly to the fact that most law and economics scholars come to law with a microeconomics background.²⁰ Microeconomists tend to be focused on the real sector as opposed to the financial sector.²¹ In any case, this situation appears to be a symptom of historical barriers to interdisciplinary research that I believe are just beginning to erode. In this Article, I endeavor to reiterate and expand analysis and discussion of options applied to other areas of law.

Although some have observed that legal decisions can be modeled as options, their models have not gained widespread popularity.²² In part, this Article is a call to take option theory more seriously. This is particularly important given the rapid growth of the options perspective in finance during the 1990s, and the observation that many new business enterprises are really options on options.²³ But there is another important distinction in the analysis provided here. This Article is also concerned with what I call free options or exploitative options. These are basically situations in which there are incentives to behave in socially undesirable ways.²⁴ Borrowing money with the intention of consuming it lavishly and filing for bankruptcy would be one example. The objective is to consider situations in which exploitative options exist in the legal system and provoke more analysis into methods by which the consequent problems could be mitigated.

18. See Bradford Cornell, *The Incentive to Sue: An Option-Pricing Approach*, 19 J. LEGAL STUD. 173, 176 (1990) ("The goal of this article . . . is . . . to offer general insights into how such options affect the incentive to sue."); Partnoy, *supra* note 13, at 629 (asserting that many future corporate law questions will have answers rooted in an options framework and that corporate lawyers and academics who understand the basics will have an advantage).

19. See ROBERT COOTER & THOMAS ULEN, *LAW AND ECONOMICS* (3d ed. 2000) (describing the pervasiveness of economic analysis in law).

20. See *id.* at 9 ("The economic analysis of law draws upon the principles of microeconomic theory For those of you who have not studied that branch of economics, reading this . . . will prove challenging but essential for understanding . . .").

21. By definition, financial markets are focused on the paper or other legal representation of claims against property and chattel. See WILLIAM F. SHARPE ET AL., *INVESTMENTS 2-3* (6th ed. 1999) (defining financial markets and securities). Microeconomics deals with relationships between decisionmaking units and the allocation of property and chattel. See WALTER NICHOLSON, *INTERMEDIATE MICROECONOMICS 3* (6th ed. 1994) (discussing the subject matter of microeconomics).

22. For example, Bradford Cornell's paper, *supra* note 18, is not cited in Chris Guthrie's paper, *supra* note 17.

23. AMRAM & KULATILAKA, *supra* note 8, at 70.

24. An example of this is given by Al Gore's decision to create uncertainty and litigate over the meaning of "legal vote" after the votes had been counted. See generally Mark Klock, *Is It "the Will of the People" or a Broken Arrow? Collective Preferences, Out-of-the-Money Options, Bush v. Gore, and Arguments for Quashing Post-Balloting Litigation Absent Specific Allegations of Fraud*, 57 U. MIAMI L. REV. 1, 3-4 (2002).

I. BACKGROUND

A. *The Theory of Option Pricing*

The theory of option pricing developed in the context of options on financial assets.²⁵ The fundamental insight used to develop the theory is the idea that assets that are not options can be packaged in a manner to create the exact equivalent of an option, guaranteed to provide the same payout in the future no matter what happens.²⁶ If financial markets are competitive, then the cost of an option must be identical to the cost of constructing the option equivalent.²⁷ This fundamental insight also suggests that many financial assets have embedded options.²⁸ A financial asset is just the representation of the legal right to receive prospective future benefits under contingencies.²⁹ Therefore, this insight should be generally applicable to legal rights. Several articles, such as Professor Roberta Romano's 1996 piece, provide an easy-to-read description of options.³⁰ For convenience, the basic features are summarized here. Options are classified as calls or puts.³¹ A call option conveys the right to purchase an asset at a fixed price, and a put conveys the right to sell.³² The fixed price is called the strike price—or the exercise price—as it is the price at which one exercises the option.³³ A call option is more valuable the lower the exercise price is and the higher the value of the underlying asset is, and the opposite relationships hold for a put.³⁴ If it would be completely foolish to exercise the option (e.g., using an option with a strike price of fifty dollars to obtain stock which is selling for forty-nine dollars), we say the option is out of the money.³⁵ Otherwise it is in the money or at the money.³⁶ Financial options always have expiration

25. See Black & Scholes, *supra* note 1, at 640 (“In deriving our formula for the value of an option in terms of the price of the stock, we will assume “ideal conditions” in the market for the stock and for the option . . .”).

26. Galai & Masulis, *supra* note 7, at 56. An interesting historical note is the fact that this Black & Scholes pathbreaking work which resulted in a Nobel Prize award was initially considered unimportant by economists. See Joshua S. Gans & George B. Shepherd, *How Are the Mighty Fallen: Rejected Classic Articles by Leading Economists*, J. ECON PERSP., Winter 1994, at 165, 173-74 (documenting failed efforts to get the contribution published until an eminent professor appealed to an editor on behalf of the authors).

27. Black & Scholes, *supra* note 1, at 637.

28. *Id.* at 650.

29. SHARPE ET AL., *supra* note 21, at 3.

30. See generally William J. Blanton, *Reducing the Value of Plaintiff's Litigation Option in Federal Court: Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 2 GEO. MASON L. REV. 159, 183 (1995); Cornell, *supra* note 18, at 175-76; Peter H. Huang, *A New Options Theory for Risk Multipliers of Attorney's Fees in Federal Civil Rights Litigation*, 73 N.Y.U. L. REV. 1943, 1951-52 (1998); Klock, *supra* note 24, at 5-6; Romano, *supra* note 3, at 40-46.

31. Jarrow, *supra* note 4, at 230.

32. *Id.* at 230-31.

33. *Id.* at 230.

34. ROSS ET AL., *supra* note 6, at 625.

35. JOHN C. HULL, *OPTIONS, FUTURES & OTHER DERIVATIVES* 154 (4th ed. 2000).

36. *Id.*

dates after which they must be exercised or abandoned.³⁷ The longer the time until expiration, the more valuable the option is.³⁸ Intuitively this should follow from the fact that more time to exercise provides more flexibility and a greater chance that events will cause an out of the money option to move into the money.

The fundamental value of an option derives from the fact that it puts the individual in a game of chance in which losses are truncated.³⁹ To understand this, consider a hypothetical call option on a stock currently selling for fifty dollars with a strike price of fifty dollars. To simplify the thinking, suppose the option was a gift from Grandma and expires in three months. If the stock price goes up, every dollar increase is worth a dollar in the recipient's pocket, because for fifty dollars, the option can be converted to stock which can be sold for fifty dollars plus the increase in the stock price. However, every dollar the stock price falls costs nothing. This is a valuable position to be in, and the options can be sold for an amount equal to the value of the position. Not only is it a valuable position, but it is also a position that increases in value as risk increases.⁴⁰ An increase in risk increases the probability of large movements.⁴¹ Large movements can be favorable or unfavorable. But since the losses associated with an unfavorable movement are truncated as risk increases, the option holder enjoys the potential for large rewards without incurring an offsetting potential for large losses.⁴²

There is one other critical point to understand about options that is overlooked in alternative economic models of law. This is that options *cannot* be valued merely by taking the expected payout and discounting it with a suitably chosen risk premium.⁴³ This is because discounting the expected payout implicitly assumes a constant level of risk over time, and the risk of an option necessarily changes over time.⁴⁴

B. Insights Obtained from Option Pricing Theory

The classic pedagogical example of an embedded option is common stock on a leveraged firm.⁴⁵ When the firm's debt matures, the stockholders

37. See ROSS ET AL., *supra* note 6, at 612 ("Options are special contractual arrangements giving the owner the right to buy or sell an asset at a fixed price anytime on or before a given date.").

38. *Id.* at 625.

39. Klock, *supra* note 24, at 6.

40. See Robert C. Merton, *On the Pricing of Corporate Debt: The Risk Structure of Interest Rates*, 29 J. FIN. 449, 455 (1974) (showing that the value of the option increases with the risk of the underlying asset).

41. Mark Klock, *Two Possible Responses to the Enron Experience: Will It Be Regulation of Fortune-Tellers or Rebirth of Secondary Liability?*, 28 J. CORP. L. 101, 127 (2002). Cf. Lynn A. Stout, *Why the Law Hates Speculators: Regulation and Private Ordering in the Market for OTC Derivatives*, 48 DUKE L.J. 701, 735 (1999) (noting that "[i]n economic parlance, 'risk' refers to probabilistic variation in wealth: chances of gains, as well as of losses").

42. Klock, *supra* note 24, at 6-7.

43. BREALEY & MYERS, *supra* note 2, at 591.

44. *Id.*

45. See ROSS ET AL., *supra* note 6, at 633-38 (teaching options using this example).

have the option of buying the firm for the face value of the debt or defaulting and letting the creditors have the firm's assets.⁴⁶ The equity is modeled as a call option on the firm's assets with an exercise price equal to the face value of the debt and an expiration date equal to the maturity date of the debt.⁴⁷ This simple analogy is widely understood,⁴⁸ but it leads to insights that were considered counterintuitive prior to the modern theory of options.⁴⁹ For example, individuals are generally believed to be predominantly risk averse, and therefore increasing risk will decrease value.⁵⁰ However, risk raises value for an option, especially when the option is right at the money (i.e., the value of the asset equals the value of the exercise price).⁵¹ Thus, the incentive of stockholders to firms in financial difficulty is to seek even riskier investments.⁵² A particularly illustrative example of this is documented in the case of Federal Express's founder Frederick Smith. When the company was near financial collapse early in its history, he took \$20,000 of corporate money to Las Vegas out of desperation and won enough gambling to keep the company afloat.⁵³ Although the outcome turned out successfully in this instance, the *a priori* expectation would have been losses on the investment. Even where firms are not distressed, leverage provides incentives to stockholders to make riskier investments than they would choose if the firm had no debt.⁵⁴

A different intuition derived from options is that putting off decisions can be valuable. It is readily shown that a call option on nondividend-paying stock is worth more alive and unexercised than exercised.⁵⁵ If one has an in-the-money call option and is convinced the stock price will fall tomorrow, the optimal strategy will be to sell the option rather than exercise it. Another way of explaining this is that an option puts one in a position in which it is better to wait for uncertainty to be resolved before using the option. This point will be particularly important for the analysis of litigation.

46. Black & Scholes, *supra* note 1, at 649.

47. *Id.*

48. See ROSS ET AL., *supra* note 6, at 645 (observing that common stock can be represented as an option in summarizing an introduction to options).

49. See Black & Scholes, *supra* note 1, at 649 (writing in 1973 that "[i]t is not generally realized that corporate liabilities other than warrants may be viewed as options").

50. Stout, *supra* note 41, at 735-36. Two well known finance professors write in their popular text:

In most financial settings, risk is a bad thing; you have to be paid to bear it For options it's the other way around . . . [O]ptions written on volatile assets are worth *more* than options written on safe assets. If you can understand and remember that one fact about options, you've come a long way.

BREALEY & MYERS, *supra* note 2, at 581.

51. See Klock, *supra* note 24, at 5-6 (explaining that uncertainty at the money has the greatest value).

52. ROSS ET AL., *supra* note 6, at 427 ("Firms near bankruptcy oftentimes takes [sic] great chances, because they believe that they are playing with someone else's money.")

53. *Id.* at 428.

54. See *id.* (providing numerical example).

55. TRIGEORGIS, *supra* note 9, at 93; Robert C. Merton, *Theory of Rational Option Pricing*, 4 BELL J. ECON. & MGMT. SCI. 141, 144 (1973) ("If the [stock pays no dividends], an American warrant will never be exercised prior to expiration . . .").

One especially good example of how insights from option theory have affected thinking in other areas can be seen in the literature on conglomerate mergers.⁵⁶ Firms merge for a variety of reasons.⁵⁷ Related firms producing the same products could seek to merge to gain power in the marketplace; these are known as horizontal mergers.⁵⁸ Related firms producing different products at different production points in the same industry could achieve more efficient operation by internalizing some operations; these are known as vertical mergers.⁵⁹ But economic theory struggled to find explanations for the merger of completely unrelated firms into conglomerates.⁶⁰ One explanation frequently put forward was that the idiosyncratic fluctuations in the cash flows generated by the firm would average out and be more stable in the conglomerate.⁶¹ The cash flows would coinsure each other, reduce risk, and increase the value of the firm.⁶² While scholars debated whether this income stabilization effect would have positive value or neutral value, it was not until the option pricing model of Black and Scholes was developed that it was understood that the coinsurance effect actually *lowers* stock value by reducing risk.⁶³ Although riskier cash flows are less valuable than safe cash flows, options on the cash flows are more valuable the greater the risk.⁶⁴ Since equity in a firm with significant outstanding debt is effectively a call option on the firm's assets with an exercise price equal to paying off the debt, risk can increase stock value. The reduction in risk brought about

56. See E. Han Kim & John J. McConnell, *Corporate Mergers and the Co-Insurance of Corporate Debt*, 32 J. FIN. 349, 349 (1977) (outlining the historical development of thought on the coinsurance of cash flows).

57. See Frank H. Easterbrook & Daniel R. Fischel, *The Proper Role of a Target's Management in Responding to a Tender Offer*, 94 HARV. L. REV. 1161, 1168 (1981) ("Commentators have proposed a bewildering number of explanations for mergers and takeovers.").

58. *E.g.*, *United States v. E.I. du Pont de Nemours & Co.*, 353 U.S. 586, 590 (1957) (explaining horizontal and vertical mergers).

59. *E.g.*, *id.*

60. Dennis C. Mueller, *A Theory of Conglomerate Mergers*, 83 Q. J. ECON. 643, 643 (1969).

Mergers have always been sort of an enigma in the theory of the firm. . . . Recent increases in merger activity seem to present a further challenge to traditional economic theory, since such a high percentage of these consolidations has been of the conglomerate variety . . .

. . . While . . . "synergistic" effects . . . are often said to be present in various merger situations, their existence in sufficient strength to warrant the high premiums paid for other firms, often appears implausible when the merger is between firms in seemingly unrelated or loosely related industries.

Id.

61. *Id.* at 652.

62. Wilbur G. Lewellen, *A Pure Financial Rationale for the Conglomerate Merger*, 26 J. FIN. 521, 522, 530 (1971).

63. Galai & Masulis, *supra* note 7, at 68. A newer theory has suggested that while conglomerate mergers might not directly benefit stockholders, they do provide a beneficial reduction of risk for the managers who are not easily able to diversify their income portfolio. Yakov Amihud & Baruch Lev, *Risk Reduction as a Managerial Motive for Conglomerate Mergers*, 12 BELL J. ECON. 605, 605-06 (1981).

64. BREALEY & MYERS, *supra* note 2, at 583 ("Always remember that an option written on a risky (high-variance) asset is worth more than an option on a safe asset. It's easy to forget, because in most other financial contexts increases in risk reduce present value.").

by a conglomerate makes outstanding debt more valuable, but the stockholders incur a loss equal to the value of the bondholders' gain.⁶⁵

C. Real Options

The foreword of a leading book on real options begins:

Flexibility has value. While this statement is obvious at the conceptual level, it is surprisingly subtle at the applied level. Professional managers have long intuited that both operating flexibility and strategic flexibility (that is, the option to alter a planned course of action in the future, given then-available information) are important elements in valuation and planning decisions.⁶⁶

Then, the field of real options is the application of option pricing theory to valuing the retention of flexibility in decisionmaking.⁶⁷ Other things equal, decisions that retain flexibility to alter them are more valuable than decisions that lock one into inflexibility.⁶⁸ As Professor Lenos Trigeorgis explains:

This book deals with the classical subject of resource allocation or project appraisal under uncertainty, particularly with the valuation of managerial operating flexibility and strategic interactions as corporate *real options*. Similar to options on financial securities, real options involve discretionary decisions or rights, with no obligation, to acquire or exchange an asset for a specified alternative price. The ability to value real options (e.g., to defer, expand, contract, abandon, switch use, or otherwise alter a capital investment) has brought a revolution to modern corporate resource allocation.

. . . In a constantly changing and uncertain world marketplace, managerial operating flexibility and strategic adaptability have become crucial to capitalizing successfully on favorable future investment opportunities and to limiting losses from adverse market developments or competitive moves. Corporate capabilities that enhance adaptability and strategic positioning provide the infrastruc-

65. ROSS ET AL., *supra* note 6, at 832-33.

66. Scott P. Mason, *Foreward* to LENOS TRIGEORGIS, *REAL OPTIONS*, at ix (1996).

67. See LENOS TRIGEORGIS, *REAL OPTIONS* 16 (1996) (outlining the development of the real options literature).

68. This is equivalent to the logical proposition that one cannot improve on the solution to an optimization problem by increasing the number of constraints. Constrained optimization is never superior to unconstrained optimization; at best, it can be equivalent if the constraint is not important. The effect of a constraint is to reduce the set of choices available to the decisionmaker, but it does not alter the decisionmaker's objective.

ture for the creation, preservation, and exercise of corporate real options.⁶⁹

Traditional valuation methods understate the value of projects because they ignore the value created by embedded options to limit losses under adverse circumstances.⁷⁰ A project might involve some outlays now and some at a future time. Conventional analysis assesses the riskiness of the cash flows and discounts accordingly.⁷¹ The possibility that some uncertainty could be resolved before additional outlays are made and that one could walk away and limit losses gets left out of the traditional analysis.⁷² The real options perspective to valuing projects and enterprises emphasizes the value that comes from the flexibility to change course.⁷³

A leading corporate finance text states:

There are two possible outcomes for virtually every business idea. On the one hand, the business may fail, in which case the managers will probably try to shut it down in the most cost-efficient way. On the other hand, the business may prosper, in which case the managers will try to expand. Thus, virtually every business has both the option to abandon and the option to expand. You may have read pundits claiming that the net-present-value approach to capital budgeting is wrong or incomplete. Although criticism of this type frequently irritates the finance establishment, the pundits definitely have a point. If virtually all projects have embedded options, only an approach such as [real options] can be appropriate. Ignoring the options is likely to lead to serious undervaluation.⁷⁴

Another often-emphasized source of value in the real options literature comes from the value in waiting until later to make a decision.⁷⁵ This has particularly high value when the uncertainty is high.⁷⁶ Recent graduates who have a large level of uncertainty about the location and salary of future employment may postpone home purchases until the uncertainty is resolved. One example of this type of value given in the business press involved a decision by Hewlett-Packard to change to a more expensive production process for their printers.⁷⁷ It was cheaper to customize the printers “for

69. *Id.* at xi.

70. AMRAM & KULATILAKA, *supra* note 8, at 25.

71. ROSS ET AL., *supra* note 6, at 642.

72. *See id.* at 644 (“This section points out a serious deficiency in classical capital budgeting; net-present-value calculations typically ignore the flexibility that real-world firms have.”).

73. *See* AMRAM & KULATILAKA, *supra* note 8, at 15 (illustrating the value of flexibility).

74. ROSS ET AL., *supra* note 6, at 658.

75. *See, e.g.*, AMRAM & KULATILAKA, *supra* note 8, at 18 (“Managers intuitively use options, such as when they delay completing an investment program until the results of a pilot project are known.”).

76. *Id.* at 24.

77. Peter Coy, *Exploiting Uncertainty*, BUS. WK., June 7, 1999, at 118.

foreign markets at the factory.”⁷⁸ But due to uncertainty, the company would find itself with too few German printers and too many French printers.⁷⁹ By changing to a more expensive production process, the company was able to delay the customization, which resulted in higher profits.⁸⁰

Other illustrative examples can be found outside the context of explicit discussions on real options. Economists Carl Shapiro and Hal Varian wrote a book about the information economy in which they emphasize the importance of maintaining the flexibility to inexpensively switch technologies.⁸¹ It might be better not to make massive irreversible investments in a technology until some uncertainty about the future of the technology has been resolved.⁸²

Many commentators, both in the business community and the legal community, have claimed that stock prices became irrationally high in the 1990s.⁸³ The subsequent decline is interpreted as a bursting of irrational exuberance under this view.⁸⁴ One of the serious alternative explanations involves recognition of the fact that much of the growth in value was in the information and technology sector.⁸⁵ These sectors are especially well-characterized as real options.⁸⁶ Under this view of the world, the market decline is a rational reaction to changed expectations about the future.⁸⁷

Research and development (R&D) expenditures are particularly transparent real options.⁸⁸ R&D expenditures never directly generate sufficient cash flow to make them valuable, unless one values the flexibility these

78. *Id.*

79. *Id.*

80. *Id.*

81. See generally CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES 105-11 (1999) (discussing the importance of retaining flexibility).

82. See, e.g., AMRAM & KULATILAKA, *supra* note 8, at 25 (“Irreversible investments often are managed by delaying a project until a significant amount of the uncertainty is resolved . . .”).

83. E.g., ROBERT J. SHILLER, IRRATIONAL EXUBERANCE 203 (2000).

84. See, e.g., Robert Prentice, *Whither Securities Regulation? Some Behavioral Observations Regarding Proposals for Its Future*, 51 DUKE L.J. 1397, 1411 (2002) (“At a macro-level, investor irrationality has, throughout history, helped cause speculative bubbles and panicky crashes.”).

85. See generally Robert E. Hall, *Struggling to Understand the Stock Market*, 91 AM. ECON. REV., May 2001, at 1-11 (Richard T. Ely Lecture given at the 2001 annual meeting of the American Economic Association). Professor Hall concludes:

It is illogical to condemn astronomical price/earnings ratios as plainly irrational without investigating the prospects for growth in future earnings. Streams of future cash growing at high rates are hugely valuable. Growth rates of cash earned by companies exploiting new technologies have been phenomenal. The stock-market values of these companies swing wildly. The pricing of new technology companies tries to avoid the error made in the case of Microsoft: a dollar invested in Microsoft stock in 1990 resulted in a claim of \$1.38 in after-tax earnings in 2000 alone. Obviously the market in 1990 guessed absurdly low about Microsoft's cash-flow growth.

Id. at 11.

86. See AMRAM & KULATILAKA, *supra* note 8, at 14 (arguing that the traditional valuation methods do not work “well for investment decisions in certain industries—such as high tech, pharmaceutical, and oil exploration—or for certain large investment decisions—such as information technology, research and development, and major capacity expansion”).

87. See Hall, *supra* note 85, at 2-3 (explaining that large changes in prices are not evidence of irrational predictions in a changing world).

88. AMRAM & KULATILAKA, *supra* note 8, at 69.

expenditures provide to make subsequent additional investments.⁸⁹ This same reasoning applies to Internet start-ups:

Internet start-ups are different from other “traditional” start-ups because of the large platform investments they require. The Internet is a young industry, still in search of profitable business models, with a rapidly evolving industry infrastructure. Internet start-ups are forced to continue making platform investments just to keep up. . . .

. . . .

. . . From the real options perspective, Internet start-ups are options on options on options on options to generate cash flow.⁹⁰

“If you [do not get] start[ed]” in the sequence, you are likely to be out of the game.⁹¹

The growth of the information technology sector has led to a great deal of activity that is characterized as rent-seeking.⁹² Rent-seeking involves the search for opportunities that are unusually profitable.⁹³ This can also be viewed as investing in real options, some of which will pay off with large rewards.⁹⁴

Shifting from business enterprises to households, one can still find many examples of options and the large value they generate. People who never go to the beach or national parks often assign very large values to the maintenance of such resources because they wish to preserve the *option* to go.⁹⁵ People purchase CDs of music they can listen to for free on the radio because they want the option to hear the music at their own convenience.⁹⁶ Consumers might purchase a product such as Microsoft Office even though

89. *Id.*

90. *Id.* at 70.

91. *Id.*

92. See Mark Klock, *Unconscionability and Price Discrimination*, 69 TENN. L. REV. 317, 370 (2002) (“Investments in innovation are often characterized as rent-seeking investments.”).

93. *Id.*

94. See AMRAM & KULATILAKA, *supra* note 8, at 168.

Using the real options approach to manage a portfolio of drugs causes more drugs to start the development process and more drugs to be abandoned, a result consistent with trends in industry practice. Also, realized returns to a successful drug will be quite high because they are the result of successfully executing options, while the returns across the drug portfolio should be significantly lower.

Id. (internal footnote omitted).

95. See Richard C. Bishop, *Option Value: An Exposition and Extension*, 58 LAND ECON. 1, 1-2 (1982). Cf. Richard A. Posner, *Rational Choice, Behavioral Economics, and the Law*, 50 STAN. L. REV. 1551, 1566 (1998) (“Surveys of attitudes toward national parks and other recreational public lands reveal dramatic endowment effects. Asked how much money they would demand to sell their rights to use such lands, people give much higher figures than when they are asked what they would offer to buy such rights.”)

96. SHAPIRO & VARIAN, *supra* note 81, at 87.

they do not use spreadsheets because they might use spreadsheets in the future.⁹⁷

There is an obvious corollary to the proposition that flexibility has value. The provision of flexibility can be costly. This is understood by firms that create value by locking in customers.⁹⁸ Once customers are locked in to a product, their flexibility is reduced and the company can extract monopoly rents.⁹⁹ But the amount of rents cannot exceed the costs of switching.¹⁰⁰ Locked-in customers can exercise their option to unlock once the option is in the money. In this context, that means once the costs of switching become less than the costs of staying, they will switch.¹⁰¹ Professors Shapiro and Varian explain in detail how many successful businesses have profited from this idea and many unsuccessful businesses have failed due to a failure to recognize the principle that flexibility is valuable and giving up flexibility can be costly.¹⁰² Those who can take flexibility away from customers can profit on the flexibility lost by the customers. It is also interesting to observe that the insights obtained from option theory are similar to those obtained out of Professor Coase's work. Coase's insight was that much behavior that is contrary to the predictions of the theoretical frictionless world of perfect markets can be explained by a desire to avoid large transaction costs.¹⁰³ The options perspective yields the insight that seemingly anomalous behavior might also be explained by a desire to retain flexibility and avoid lock-in.¹⁰⁴

II. OPTIONS IN LAW

A. Bankruptcy and Information Asymmetry

1. The Default Option

The fundamental attribute creating value in an option position is the presence of risk where losses are truncated and gains are not.¹⁰⁵ Risk is used in the statistical sense, meaning the presence of uncertainty.¹⁰⁶ The most

97. *Id.* at 76.

98. See Klock, *supra* note 92, at 363-64 (discussing customer lock-in).

99. See Benjamin Klein et al., *Vertical Integration, Appropriable Rents, and the Competitive Contracting Process*, 21 J.L. & ECON. 297, 299 (1978) ("Because of transaction and mobility costs, 'market power' will exist in many situations not commonly called monopolies.").

100. SHAPIRO & VARIAN, *supra* note 81, at 114.

101. *Id.* at 152.

102. *Id.* at 105-10.

103. Ronald H. Coase, *The Nature of the Firm: Influence*, 4 J.L. ECON. & ORG. 33, 34 (1988).

104. See Steven Walt, *Collective Inaction and Investment: The Political Economy of Delay in Bankruptcy Reform*, 49 EMORY L.J. 1211, 1234-36 (2000) (describing political inaction as a calculated decision to use the option to delay action until later).

105. See TRIGEORGIS, *supra* note 9, at 69-70 (explaining that the asymmetry of the option contract lies at the heart of its value).

106. See Stout, *supra* note 41, at 735 ("In economic parlance, 'risk' refers to probabilistic variation in wealth: chances of gains, as well as of losses.").

obvious example of a legal equivalent to a financial option is the option of a debtor to extinguish debts through bankruptcy.¹⁰⁷ Debtor (*D*) borrows \$1000 from Creditor (*C*). *D* intends to use the \$1000 to play roulette. If *D* wins, he returns the borrowed capital and keeps the winnings. If *D* loses, he defaults. This is equivalent to *D* creating a call option with *C* in the short position.

Bankruptcy is a particularly transparent example of how options work and how the law can adapt to minimize or exacerbate inefficiency. Debtors can have multiple options, each being the source of a potential deadweight loss or inefficiency. Economic inefficiency or deadweight social loss occurs when someone could be made better off without making anyone else worse off, or put another way, when the losses of one group exceed the gains of the rest.¹⁰⁸ The first option debtors have is the simple choice to default or pay. The second option is the right to litigate upon default. This latter option is similar to a poison pill that debtors can use to extort a ransom for the assets to which the creditors are entitled. It is discussed further in Part II.B.1. *infra*.

The inefficiency of the first option, the simple option to default, can be illustrated with the case of the gambling debtor with no assets other than borrowed money. Because the house takes a cut of the stakes, the expected value of the gamble is necessarily negative.¹⁰⁹ But since the gambling debtor has an option to effectively gamble with someone else's money, the gamble has a positive payoff for the individual.¹¹⁰ Indeed, the more risky the gamble, the greater the option value and the higher the expected gain is to the debtor gambler.¹¹¹ But the value to the gambler is necessarily less than the loss to the creditor because the house takes a cut.¹¹²

This example is admittedly contrived and fictional. In reality, this transaction would not take place since the rational lender would never lend funds to an individual with no assets knowing that the purpose of the loan was to gamble in a negative expected value game. But extreme examples illustrate basic principles.¹¹³ Markets for loans do exist because lawyers have devel-

107. See Jarrow, *supra* note 4, at 240-41 (explaining that the borrower has a call option).

108. Guido Calabresi, *The Pointlessness of Pareto: Carrying Coase Further*, 100 YALE L.J. 1211, 1215 (1991).

109. Lynn A. Stout, *Are Stock Markets Costly Casinos? Disagreement, Market Failure, and Securities Regulation*, 81 VA. L. REV. 611, 622-23 (1995) (“[T]he ‘house cut’ ensures that gamblers on average exit casinos poorer than when they entered.”).

110. See BREALEY & MYERS, *supra* note 2, at 504 (providing a numerical example in which “the owner is essentially betting with the bondholder’s money.”).

111. See ROSS ET AL., *supra* note 6, at 428 (explaining how debtors expropriate value from creditors by taking more risks).

112. See Stout, *supra* note 109, at 622 (“Zero-sum games that involve playing costs become negative-sum games in which the average player loses money.”).

113. See Oliver Williamson, *The Theory of the Firm as Governance Structure: From Choice to Contract*, J. ECON. PERSP., Summer 2002, at 171, 182 n.7 (“[T]he main purpose of an anecdote is pedagogical, to provide intuition. . . . [A]n anecdote that helps to bring an abstract condition to life has served its intended purpose.”).

oped efficient covenants,¹¹⁴ and courts have developed fiduciary principles to mitigate the deadweight loss created by the default option.¹¹⁵

In a theoretical world of perfect markets, the existence of the default option in and of itself should not result in allocational problems generally.¹¹⁶ The options have a value, and the value can be priced.¹¹⁷ If markets are complete,¹¹⁸ individuals can offset or take positions on their own and the Modigliani and Miller theorems would apply.¹¹⁹ These theorems demonstrate conditions under which financial decisions are irrelevant to the valuation of assets (and hence the allocation of resources).¹²⁰

2. Information Asymmetry

The real world is not as simple as the theoretical world of perfect markets, and for the analysis of options embedded in law, the difference is particularly important. Information is not equally available.¹²¹ Information has some unique properties.¹²² “Information is the quintessential lumpy

114. See Clifford W. Smith & Jerold B. Warner, *On Financial Contracting: An Analysis of Bond Covenants*, 7 J. FIN. ECON. 117, 152-53 (1979) (finding that bond covenants are generally standardized and efficient).

115. See *Pittsburgh Terminal Corp. v. Baltimore & Ohio R.R. Co.*, 680 F.2d 933, 941 (3d Cir. 1982) (stating that the court “would be very much surprised if Maryland or any other state would today hold that no such [fiduciary] obligations were owed [to bondholders] by an issuer of such securities and its directors”), *cert. denied*, 459 U.S. 1056 (1982); *Broad v. Rockwell Int’l Corp.*, 642 F.2d 929, 958-59 (5th Cir. 1981) (indenture creates fiduciary duty to assure terms of indenture are met), *cert. denied*, 454 U.S. 965 (1981); *Gardner & Florence Call Cowles Found. v. Empire Inc.*, 589 F. Supp. 669, 673-74 (S.D.N.Y. 1984) (fiduciary duty in debenture contract, while not existing in abstract, may be derived from indenture), *vacated on other grounds*, 754 F.2d 478 (2d Cir. 1985); *Green v. Hamilton Int’l Corp.*, 437 F. Supp. 723, 729 n.4 (S.D.N.Y. 1977) (suggesting that fiduciary duty could be owed to convertible debenture holders by directors and controlling stockholders); *Fox v. MGM Grand Hotels, Inc.*, 137 Cal. App. 3d 524, 527, 187 Cal. Rptr. 141, 143 (1982) (observing a fiduciary duty not to deliberately prejudice creditors); see also *Clarkson Co. Ltd. v. Shaheen*, 660 F.2d 506, 512 (2d Cir. 1981) (emphasizing New York policy to preserve assets of insolvent corporation for the creditors), *cert. denied*, 455 U.S. 990 (1982); cf. *Van Gemert v. Boeing Co.*, 520 F.2d 1373, 1385 (2d Cir. 1975) (stating courts will protect debenture holders’ expectation of being provided with reasonable notice of conversion rights), *cert. denied*, 423 U.S. 947 (1975). But see Lawrence E. Mitchell, *The Fairness Rights of Corporate Bondholders*, 65 N.Y.U. L. REV. 1165, 1166 (1990) (arguing that courts have largely denied fiduciary protection to creditors).

116. See Joseph E. Stiglitz, *Some Aspects of the Pure Theory of Corporate Finance: Bankruptcies and Take-Overs*, 3 BELL J. ECON. & MGMT. SCI. 458, 463 (1972) (explaining the conditions under which bankruptcy does not affect total firm value).

117. See Jarrow, *supra* note 4, at 243 (observing the use of option valuation models in the pricing of corporate debt).

118. *Id.* at 237 (“A complete market is one where synthetic construction of any security or derivative is possible.”).

119. See generally Franco Modigliani & Merton H. Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment*, 48 AM. ECON. REV. 261, 261-97 (1958) (developing theorems under which corporate financial decisions are irrelevant because individuals can costlessly replicate or undo them).

120. Merton H. Miller, *The Modigliani Miller Propositions After Thirty Years*, J. ECON. PERSP., Fall 1988, at 99, 99-100.

121. See George A. Akerlof, Behavioral Macroeconomics and Macroeconomic Behavior, Nobel Prize Acceptance Speech (Dec. 8, 2001), in 92 AM. ECON. REV. 411, 413 (2002) (stating that informational problems caused by asymmetry are present to varying degrees in all markets).

122. See SHAPIRO & VARIAN, *supra* note 81, at 3 (“The cost structure of an information supplier is rather unusual.”).

good.”¹²³ It is cheap to copy and costly to create.¹²⁴ To see some ways in which information is different, consider that information, once given, cannot be returned.¹²⁵ This means that the quality of information cannot be readily sampled or assessed until after it has been purchased and used.¹²⁶ This results in some interesting complications. Traditional Chicago-School microeconomic models are not transferable to markets in information without modification.¹²⁷ Professors Akerlof, Spence, and Stiglitz received the 2002 Nobel Prize in Economic Science for their pioneering work on the theory of information economics.¹²⁸ In his acceptance speech, Professor Stiglitz wrote, “[O]ne of the key issues in information economics [is] the difficulty of *appropriating* the returns to creating information.”¹²⁹ This difficulty arises from the option nature inherent in information in which options are lost the moment information is revealed.¹³⁰ Thus, we have patent protection to protect the property rights in the development of information.¹³¹ However, patent protection is ineffective for many types of information.¹³²

To see how information is important in the bankruptcy case, consider first a theoretical world in which all people are identical and conscientious.¹³³ Assume a fixed probability of defaulting on a loan. The option to default can then be priced, and the expected cost would be incorporated into the price of the loan.¹³⁴ Everyone pays for the cost of the option, but intuitively this should seem fair because everyone is equally likely to default. Now consider a complication moving slightly towards reality, in which there are two different types of people—conscientious people and exploitive people. There are a substantial number of people who are exploitive, and they have a substantially higher probability of defaulting. Each person

123. Pamela Megna & Dennis C. Mueller, *Profit Rates and Intangible Capital*, 73 REV. ECON. & STAT. 632, 633 (1991).

124. SHAPIRO & VARIAN, *supra* note 81, at 3.

125. *Id.* at 5.

126. *Id.*

127. See Joseph E. Stiglitz, Information and the Change in the Paradigm in Economics, Nobel Prize Acceptance Speech (Dec. 8, 2001), in 92 AM. ECON. REV. 460, 462 (2002).

128. Louis Uchitelle, *3 Americans Awarded Nobel for Economics*, N.Y. TIMES, Oct. 11, 2001, at C1.

129. Stiglitz, *supra* note 127, at 463. Cf. Chairman Alan Greenspan, Regulation, Innovation, and Wealth Creation, Remarks Before the Society of Business Economists (Sept. 25, 2002), available at <http://www.federalreserve.gov/boarddocs/speeches/2002/200209252/default.htm> (explaining that forced disclosure of information can eliminate valuable innovations).

130. The option attributes of information are that one can choose to disclose or not and will only disclose if valuable to do so, but once disclosed, the exercise of the option cannot be reversed.

131. U.S. CONST. art. I, § 8, cl. 8.

132. See Kimberly D. Krawiec, *Fairness, Efficiency, and Insider Trading: Deconstructing the Coin of the Realm in the Information Age*, 95 NW. U.L. REV. 443, 488-89 (2001) (outlining some reasons why patent protection will not necessarily result in efficiency).

133. This hypothetical is very similar to the analysis of the used car market given by Professor Akerlof. George A. Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q.J. ECON. 488, 488-89 (1970). See also Michelle J. White, *Why It Pays to File for Bankruptcy: A Critical Look at the Incentives Under U.S. Personal Bankruptcy Law and a Proposal for Change*, 65 U. CHI. L. REV. 685, 693-96 (1998) (giving a similar hypothetical).

134. See SHARPE ET AL., *supra* note 21, at 395-401 (explaining that bonds with some possibility of default are priced to provide a default premium which increases with default risk).

knows she has information about which type of person she is. Exploitive people do not have any incentive to give this information out, and conscientious people have no credible method of conveying that information, since obviously no one admits to being exploitive.¹³⁵ Creditors cannot stay in the credit business over the long run if they earn negative profits.¹³⁶ They can only break even if they can charge an average price that covers their average costs.¹³⁷ If they cannot distinguish the exploitive people from the conscientious people, they must charge everyone a price that will ensure that their average costs are covered.¹³⁸ This should seem intuitively unfair because the conscientious people now have to pay costs attributable to the exploitive group. Additionally, this creates an adverse selection problem in which the exploitive people drive out the conscientious people and ultimately leads to a failure of the credit market.¹³⁹

This informational asymmetry has many parallels. It is difficult to get full value for used cars because the mere offering of a used car suggests the car is a lemon.¹⁴⁰ Seasoned equity issues¹⁴¹ convey a signal that the stock is overpriced.¹⁴² Applying for an unsecured loan signals a high probability for default.¹⁴³

The default option does not, in and of itself, create inefficiency. Inefficiency is introduced if either there are real costs associated with default¹⁴⁴ or if there is informational asymmetry leading to an adverse selection problem.¹⁴⁵ This latter situation can be characterized as exploitive use of the option. Recent empirical research suggests that personal bankruptcies are indeed driven by opportunism.¹⁴⁶

135. See Akerlof, *supra* note 133, at 495 (describing how dishonest deals can drive out honest deals). Cf. Stewart C. Myers & Nicholas S. Majluf, *Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have*, 13 J. FIN. ECON. 187, 195 (1984) ("The firm cannot convey [good] information by saying: 'We have great prospects, but we can't tell you the details.' In our model, the firm always has the incentive to do this, so such statements carry no information.").

136. See JOSEPH E. STIGLITZ, *PRINCIPLES OF MICROECONOMICS* 288 (2d ed. 1997) (explaining that firms will exit if price does not cover average costs).

137. See *id.*

138. See Akerlof, *supra* note 133, at 492-94 (explaining the adverse selection problem inherent in insurance when more healthy and less healthy people cannot be distinguished).

139. See Stiglitz, *supra* note 127, at 461-62 ("It is because lenders do not know the default probabilities of borrowers perfectly that this process of adverse selection has such important consequences [leading to inefficiency].").

140. Akerlof, *supra* note 133, at 489.

141. See Ivo Welch, *Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings*, 44 J. FIN. 427, 445 (1989) (explaining that a seasoned equity offering is an offering by a public corporation beyond the initial public offering).

142. Myers & Majluf, *supra* note 135, at 203.

143. See John R. Lott, Jr., *A Transaction-Costs Explanation For Why the Poor Are More Likely to Commit Crime*, 19 J. LEGAL STUD. 243, 244 (1990) (explaining why credit markets can fail without adequate collateral).

144. See Mark Klock, *On the Simultaneity of Real and Financial Policies*, 39 J. ECON. & BUS. 45, 46 n.6 (1987) (stating that economic model relating corporate financial decisions to real decisions is driven entirely by imperfections in the market for assets of insolvent firms).

145. See Stiglitz, *supra* note 127, at 468 ("Under the imperfect information paradigm, markets are almost never Pareto efficient.").

146. Scott Fay et al., *The Household Bankruptcy Decision*, 92 AM. ECON. REV. 706, 706 (2002).

This analysis is potentially capable of explaining a range of phenomena, such as why people do not save more.¹⁴⁷ Savers are exploited because society often requires those who can afford to pay to provide for those who cannot. Those who consume more than they have can appeal for help with an expectation of getting some. Those who consume less than they could necessarily must pay for the benefits given to others. Savers convey an option to be taxed and exploited. There are strong disincentives to saving created by the tendency to label those with wealth as prosperous, lucky, and exploitive rather than hardworking and frugal. Those without wealth are considered exploited and needy rather than voracious consumers.

The point of this analysis is to show that options can exacerbate problems in some scenarios. Indeed, Professor Huang demonstrated that the addition of new derivative securities can make markets less efficient under conditions of incomplete markets, which was contrary to conventional wisdom.¹⁴⁸ Professor Huang's analysis is applicable to the option to extinguish debts through bankruptcy. In other words, this option can lead to Pareto inferior allocations.¹⁴⁹

At this point, one can easily imagine two assaults on this line of inquiry. One assault would be by those who argue Pareto efficiency is a poor standard for evaluating policy.¹⁵⁰ The defense of Pareto efficiency is simple.¹⁵¹ More is better than less, and any alternative standard is entirely arbitrary.¹⁵² The intuition underlying this idea is simple. Alternative standards to efficiency are necessarily multidimensional and require an arbitrarily chosen weighting scheme. As an illustration, take the standard of fairness. A basic principle of fairness could be to treat equals equally and unequals unequally. The tension in this principle is immediately apparent. People have multidimensional attributes, and any system of classifying equals and unequals is necessarily arbitrary.

The second line of attack might come from those who argue that bankruptcy laws should protect the debtors.¹⁵³ There has been a tremendous

147. Professor Akerlof's Nobel Prize acceptance speech states, "It is common wisdom that people save too little." Akerlof, *supra* note 121, at 422. He observes that the strongest evidence of undersaving is a dramatic decline in consumption at retirement. *Id.* at 424.

148. Peter H. Huang, *A Normative Analysis of New Financially Engineered Derivatives*, 73 S. CAL. L. REV. 471, 473-74 (2000).

149. See Stiglitz, *supra* note 127, at 468 ("[Due to imperfect information,] markets are almost never Pareto efficient.").

150. See, e.g., Calabresi, *supra* note 108, at 1216 (arguing that Pareto efficiency does not provide a meaningful basis for policy changes).

151. See STIGLITZ, *supra* note 136, at 320, 325 (explaining the benefit of Pareto efficiency).

152. See Mark Klock, *Are Flamboyance and Waste Really Virtues? Use and Abuse of Economics*, 71 U. CIN. L. REV. 181 (2002) ("Policy is inherently contentious. Efficiency should not be."); see also Klock, *supra* note 41, at 95 (explaining that risk is a multidimensional concept and its measurement is inherently arbitrary). Cf. Lee Epstein & Gary King, *The Rules of Inference*, 69 U. CHI. L. REV. 1, 81 (2002) (explaining that any single measurement of a multidimensional object necessarily involves distortion).

153. See, e.g., Susan Block-Lieb, *The Logic and Limits of Contract Bankruptcy*, 2001 U. ILL. L. REV. 503, 519 (describing the debate about whether bankruptcy proceedings should maximize creditor welfare or the collective welfare of all and concluding that creditor welfare is a too narrow perspective).

amount of recent commentary along these lines in response to proposed and pending bankruptcy reform legislation.¹⁵⁴ The difficulty with the analysis suggesting that bankruptcy should benefit debtors is that it is based on a static partial equilibrium model.¹⁵⁵ Just as usury and unconscionability are doctrines conceived to protect the disadvantaged, they effectively injure them.¹⁵⁶ The flaw in the scheme is ignoring the forward-looking rational response of creditors.¹⁵⁷ Legislation that is designed to benefit debtors at the expense of creditors will make credit more expensive and less accessible.¹⁵⁸ Rational people will resist efforts to compel them to give valuable options to exploiters.

But the primary defense of my analysis of bankruptcy as a derivative security in an incomplete market is that I am not arguing that bankruptcy should be prohibited. I am only arguing that the option perspective should

154. For a small sampling of such commentary, see Lucian A. Bebchuk & Jesse M. Fried, *The Un-easy Case for the Priority of Secured Claims in Bankruptcy*, 105 YALE L.J. 857, 934 (1996) (proposing changes in the treatment of secured creditors under bankruptcy law); F.H. Buckley, Book Review, 87 CORNELL L. REV. 1078, 1078 (2002) (reviewing TERESA A. SULLIVAN ET AL., *THE DEBTOR AS VICTIM*) (discussing bankruptcy reform bills); Rocco I. Debitetto, *Bankruptcy Reform in Light of Increased Consumer Filings: Means-Testing Employed to Prevent Long-Run Economic Impacts on Consumers and to Cure Debtor Abuse Under the Current Bankruptcy Code*, 69 U. CIN. L. REV. 641, 667-69 (2001) (summarizing recent legislative attempts to address a bankruptcy crisis); Julia Patterson Forrester, *Bankruptcy Takings*, 51 FLA. L. REV. 851, 862-63 (1999) (discussing some specific proposed changes to bankruptcy law); Steven L. Schwarcz, *The Easy Case for the Priority of Secured Claims in Bankruptcy*, 47 DUKE L.J. 425, 428-30 (1997) (criticizing a proposal to change bankruptcy statutes); Hung-Jen Wang & Michelle J. White, *An Optimal Personal Bankruptcy Procedure and Proposed Reforms*, 29 J. LEGAL STUD. 255, 255-59 (2000) (summarizing legislative and academic proposals for bankruptcy law reform); Michelle J. White, *Why It Pays to File for Bankruptcy: A Critical Look at the Incentives Under U.S. Personal Bankruptcy Law and a Proposal for Change*, 65 U. CHI. L. REV. 685, 686-87 (1998) (proposing bankruptcy reform).

155. Logically, using bankruptcy law to improve the lot of debtors can only work if creditors do not alter their behavior in response. Cf. KARL E. CASE & RAY C. FAIR, *PRINCIPLES OF MICROECONOMICS* 275 (5th ed. 1999). The authors write:

A general equilibrium exists when all markets in an economy are in simultaneous equilibrium. An event that disturbs the equilibrium in one market may disturb the equilibrium in many other markets as well. The ultimate impact of the event depends on the way *all* markets adjust to it. Thus, partial equilibrium analysis, which looks at adjustments in one isolated market, may be misleading.

Id.

156. See Cass R. Sunstein, *Paradoxes of the Regulatory State*, 57 U. CHI. L. REV. 407, 422 (1990) (“[T]he market will frequently adjust to the imposition of regulation in a way that will harm the least well-off.”).

157. See Klock, *supra* note 92, at 344-45 (“[I]t is by no means obvious that allowing courts to modify unconscionable contracts promotes the interests of those being ‘protected.’ This is due in part to the well-known fact that if courts are inclined to modify certain contracts *ex post*, the contracts will cease to be available *ex ante*.”) (internal footnote omitted).

158. See Alan Schwartz, *A Reexamination of Nonsubstantive Unconscionability*, 63 VA. L. REV. 1053, 1062-63 (1977).

In sum, when a contract clause is prohibited because a poor buyer finds it difficult to purchase a more favorable provision, the court or legislature prohibiting the clause produces a nonoptimal result. The prohibition creates a situation in which some buyers regard themselves as worse off than before the ban and no buyers regard themselves as better off. Even when the welfare of nonpurchasers is considered, the utility calculus suggests that prohibiting a contract clause will yield a nonoptimal outcome. That outcome, moreover, is distributionally objectionable. Thus, a buyer’s poverty militates in favor of, rather than against, enforcing an agreement.

Id.

be applied in order to gain greater understanding of the effects of particular policy choices. An understanding of how options create value and where they are embedded can lead to improvements in policy. An obvious example of an area for potential policy improvement using option theory would be legal reform of bankruptcy.¹⁵⁹

The reason bankruptcy must be considered in the context of incomplete markets is that information economics teaches us that real world markets are necessarily incomplete.¹⁶⁰ The personal credit market is highlighted as a particularly poignant example of markets failing to allocate resources efficiently due to incomplete information.¹⁶¹ What Professor Huang's work then demonstrates is that inefficiencies, which exist in the credit market, can be made even more inefficient by the bankruptcy option.¹⁶²

3. *Distinctions Between Corporate and Personal Bankruptcy*

In the option theory framework, there is no difference between the decisions of households and corporations to exercise the bankruptcy option. But as a practical matter, there are many differences. Stockholders of levered firms actually own a call option on the corporate assets written by the bondholders.¹⁶³ On a simplified level, the analogy of the relation between stocks and bonds to that between *D* and *C* is perfect. But in reality there is an important distinction. Financial claims against publicly reporting companies trade in sophisticated, organized markets.¹⁶⁴ There are economies of scale in collective action.¹⁶⁵ Bondholders as a group can efficiently reduce the value of the option to extinguish debt.¹⁶⁶ Practicing lawyers have developed efficient boilerplate covenants designed to prevent exploitation of the option to default.¹⁶⁷ The law of secured transactions is a powerful tool to prevent exploitation.¹⁶⁸ Pledging quality collateral has the effect of credibly giving up

159. See generally White, *supra* note 154, at 685-732 (explaining policy changes that could improve the performance of bankruptcy laws by altering exemption amounts).

160. Stiglitz, *supra* note 116, at 468.

161. See Akerlof, *supra* note 121, at 413 ("The failure of credit markets [resulting from imperfect information] is one of the major reasons for underdevelopment.")

162. See Huang, *supra* note 14, at 481 ("[W]hat might be a surprising result is that usually new derivatives have indeterminate welfare consequences for households. In other words, new derivatives can make all households worse off or better off, or some households worse off and others better off.") (emphasis added).

163. See Black & Scholes, *supra* note 1, at 649.

164. See Bernard Black, *The Legal and Institutional Preconditions for Strong Securities Markets*, 48 UCLA L. REV. 781, 788-89 (2001) (describing U.S. securities markets as strong but complex).

165. Jonathan R. Macey & Geoffrey P. Miller, *The Plaintiffs' Attorney's Role in Class Action and Derivative Litigation: Economic Analysis and Recommendations for Reform*, 58 U. CHI. L. REV. 1, 8-9 (1991).

166. Clifford W. Smith, Jr. & Jerold B. Warner, *Bankruptcy, Secured Debt, and Optimal Capital Structure: Comment*, 34 J. FIN. 247, 250 (1979).

167. See Smith & Warner, *supra* note 114, at 152-53 (finding that bond covenants are standardized, efficient, and operate to ensure that shareholders maximize firm value).

168. See Claire A. Hill, *Is Secured Debt Efficient?*, 80 TEX L. REV. 1117, 1118 (2002) (finding that secured debt is used efficiently, particularly by low quality firms, and concluding that "[s]ecured debt is apparently the best means available to constrain firms that lenders believe to be in greater need of con-

the option to default or exploit a lender and leads to lower cost loans.¹⁶⁹ Even common law doctrine has developed to prevent exploitation of the option to default by establishing fiduciary duties to corporate creditors.¹⁷⁰

Secured consumer debt also trades in liquid markets,¹⁷¹ particularly the home mortgage market.¹⁷² But the personal credit market is not as developed and not as efficient at preventing exploitation of the option to default. New empirical research indicates both that personal bankruptcy has grown dramatically¹⁷³ and that the growth is attributable to strategic exercise of a more valuable option rather than a forced response to adverse events.¹⁷⁴ It is hardly surprising that there has been much controversy and commentary about bankruptcy reform.¹⁷⁵ The stakes are enormous.¹⁷⁶

B. Litigation

1. Litigation in Bankruptcy

Having discussed default as an option, it is interesting to consider the option to litigate in default. The option to litigate in default is only relevant for a debtor with some assets. It is easy to see how deadweight loss can occur. When a company with no prospect of being able to repay its creditors seeks bankruptcy protection, it puts itself into a position to further lower the value of its remaining assets by driving away loyal customers and suppliers.¹⁷⁷ Since the equityholders have nothing to lose, they can effectively erode the value of the firm and extract a ransom from the creditors for release of the firm through a settlement.

A brief summary of a component of finance theory is appropriate and helpful in understanding the significance of the option to litigate in bank-

straint, but is less clearly superior to other means of lowering aggregate financing costs for firms in lesser need of constraint. In other words, secured debt is apparently much better at reducing agency costs than it is at reducing transaction costs.”).

169. Smith & Warner, *supra* note 166, at 250.

170. See sources cited *supra* note 115.

171. See MARK GRINBLATT & SHERIDAN TITMAN, FINANCIAL MARKETS AND CORPORATE STRATEGY 25 (1998) (“[Securitization] has also launched a whole new market in asset-backed securities. Firms can now sell assets, like their accounts receivable, that were previously costly or impossible to sell.”).

172. *Id.*

173. Fay et al., *supra* note 146, at 706 (“Personal bankruptcy filings have risen from 0.3 percent of households per year in 1984 to around 1.35 percent in 1998 and 1999, transforming bankruptcy from a rare occurrence to a routine event.”).

174. *Id.* (“We find support for the strategic model of bankruptcy, which predicts that households are more likely to file when their financial benefit from filing is higher. . . . We find little support for the nonstrategic model of bankruptcy which predicts that households file when adverse events occur which reduce their ability to repay.”).

175. See sources cited *supra* note 154.

176. Fay et al., *supra* note 146, at 706 (“Lenders lost about \$39 billion in 1998 due to personal bankruptcy filings.”) (internal footnote omitted).

177. See David M. Cutler & Lawrence H. Summers, *The Costs of Conflict Resolution and Financial Distress: Evidence from the Texaco-Pennzoil Litigation*, 19 RAND J. ECON. 157, 167-68 (1988) (describing interruptions to Texaco's business during bankruptcy litigation).

ruptcy. Professor Franco Modigliani and the late Professor Merton Miller are well known for having developed several separation theorems in finance.¹⁷⁸ These separation theorems demonstrate conditions under which financial decisions may be separated from other decisions because there will be no interaction between them.¹⁷⁹ The one which is probably best known demonstrates that a set of conditions exist under which the capital structure—choice of debt and equity mix—is irrelevant to the valuation of the firm.¹⁸⁰ The analogy used by Professor Miller in explaining the theorem to journalists is basically that whole pizzas are worth the same as sliced pizzas because people can slice it themselves or consume the entire sliced pizza as they prefer.¹⁸¹ Their theorem is widely mistakenly cited as demonstrating that capital structure is irrelevant.¹⁸² In fact, what they intended was to provide insight about what is important by showing what is not.¹⁸³

There are two insights that have evolved from their line of inquiry which are significant for this analysis. One is that capital structure is irrelevant only if everyone has equal information.¹⁸⁴ Of course, this is never the case since a debtor always knows more about himself than a creditor. It is not uncertainty but rather the presence of asymmetric information that creates trouble for the separation theorem.¹⁸⁵ The other important insight is that the possibility of bankruptcy is not important unless there are deadweight costs associated with the bankruptcy process.¹⁸⁶ If the creditor can simply take possession of the assets in the event that the debtor exercises the option to default, there is no loss of efficiency, even though the assets are insufficient to cover the obligation.¹⁸⁷ If, however, it is costly for the creditor to take possession, there is an efficiency loss.¹⁸⁸ Direct costs associated with bankruptcy are legal fees.¹⁸⁹ These turn out to be relatively small in some cases.¹⁹⁰ The larger costs of bankruptcy are seen in what is widely termed indirect costs associated with financial distress.¹⁹¹ These are costs associated with the fact that valuable assets that depreciate over time are underutilized during the litigation process.¹⁹²

178. Miller, *supra* note 120, at 99.

179. See Joseph E. Stiglitz, *A Re-Examination of the Modigliani-Miller Theorem*, 59 AM. ECON. REV. 784, 784 (1969).

180. Miller, *supra* note 120, at 99.

181. See ROSS ET AL., *supra* note 6, at 406 (reporting on Professor Miller's recollection of his explanation to the news media).

182. See Miller, *supra* note 120, at 100.

183. See *id.*

184. See Myers & Majluf, *supra* note 135, at 203 (explaining that without information asymmetry about assets-in-place, financing decisions do not affect investment decisions).

185. See *id.*

186. Stiglitz, *supra* note 116, at 463.

187. See Jerold B. Warner, *Bankruptcy Costs: Some Evidence*, 32 J. FIN. 337, 337 (1977).

188. See *id.*

189. *Id.* at 338.

190. See *id.* at 337 (reporting costs at one percent of firm value in railroad bankruptcies).

191. Edward I. Altman, *A Further Empirical Investigation of the Bankruptcy Cost Question*, 39 J. FIN. 1067, 1071-72 (1984).

192. *Id.*

The option to litigate enables the debtor to waste assets at no cost.¹⁹³ This creates a situation in which the shareholders of a bankrupt firm can hold the assets hostage for a ransom equal to the amount of value they are capable of destroying during litigation.¹⁹⁴ It is well understood that this creates economic inefficiency.¹⁹⁵ The ability of secured creditors to bypass much of the potential for ransom makes secured transactions more efficient,¹⁹⁶ even though some commentators have argued vehemently against permitting secured creditors to have priority over unsecured creditors.¹⁹⁷ Such changes would be contrary to their objective because they would increase economic inefficiency and have distributional consequences that are not contemplated by the advocates of such reform.¹⁹⁸ The options perspective facilitates visualization of these ideas.

The significance of this discussion to the idea of options in law is that it is not the option that creates difficulty; instead, it is the exploitive exercise that creates trouble. There is nothing problematic about shareholders borrowing money in an uncertain environment and walking away from a factory that proves to be worth less than the debt.¹⁹⁹ The creditors would have contemplated this when making the loan and charged accordingly.²⁰⁰ There are economic efficiency problems in two special cases though. First, there are problems if the shareholders, upon realization that they should exercise their option to default, also take the factory hostage and hold it for ransom.²⁰¹ The other situation occurs if the shareholders exploited the creditors with superior information.²⁰² An alternative illustration would be a household taking a mortgage on a house and defaulting due to a decline in real estate values. This is not problematic because the lender knowingly bears this risk. If the household were to occupy the house and trash it in an effort to extract payment, it would be an example of an exploitive exercise of an

193. Allan C. Eberhart et al., *Security Pricing and Deviations from the Absolute Priority Rule in Bankruptcy Proceedings*, 45 J. FIN. 1457, 1466 (1990).

194. See Julian R. Franks & Walter N. Torous, *An Empirical Investigation of U.S. Firms in Reorganization*, 44 J. FIN. 747, 752 (1989) (explaining how threats to use legal process can extract payments from senior creditors to others).

195. See Michelle J. White, *The Corporate Bankruptcy Decision*, J. ECON. PERSP., Spring 1989, at 129, 130 (concluding that deadweight social costs are the inevitable consequence of a bankruptcy procedure).

196. See Smith & Warner, *supra* note 166, at 250.

197. See, e.g., Lynn M. LoPucki, *The Unsecured Creditor's Bargain*, 80 VA. L. REV. 1887, 1916 (1994) (criticizing the institution of security as unjustifiably redistributing wealth from unsecured creditors to secured creditors).

198. See Sunstein, *supra* note 156, at 423 ("[R]edistributive regulation will have complex distributive consequences, and the group particularly disadvantaged by the regulation will typically consist of those who are already most disadvantaged. Efforts to redistribute resources through regulation will therefore have a serious perverse result.").

199. See ROSS ET AL., *supra* note 6, at 424 (explaining that there is no negative effect on firm value if none of the assets is lost in the transaction).

200. See *id.*

201. This is just an exaggerated example of bankruptcy costs. See *id.* (concluding that it is not the risk of bankruptcy, but instead is the cost associated with bankruptcy that negatively affects value).

202. This is just another way of presenting a hypothetical in which shareholders commit fraud on the lenders.

option. Alternatively, if the household were to obtain an excessive appraisal of the value of the house to pay a high price to a friend in a less-than-arm's-length transaction and obtain the mortgage with the intent to default, there would again be an example of an exploitive exercise of an option.

2. *Litigation Generally*

Options theory provides some important insights into models of litigation.²⁰³ Although other commentators have observed that litigation can be modeled as a series of staged investments in options,²⁰⁴ the option model is still frequently overlooked in articles explaining litigation and the failure to settle.²⁰⁵ This is a puzzle because I will attempt to show that complex litigation can only be modeled using an option approach. I believe that this is particularly important because empirical research in law is on the rise,²⁰⁶ and one of the interesting empirical questions that has been addressed is what determines settlement versus trial.²⁰⁷ Empirical research can only provide meaningful inferences when a well-structured theory provides the framework for the investigation.²⁰⁸ Therefore, we need to establish a strong theory of litigation.

The traditional economic model of litigation is based on rational agents assessing the expected payout and expected costs and making a decision based on maximization of expected value.²⁰⁹ The principle drawback of such a model is that it does not explain why all cases do not settle.²¹⁰ In order to explain failure to settle, scholars have invoked emotion, limits of cognition, and differences in tastes.²¹¹ While these features are worthy of additional exploration, as currently developed, they do not take us very far in understanding behavior. To say that a case did not settle because the parties were not rational does not further our understanding of the process.²¹²

203. Huang, *supra* note 10, at 595.

204. See Cornell, *supra* note 18, at 173-74 (“[O]thers[] have attempted to generalize the discounted cash flow approach by developing game-theoretic models which take account of the sequential nature of litigation . . .”).

205. See *supra* note 22. See also Leandra Lederman, *Which Cases Go to Trial?: An Empirical Study of Predictors of Failure to Settle*, 49 CASE W. RES. L. REV. 315, 319-20 (1999) (providing an empirical analysis of settlement modeled on the simplistic Shavell model without discussion of the option model). Cf. Julie Macfarlane, *Why Do People Settle?* 46 MCGILL L.J. 663, 706 (2001) (recognizing the importance of the dynamic nature of risk in litigation which characterizes options, but not linking into the option models of litigation, Macfarlane stated: “Also important—and often missing—in a complete appraisal of risk are considerations of timing in the dynamics of bargaining. There are no ‘neutral’ moves in negotiation, including silence; every move and countermove changes the bargaining climate.”).

206. Mark Klock, *Finding Random Coincidences While Searching for the Holy Writ of Truth: Specification Searches in Law and Public Policy or Cum Hoc Ergo Propter Hoc?*, 2001 WIS. L. REV. 1007, 1008.

207. Lederman, *supra* note 205, at 318.

208. See Klock, *supra* note 206, at 1023, 1064.

209. Guthrie, *supra* note 17, at 170-71.

210. *Id.* at 171.

211. *Id.* at 195-206.

212. See Posner, *supra* note 95, at 1567 (explaining that generalizing a model to provide predictions that are consistent with a given set of observations does not explain anything).

Options theory, along with other elements from financial theory and the economics of information, can provide some insight into failure to settle without resorting to the explanation that the parties were irrational.

Litigation can be viewed as the production of information.²¹³ The value of the claim is uncertain, and litigation resolves the uncertainty.²¹⁴ Because litigation is costly, claims involving no uncertainty will always be settled unless litigation is invoked as a dilatory tactic and the savings from delay exceed the litigation costs. At the current low levels of interest, litigating to delay an exact liability known with certainty is not going to be a reasonable explanation for many cases. So we accept the first premise that litigation resolves uncertainty. But uncertainty alone does not explain litigation. The expected value model incorporates uncertainty.²¹⁵ There needs to be more.

The reason the expected value model fails is precisely the same reason that conventional methods cannot be employed to value a stock option. There is an implicit assumption in the expected value model that is inconsistent with litigation.²¹⁶ The assumption is that the riskiness of the claim is constant throughout the process.²¹⁷ If we could look at a claim and evaluate the distribution of net payouts, and then have the distribution remain fixed until the jury comes back, we could value litigation using the expected value approach.²¹⁸ But this does not happen. The distribution is constantly changing as adversaries make strategic decisions, lock themselves into particular lines of argument, and preclude other lines. In a securities case, an attorney might argue that sophistication of the plaintiff is not relevant to the claim in order to prevent discovery and presentation of unfavorable evidence only to find that when her case develops unfavorably, she has cut herself off from optional theories for the claim. Evidence is discovered or not discovered after searching. Judges make rulings. Jurors are selected. Each of these

213. See, e.g., William W. Bratton & Joseph A. McCahery, *Regulatory Competition, Regulatory Capture, and Corporate Self-Regulation*, 73 N.C. L. REV. 1861, 1899 (1995) (discussing the production of case law in the context of corporate litigation). Cf. Frank B. Cross, *The First Thing We Do, Let's Kill All the Economists: An Empirical Evaluation of the Effect of Lawyers on the United States Economy and Political System*, 70 TEX. L. REV. 645, 659 (1992) (observing that lawyers are involved in the production of social goods).

214. See Cornell, *supra* note 18, at 175-76 (explaining why known valuation methods cannot generally be used to value litigation claims).

215. See, e.g., Steven Shavell, *Suit, Settlement, and Trial: A Theoretical Analysis Under Alternative Methods for the Allocation of Legal Costs*, 11 J. LEGAL STUD. 55, 58 (1982) (“[U]nder the American system, the plaintiff will bring suit if and only if his expected judgment would be at least as large as his legal costs.”) (internal footnote omitted).

216. Professor Cornell's explanation is:

Uncertainty is also a function of time. For example, the variance of stock returns rises monotonically as the observation interval is increased. With respect to litigation, the longer the interval between the time a suit is filed and the time a decision is reached, the greater the probability that events will occur that affect the final award. For instance, new facts may come to light or legal precedents may change.

Cornell, *supra* note 18, at 183.

217. See, e.g., John J. Donohue III, *Opting for the British Rule, Or if Posner and Shavell Can't Remember the Coase Theorem, Who Will?*, 104 HARV. L. REV. 1093, 1096-97 (1991).

218. *Id.*

events affects the distribution of net payouts.²¹⁹ Furthermore, we know this will occur.²²⁰

Stock options also have changing volatility.²²¹ Traditional discounting of expected cash flows does not properly value an option because the method implicitly assumes risk is fixed and the risk of an option is continuously changing through time.²²² This insight alone explains why the expected value model of litigation does not work.²²³ It explains the failure without resorting to inexplicable irrationality. It will also lead to another insight. Stock options can nevertheless be valued using a different approach such as the Black-Scholes model.²²⁴ But their approach assumes that although the riskiness of the option changes, the instantaneous risk of the underlying asset—the stock—is constant.²²⁵ This assumption is not plausible for litigation.

Returning to the point that litigation involves the production of information, it is important to observe again that information has some unique properties.²²⁶ Information is an experience good, which means that it cannot be valued until it is consumed.²²⁷ Information is an experience good *every* time it is consumed.²²⁸ Information has high fixed costs and low variable costs, meaning that it is expensive to create and cheap to copy.²²⁹ An implication of these properties is that there will not be a strong resale market. Even if not restricted by a confidentiality order, I likely will not be able to recover my discovery costs by selling the information I have developed. The costs of creating information are sunk and cannot be recovered.²³⁰ This is the essence of litigation.

The stages of litigation might involve preliminary negotiations, formal filing, preliminary motions, discovery, more motions, jury selection, and trial. Each stage requires a sunk investment.²³¹ Each sunk investment creates

219. Cornell, *supra* note 18, at 183.

220. See BREALEY & MYERS, *supra* note 2, at 591.

221. *Id.*

222. *E.g.*, TRIGEORGIS, *supra* note 9, at 1.

223. See Cornell, *supra* note 18, at 178 (showing that the expected value model incorrectly values valuable claims as having a negative value due to a failure to account for the flexibility options provide to adjust strategy after uncertain events are realized). Professor Cornell's explanation is focused on the asymmetric payoff characteristic, but this is not separable from the fact that the underlying risk necessarily changes.

224. Black & Scholes, *supra* note 1, at 640-45 (explaining the basic principles of their valuation formula).

225. *Id.* An alternative and more general valuation approach was developed by Robert Merton. See Merton, *supra* note 55, at 142 ("An alternative derivation of [Black & Scholes'] formula shows that it is valid under weaker assumptions than they postulate."). Still, even the more general assumptions are violated by litigation because it is not possible to construct hedged portfolios of legal claims. Cornell, *supra* note 18, at 176.

226. See Stiglitz, *supra* note 127, at 462 (explaining that neither the production nor the use of information can be modeled in the same manner as other resources).

227. SHAPIRO & VARIAN, *supra* note 81, at 5.

228. *Id.*

229. *Id.* at 3.

230. *Id.* at 21.

231. Lucian Arye Bebchuk, *A New Theory Concerning the Credibility and Success of Threats to Sue*,

flexibility and sets up the option to proceed to the next stage or not.²³² These investments cannot be valued using an expected payout approach because the riskiness of the payout changes through the proceedings.²³³ At the time that the decision to file is made, we do not know what evidence will be uncovered in discovery, how the judge will rule, or even who the judge will be. Moreover, at each stage, we do not know how the adversary will respond and what impact the adversary's strategy will have on the costs of investing in the subsequent options. It is much more difficult to make a strategic decision when one does not know the strategy that will be employed by the opponent.²³⁴ Indeed, not only is making the decision difficult, but it can be disadvantageous because it necessarily gives away some information.²³⁵ But once a decision is made, there is a certain amount of relief that comes from putting the ball in the other court and requiring the opponent to make a decision, lock in a path, and give up some flexibility. The complexity means that for many cases it will not be possible to estimate the option value with reasonable accuracy. The imprecision around any estimate will be so great that any effort to reduce it to a single number will necessarily result in reification.²³⁶

Professor Bebchuk advanced the idea that litigation occurs in stages to explain negative expected value lawsuits, litigation in which the expected costs exceed the expected value of the claim.²³⁷ Bebchuk correctly concluded that many small claims have more value than they would have if all litigation costs were paid upfront.²³⁸ But in failing to utilize the option approach, he incorrectly attributed this increased value to simple divisibility of litigation costs rather than the option to abandon, alter, or expand the claim.²³⁹ Bebchuk explains that because costs are incurred sequentially, the plaintiff in a negative expected value lawsuit eventually reaches a point at which the value of continuing becomes positive since most of the costs have been sunk.²⁴⁰ This puts the plaintiff in a credible position to threaten the defendant and force a settlement, and, therefore, the expectation that this

25 J. LEGAL STUD. 1, 4 (1996).

232. Richard L. Revesz, *Litigation and Settlement in the Federal Appellate Courts: Impact of Panel Selection Procedures on Ideologically Divided Courts*, 29 J. LEGAL STUD. 685, 692 (2000).

233. See William M. Landes, *Sequential Versus Unitary Trials: An Economic Analysis*, 22 J. LEGAL STUD. 99, 100-01 (1993) (explaining that the sequential nature of litigation causes the potential end results to change throughout the process).

234. See Jacob K. Goeree & Charles Holt, *Ten Little Treasures of Game Theory and Ten Intuitive Contradictions*, 91 AM. ECON. REV. 1403, 1417 (2001) (observing that the best strategic response depends on predicting what the adversary will do).

235. See Macfarlane, *supra* note 205, at 706.

236. See Klock, *supra* note 41, at 90 (suggesting that people have a strong tendency to mistreat diffuse estimates as precisely correct calculations).

237. Bebchuk, *supra* note 231, at 1-4.

238. See *id.* at 4 ("This article offers a new explanation for the credibility and success of NEV suits . . . based on the recognition that litigation costs are not incurred all at once but are spread over a period of time . . .").

239. See *id.* ("The credibility of an NEV suit can arise from the fact that bargaining in 'late' rounds occurs after some of the plaintiff's litigation costs are sunk.").

240. *Id.*

stage occurs will make the defendant's threat credible earlier.²⁴¹ To provide a numerical example, suppose a plaintiff has a \$70,000 claim that will cost \$100,000 to take through trial. Then when the plaintiff has sunk \$90,000 into the proceedings she will be at a point at which an additional \$10,000 investment will provide a \$70,000 payoff. It is true that investing that \$10,000 conditional on being in those circumstances would be rational, but clearly spending the first \$90,000 to get to that position would not be. There is a logical fallacy in the argument that occurs because of failure to fully incorporate the option model.

Professor Chris Guthrie provides an alternative attempt to explain litigation of low value claims by injecting a lack of rationality into the litigants.²⁴²

The existing models of frivolous litigation, upon which the reformers have at least implicitly relied, assume litigants are "rational actors" who make risk-neutral decisions to maximize the value of litigation outcomes. According to these rational actor models, plaintiffs pursue frivolous claims because they believe they can use cost or information asymmetries to extort settlements, and defendants decide whether to settle or defend based on their assessments of the costs they will incur or on the basis of imperfectly informed assessments of the merits of plaintiffs' cases.

These rational actor models undoubtedly explain much frivolous litigation behavior. Unfortunately, however, they rest on the untenable assumption that the litigants pursuing and defending against frivolous claims make outcome-maximizing decisions. While litigants may very well *seek* to maximize outcomes in frivolous litigation, they are in fact unlikely to do so because individuals seldom make outcome-maximizing decisions when faced with the kind of risk and uncertainty that plague the litigation process.²⁴³

The gist of the theory is that litigants suffer from perceptual biases that cause plaintiffs and defendants to view opposite positions as something different than opposites and render them incapable of rational settlement.²⁴⁴

241. *Id.*

242. Guthrie, *supra* note 17, at 176 (asserting "that individuals do not make decisions in the 'rational' manner assumed by the economic models, but instead exhibit different risk preferences depending upon the characteristics of the decision problem").

243. *Id.* at 165 (internal footnotes omitted).

244. *See id.* at 191 ("[P]laintiffs and defendants are likely to exhibit fairly predictable risk patterns in frivolous litigation. Plaintiffs are likely to be psychologically inclined toward risk-seeking behavior, while defendants are likely to be psychologically inclined toward risk-averse behavior."). *See also* Jeffrey J. Rachlinski, *Gains, Losses, and the Psychology of Litigation*, 70 S. CAL. L. REV. 113, 116-18 (1996) (questioning the accuracy of the economic model of behavior and suggesting that cognitive impediments to rational behavior can predictably prevent individuals from successfully acting in their best interest).

This of course begs the question: why do any cases settle? Presumably, the answer is that some individuals suffer more severe perceptual biases and others suffer less. But is this an intellectually satisfying explanation of behavior?

The behavior Professor Guthrie explains can be explained alternatively without resorting to such mystical phenomena as the inability to explain emotional behavior. The option characteristic of litigation, combined with asymmetric information and Knightian uncertainty about the future, drives a wedge of complexity between defendant's and plaintiff's strategic moves.²⁴⁵ In one move, a party can create an option, save an option, exercise an option, or neutralize an adversary's option.²⁴⁶ Then the other party makes a move. The wedge of complexity is driven deeper when considering the effects that decisions in one case might have on other cases, including unpredictable future claims. Claims can move forward simply because the process is too complex for either side to quantify the expected outcome, but the cost of staying in the game for another move is small.²⁴⁷ Once a claim has made it to trial, a weak case may proceed to a jury because of the small marginal cost required and the limited liability characteristic.²⁴⁸ People play games to their conclusion because they cannot always predict who will win, not because they are irrational.

It is important to distinguish between understanding how people actually think and predicting what they will do in response to a stimulus.²⁴⁹ Behavioralists seem to be focused on how people think about a problem when policymakers need only know how people will respond to a policy.²⁵⁰ Positive economic analysis of law is focused on whether models successfully predict behavior, not whether they capture the actual thought process.²⁵¹ For

245. See Kaushik Basu, *The Traveler's Dilemma: Paradoxes of Rationality in Game Theory*, 84 AM. ECON. REV. 391, 391-95 (1994) (giving an example of the complexity of strategy).

246. Macfarlane, *supra* note 205, at 706.

247. See Bebchuk, *supra* note 231, at 4 ("There may arrive a stage at which a threat to continue all the way to judgment becomes credible by virtue of the small fraction of the litigation costs that remains to be incurred.").

248. See *id.*

249. STEVEN M. SHEFFRIN, *RATIONAL EXPECTATIONS* (2d ed. 1996) (citing economic literature on this point and explaining that subjects need only act *as if* they are following the theory for the theory to work).

250. See Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1476 (1998) ("The task of behavioral law and economics, simply stated, is to explore the implications of *actual* (not hypothesized) human behavior for the law.").

251. See Posner, *supra* note 95, at 1560 (discussing the explanatory power of predictive theories in the context of a broader discussion about whether human thoughts are rational). Judge Posner writes:

It's easy to formulate a theory that will explain, in the sense of subsume, all observations within its domain, however anomalous they are from another theoretical standpoint. The trick is to relax whatever assumptions in the other theory made some of the observations anomalous. The rotation of the moons of Jupiter was anomalous in medieval cosmology because each planet (other than the earth, which was not considered a planet, but instead the center around which the planets revolved) was thought to be fastened to a crystalline sphere, which the moons would have collided with in their rotation. The anomaly could be dispelled by assuming that the sphere was permeable, or by assuming (as Cardinal Bellarmine did in his famous dispute with Galileo) that the telescopic observations that had disclosed the rotation of Jupiter's moons were a deceit by the devil. Whichever route was taken, the amended theory

example, consider the problem of pedestrians who wish to get across a busy street. We might model pedestrians using calculus to calculate the speed of the vehicle and determine whether the approaching vehicle will hit them if they attempt to cross. It is not important whether people actually engage in that thought process as long as our model successfully predicts whether they do or do not attempt to cross the street. If people have cognitive biases such as overconfidence,²⁵² why do we not observe more pedestrians flinging themselves in front of vehicles? While I do not have the data, I find it much more plausible that pedestrian fatalities are the result of distracted individuals forgetting to look than to argue that overconfidence caused them to move into the path of the oncoming vehicle. Similarly, the idea that litigation is a strategic game with sequential moves that sometimes results in a trial is more compelling than the idea that trials are consistently the result of litigants with cognitive defects who miscalculate the value of settlement.

It is troubling that empirical observations that seem puzzling are quickly explained by intelligent scholars as examples of individual inability to act consistently with one's objective. In the words of one such scholar:

What troubles me about the existing models, though, is that they rest on the highly questionable assumption that plaintiffs and defendants make risk-neutral, economically rational decisions. The notion that plaintiffs and defendants *seek* to maximize economic outcomes in litigation is not troubling, but the assumption that they are able to do so is problematic because research by cognitive psychologists has demonstrated that this assumption is inaccurate.²⁵³

What I am suggesting is that criticism of standard economic expected value models of litigation such as Posner and Shavell's warrant criticism, but not the criticism frequently seen. The problem is not that an economic model employing rational behavior is being used, but that the wrong economic model is being used. More than fifty years ago John Nash explained some anomalies of neoclassical economics by modeling strategic behavior.²⁵⁴ Litigation is possibly the most complex strategic game devised. War and politics are obviously also strategic, but strength of force often overwhelms strategy. In law, there are constraining rules of procedure that level

would not generate any predictions about planetary satellites; all it would predict was that whatever would be, would be.

Id.

252. Overconfidence has been put forward to explain many phenomena such as the propensity to marry even though most marriages end in divorce or the propensity to drive even though the chances for an accident are high. See Melvin Aron Eisenberg, *The Limits of Cognition and the Limits of Contract*, 47 STAN. L. REV. 211, 216 (1995) ("[E]vidence shows that as a systematic matter, people are unrealistically optimistic.") (citing numerous surveys as evidence). But see Klock, *supra* note 152, at 232-33 (challenging the validity and interpretation of this type of evidence).

253. Guthrie, *supra* note 17, at 175 (internal footnotes omitted).

254. John F. Nash, Jr., *The Bargaining Problem*, 18 ECONOMETRICA 155, 155 (1950).

the playing field somewhat and make strategy more significant.²⁵⁵ Failure to incorporate sequential strategic behavior under uncertainty is a critical error in the expected outcome model of litigation.²⁵⁶ The option perspective helps highlight the importance of strategy and gamesmanship.²⁵⁷

The most fundamental insight that can be drawn from the financial economics literature regarding litigation relates to why the classical economic model of perfect competition fails to give accurate predictions in the context of litigation. Classical economics teaches us that absent gross market failure, all optimal contracts (such as settlement) will be agreed to and all allocations will be efficient.²⁵⁸ This result occurs because the theory begins with the assumption that all decisionmakers are small and incapable of affecting the behavior of others.²⁵⁹ With imperfect information, this is not true because actions convey information and affect the behavior of others.²⁶⁰ And when we act, we do so with the knowledge that our actions will be interpreted.²⁶¹ We might also select our actions in an attempt to reveal information or conceal information.²⁶² Litigation always involves uncertainty; that is why litigation happens. This uncertainty creates value for litigation options. The game of litigation is about maximizing options, neutralizing an adversary's options, and waiting to see how uncertainty is resolved.

If we could formally specify the evolution of risk underlying a claim, plaintiffs could estimate the value of their option, and defendants could also estimate the value of the option.²⁶³ Value-maximizing decisions about settlement versus litigation could then be made quickly. If the value to the claimant was not more than the value to the defendant, the claim could be readily settled for a price somewhere between the two.²⁶⁴ Indeed, this likely happens in litigation where the uncertainty is low and the options are simple. But in reality, it is likely to be frequent that a case involves so much uncertainty changing in ways we cannot simplify sufficiently for modeling, it is impossible to estimate the value of the initial claim with any confidence in the accuracy of the estimate. The complexity of the process by which information develops is the explanation for why litigation occurs—not irrational behavior. But although we might not be able to use option models to

255. See, e.g., FED. R. CIV. P.

256. Cf. LENOS TRIGEORGIS, REAL OPTIONS I (1996) (explaining that the failure to account for strategic use of flexibility is a critical flaw in expectation-based models of valuation and likening managerial operating flexibility to financial options).

257. See *id.* at 4 (“An options approach . . . has the potential to conceptualize and quantify the value of options from active management and strategic interactions.”).

258. Stiglitz, *supra* note 127, at 468.

259. *Id.*

260. *Id.*

261. See *id.* at 472 (observing that in everyday life we infer information from the behavior of people).

262. See *id.* (“The fact that these actions may convey information affects behavior. In some cases, the action will be designed to obfuscate, to limit information disclosure.”).

263. See Black & Scholes, *supra* note 1, at 640 (valuing an option by specifying the evolution of the stochastic process governing the future states of nature).

264. See Richard A. Posner, *An Economic Approach to Legal Procedure and Judicial Administration*, 2 J. LEGAL STUD. 399, 417-18 (1973) (analyzing the decision to settle).

quantify the value of a claim, we can still use the perspective to understand the nature of litigation.²⁶⁵

C. Contracts

A fundamental principle of contract law is that the parties are always free to agree to modify the contract.²⁶⁶ This implies that modifications that will improve the welfare of one or both parties without harming any party will be made.²⁶⁷ Breaches occur where one party attempts to behave opportunistically at the expense of the other.²⁶⁸

More generally, it should be obvious that bankruptcy cases are just a special case of the option to breach any contract. Option theory again provides insights into how the law affects the value of this option. The literature on self-enforcing contracts, while not explicitly recognizing the relevance of option theory, is essentially a literature on situations in which the value of the option to breach is zero.²⁶⁹

One contractual solution to the problem of the breach option is the conveyance of contingent collateral, such as a security interest.²⁷⁰ Under ideal conditions—highly liquid markets for all assets with no transactions costs and continuous adjustments for fluctuations in the value of the collateral or changes in incentives to breach—performance bonds can render the breach option worthless. Of course, problems occur where conditions are not ideal.

The heated debate about whether security interests are an efficient method of bonding and monitoring or a method of expropriating wealth from unsecured creditors has failed to consider the option angle.²⁷¹ The ideal security interest guarantees that the option to breach will always be out of the money and, hence, worthless. This is efficient when the option to breach raises the costs of contracting by more than the option is worth due to asymmetric information and the adverse selection problem.²⁷²

There has been a growing literature on self-enforcing contracts.²⁷³ Self-enforcing contracts are designed so that there will be no incentive to breach and no need to resort to the legal system for enforcement.²⁷⁴ From an option

265. Cornell, *supra* note 18, at 176.

266. *E.g.*, U.C.C. § 2-209 (2001).

267. *See id.* cmt. 1 (“This section seeks to protect and make effective all necessary and desirable modifications . . .”).

268. *See* COOTER & ULEN, *supra* note 19, at 187 (discussing the primary purpose of contract law to enable people to convert uncooperative solutions where investment does not occur due to misappropriation into cooperative solutions).

269. *See id.* at 190 (discussing the concept of a perfect contract for which courts are not needed).

270. *See generally* Forrester, *supra* note 154, at 851-912 (discussing the academic debate over security interests and analyzing them as a property interest providing protection against default).

271. *See generally* Hill, *supra* note 168, at 1117-77 (providing an empirical study on the practical uses of security interests and a recent discussion of academic commentary without mentioning options).

272. *See id.* at 1118 (“My investigation thus supports an efficiency explanation, as does the existing empirical work: secured debt saves costs arising because of market imperfections.”).

273. Jeffrey Livingston, How Valuable is a Good Reputation? A Sample Selection Model of Internet Auctions I (Jan. 2003) (unpublished manuscript, University of Maryland, on file with author).

274. *See* Costas Azariadis & Joseph E. Stiglitz, *Implicit Contracts and Fixed Price Equilibria*, 98

perspective, a perfectly self-enforcing contract is one that has been designed to make the value of the option to breach worthless in all states of the world. This is done by structuring the contract so that the cost of exercising the option to breach can never be less than the benefits. One method of creating self-enforcing contracts is through reputation value in a dynamic environment.²⁷⁵ According to one researcher:

This body of [Industrial Organization] literature shows that given the right circumstances, an agent who finds it in his interest to behave dishonestly in the short term may instead behave honestly in order to gain a reputation as someone who can be trusted to be honest in the future. These models demonstrate that agreements can be self-enforcing and no formal contract enforcement is necessary to ensure that the parties behave honorably.²⁷⁶

An alternative method for providing self-enforcement is requiring the parties to post an adequate performance bond payable to the counterparty on breach. The best example of this type of self-enforcing contract is a futures contract.²⁷⁷ There has never been a default on a futures contract by a U.S. clearing corporation.²⁷⁸ This seemingly remarkable feat has been accomplished by the practice of daily marking to market whereby the adequacy of the performance bond is maintained on a daily basis.²⁷⁹ The effect of marking to market ensures that the option to default is never in the money.²⁸⁰ Obviously this is costly to do, and that is why not all contracts are self-enforcing. However, futures contracts are self-enforcing for two reasons. First, it is relatively easy to measure the adequacy of the collateral on a daily basis, so the costs of requiring the performance bond are relatively low to what they might be in other settings.²⁸¹ Second, the consequences of a default and any perceived inability to guarantee performance would destroy the value of futures contracts and obliterate that market.²⁸² This combination of extraordinary costs to breaching and relatively low costs to posting ade-

Q.J. ECON. 1, 6 (1983) (describing agreements which cannot occur without self-enforcement).

275. Livingston, *supra* note 273, at 3.

276. *Id.* at 1.

277. See ROBERT JARROW & STUART TURNBULL, DERIVATIVE SECURITIES 9 (2d ed. 2000) ("This intervention by the clearing house implies that the futures market has no counterparty risk.").

278. Romano, *supra* note 3, at 21. See also JARROW & TURNBULL, *supra* note 277, at 9 ("The clearing house, having financial reserves to guarantee that its contracts are executed, is considered default-free.").

279. JARROW & TURNBULL, *supra* note 277, at 9.

280. *Id.* at 9-10.

281. One only needs to look at the market prices for the security at the end of the trading day to establish the adequacy of collateral. See *id.* at 9 (describing daily settlement price).

282. A unique feature of futures contracts is that a party can fulfill their contractual obligation by entering into an offsetting contract with a third party, effectively transferring all obligations under the contract to a complete stranger unknown to the original counterparty. Clearly these arrangements would not be acceptable unless the contracts were designed to be free of the risk of breach. See DARRELL DUFFIE, FUTURES MARKETS 57-58 (1989) (describing settlement of futures contracts by offset).

quate margin caused the futures contract market to develop as a self-enforcing market.

D. Torts

Why do some people treat others with an unreasonable degree of carelessness? Because they have the option to. Tort theory is grounded in the concept of duty of care.²⁸³ Individuals owe a duty of care to others.²⁸⁴ The level of duty varies with the relationship, activity, statute, and common law jurisdiction.²⁸⁵ There is literature on optimal damages that suggests that damages should be set so as to create the socially optimal level of investment in care.²⁸⁶ This theory might work well in a frictionless world of perfect information and homogenous individuals without options. However, everyone has the option to abrogate their duty of care. The cost of exercising the option is potential liability for damages caused by the breach of duty.²⁸⁷ The efficiency problem is that liability can be truncated.²⁸⁸ Individuals with little in the way of tangible assets or human capital face severely truncated losses.²⁸⁹ For them, the value of the option to be reckless is high since they have nothing to lose but their time, which is not that valuable.²⁹⁰ Affluent individuals have to invest more in carefulness than indigent individuals without skills because they have more to lose.

Other factors can also lead to suboptimal investment in care. Fully-insured individuals have less incentive than the uninsured.²⁹¹ Financial responsibility laws, if perfectly enforced, provide the means for compensation but at the expense of less carefulness and more accidents.²⁹² These are pol-

283. See, e.g., Robert L. Rabin, *The Historical Development of the Fault Principle: A Reinterpretation*, 15 GA. L. REV. 925, 932 (1981) (explaining that a cause of action for negligence requires a breach of the duty of care).

284. See PROSSER & KEETON ON THE LAW OF TORTS 5 (Dan B. Dobbs et al., eds., 5th ed. 1984) (“[T]ort duties are owed to persons generally, or toward general classes of persons.”).

285. *Id.* at 6.

286. See generally, e.g., A. Mitchell Polinsky & Steven Shavell, *Punitive Damages: An Economic Analysis*, 111 HARV. L. REV. 869, 878-87 (1998) (explaining the general theory that damages should be set equal to injury to promote optimal levels of care).

287. *United States v. Carroll Towing Co.*, 159 F.2d 169, 173 (2d Cir. 1947) (holding that one is liable for the cost of the injury if it could have been prevented at a cost lower than the expected cost of injury).

288. See Keith N. Hylton, *Welfare Implications of Costly Litigation Under Strict Liability*, 4 AM. L. & ECON. REV. 18, 28-30 (2002) (modeling the efficient level of liability but implicitly assuming that the liability can in fact be imposed).

289. See Lott, *supra* note 143, at 245 (explaining higher crime rates among the poor with the observation that they have few tangible assets, which makes the relative cost of legal to illegal transactions higher than it is for more affluent people).

290. See *id.*

291. See 2 KENNETH J. ARROW, *The Organization of Economic Activity: Issues Pertinent to the Choice of Market versus Nonmarket Allocation*, reprinted in COLLECTED PAPERS OF KENNETH J. ARROW 143 (1983).

292. See, e.g., PHILIPPE JORION, *VALUE AT RISK* 53 (1997). Describing the relation between moral hazard and risk when one exerts influence over the risk, Professor Jorion wrote:

This government guarantee is no panacea, for it creates a host of other problems, generally described under the rubric of *moral hazard*. Given government guarantees, there is even less incentive for depositors to monitor their banks, but rather to flock to institutions offering high

icy decisions that might be improved with more thought using an option perspective. There are also implications for society. Diversity and heterogeneity might involve real costs that have not been contemplated, or at least not discussed. The affluent are held hostage by the poor. Not only do they have to invest more into being careful toward others, but they also have to invest more in being careful to compensate for lack of care they can expect from others. Cultural values play a role, too. Individuals who are ashamed of bankruptcy are hostage to those who consider it a badge of pride.²⁹³ The latter feel like they have outsmarted the system.²⁹⁴ Certainly some people will be offended by these casual empirical observations, but there is no intellectually meritorious argument for not looking at the data. There can be no question that institutions operate differently when the people making up the organization have common views as opposed to the situation in which their views differ widely.²⁹⁵ Divergent views aggregate into irrational preferences and policy decisions.²⁹⁶ This results in unstable policies and logrolling, which in turn increase uncertainty.²⁹⁷ Diverging social attitudes might enhance options to exploit others by increasing uncertainty about future rules and norms.

deposit rates. Bank owners are now offered what is the equivalent of a “put” option. If they take risks and prosper, they partake in the benefits. If they lose, the government steps in and pays back the depositors. As long as the cost of deposit insurance is not related to the riskiness of activities, there will be perverse incentives to take on additional risk.

Id.

293. See Frank H. Buckley & Margaret F. Brinig, *The Bankruptcy Puzzle*, 27 J. LEGAL STUD. 187, 187-88 (1998).

Our study presents new evidence on the determinants of consumer bankruptcy during this period. We regressed consumer bankruptcy filing rates on legal, economic, and social variables for 86 federal judicial districts from 1980 to 1991. Legal variables were unable to account for the run-up in consumer filings, and economic variables were scarcely more successful. However, social predictors, measuring differences in social norms and institutions, were a powerful predictor of consumer filing rates, and we suggest that the explosion in bankruptcy filings is in substantial part attributable to a shift in social norms.

Id. See also Debitetto, *supra* note 154, at 644 (suggesting that changes in social attitudes are responsible for increasing consumer bankruptcy).

294. Marcus Cole, *A Modest Proposal for Bankruptcy Reform*, 5 GREEN BAG 2D 269, 275 (2002) (“[S]hameless debtors are not deterred by shame.”).

295. See generally Herbert Hovenkamp, *Arrow's Theorem: Ordinalism and Republican Government*, 75 IOWA L. REV. 949, 949-973 (1990) (describing the effects of social attitudes and institutions on the collective decisionmaking process).

296. There is a vast literature spanning many disciplines (including ethics, philosophy, economics, sociology, psychology, and political science) on the fundamental incompatibility between voter sovereignty and rational collective choice. For an accessible description of this incompatibility, see ALFRED F. MACKAY, *ARROW'S THEOREM: THE PARADOX OF SOCIAL CHOICE* 1-12 (1980). This literature is highly cited within the legal literature. See generally *e.g.*, Cheryl D. Block, *Truth and Probability—Ironies in the Evolution of Social Choice Theory*, 76 WASH. U. L.Q. 975, 975-81 (1998) (observing the pervasiveness of Professor Arrow's proof that collective decisions cannot be made in such a manner that they will obey basic principles of rationality).

297. It is well known that rational individual preferences cannot be aggregated to achieve a rational social preference ordering without imposing socially unacceptable constraints such as dictatorship. See, *e.g.*, IAIN MCLEAN, *PUBLIC CHOICE* 25 (1987) (“[T]here are deep problems with all procedures of getting from many preferences to one decision.”). A commonly given example of this is the fact that there is nothing inconsistent with a majority preferring *A* to *B*, another majority preferring *B* to *C*, and another preferring *C* to *A*. See, *e.g.*, *id.* at 25-27. This implies that there is no such thing as a “best policy” for the government because there is no platform that cannot be beaten by another platform. See *id.* at 103.

III. EXPLOITIVE OPTIONS AND LEGAL DOCTRINES THAT LESSEN OPTION VALUE

A. Exploitation

The problem with free options is that they are not free. Although they may be free to the individual with the option, they are costly to the organization providing the option. Free options are collected by exploitive people and exercised. Even when the options are not exercised, the provider of flexibility incurs a cost or accepts a risk. This results in a redistribution of wealth toward exploiters.²⁹⁸ But the end result is not merely a redistribution because the existence of the option affects behavior.²⁹⁹ In other words, the redistribution might be inefficient, costing the nice guys more than the exploiters appropriate. However, it might be possible in some situations to reduce these opportunities by attacking the sources of option value. Alternatively, merely understanding that the options are there provides some insight into behavior, such as why cases go to trial rather than settle.³⁰⁰

These options can develop under different settings. One scenario involves asymmetric information. An example of this is the option to steal. The individual planning a theft certainly knows his identity, but society will be unlikely to know prior to the act, if ever.³⁰¹ The option to steal is provided at a cost to society.³⁰² Professor Lott observed that the option to steal expands the feasible set of individuals.³⁰³ This is a source of value for individuals who find the alternatives in the expanded set preferable to the alternatives in the constrained set.³⁰⁴ In order to reduce the cost of the option, society spends resources on surveillance, enforcement, and punishment to

298. For example, it is reported that creditors "lost about \$39 billion in 1998 due to personal bankruptcy filings." Fay et al., *supra* note 146, at 706. These researchers conclude from empirical analysis of the data that strategic exercise of the option to discharge debt was the dominant consideration, with little support for the idea that households filed for bankruptcy due to an adverse change in circumstances. *Id.* at 716.

299. This proposition should be obvious. People will avoid putting themselves in a situation in which they can easily be exploited. This explains the failure of credit markets. *See* Akerlof, *supra* note 133, at 497-99 (stating that the failure of credit markets is one of the major reasons for underdevelopment). *See also A Tort Reply: Philip Howard Is Dressing Down the Legal Community for Its Frivolous Suits*, WASH. POST, Oct. 1, 2002, at C1 (observing that social behavior has changed greatly due to a fear of giving people the opportunity to sue).

300. Cornell, *supra* note 18, at 181-82.

301. *See* George J. Stigler, *The Optimum Enforcement of Laws*, 78 J. POL. ECON. 526, 527 (1970) ("The cost limitation upon the enforcement of laws would prevent the society from forestalling, detecting, and punishing all offenders . . .").

302. It has been estimated that the direct costs of crime (the value of losses and expenditures on deterrence) amount to five percent of the U.S. gross domestic product. These figures exclude indirect costs such as adverse effects on the economy due to the possibility of crime (such as an individual staying home and watching television rather than going out to a show in order to avoid becoming a victim). COOTER & ULEN, *supra* note 19, at 460.

303. Lott, *supra* note 143, at 245.

304. *Id.*

constrain the choices from which the exploitive person might select.³⁰⁵ These reduce the value of the option to steal.

Professor Lott does not expressly analyze crime in terms of options:

In principle, it should be possible for any borrower to use his human capital to secure loans. In practice, however, these loans are quite rare because the bankruptcy and antislavery laws make it impossible for the lender to realize this “collateral”

. . . Bankruptcy and antislavery laws therefore raise the transaction costs of legal purchases relative to illegal ones. When an individual's wealth consists entirely of human capital, the cost of borrowing against that capital is likely to be infinite. The only method by which the individual can then pay for the item is by incurring the expected penalty for stealing it. The criminal justice system may thus be viewed as allowing individuals to borrow against their future human capital. . . .

This constraint is likely to be most binding for the poor, who have few tangible assets and whose wealth usually consists primarily of human capital.³⁰⁶

An options perspective interpretation of Lott's analysis is that individuals have the option to finance purchases in different markets. For some, the option to switch from the capital market to the criminal market is in the money.

Consider a different example of an exploitive option. This type occurs after uncertainty has been resolved. An excellent example of this is the 2000 presidential election challenge.³⁰⁷ After the voting ended and ballots had been counted, a major source of uncertainty—which marginal voters would vote and how—was resolved. Since Al Gore was in a situation in which he had insufficient votes and it did not matter whether he was one vote short or a million votes short, he found himself in the situation of having nothing to lose and everything to gain from litigating over the legal interpretation of the statutory language.³⁰⁸ Mr. Gore's exercise of this option was detrimental to society.³⁰⁹ His motivation for litigating would have been more credible and not exploitative if he had stated his legal arguments about ambiguity

305. COOTER & ULEN, *supra* note 19, at 458.

306. Lott, *supra* note 143, at 244-45.

307. Klock, *supra* note 24, at 3.

308. Jon Sawyer & Bill Lambrecht, *Opinions Run the Gamut Among Citizens Waiting for Election's Conclusion*, ST. LOUIS POST-DISPATCH, Dec. 3, 2000, at A10 (quoting an Iowa farmer).

309. See Peter G. Gosselin, *Political Mess Raises Fears of Recession*, L.A. TIMES, Nov. 15, 2000, at C1 (reporting on economists' concern about negative impact of recounts on the economy and financial markets); *A Question of Trust as Confidence in Balloting Weaken; Bush, Gore Make Matters Worse*, USA TODAY, Nov. 13, 2000, at 29A (describing candidates' loss of credibility and crisis scenarios).

and interpretation of the Florida code prior to the resolution of uncertainty, that is, prior to the votes being cast.³¹⁰

B. Legal Doctrines Reducing Exploitive Option Value

In some settings, individuals can reduce or eliminate the value of a free option by designing self-enforcing contracts, credibly signaling, or posting bond. The question now at bar is: what has the law done to mitigate exploitive options? A variety of doctrines exist to limit the value of free options. Five variables determine option value: risk of the underlying asset, price of the underlying asset, exercise price of the option, time to expiration, and the riskless rate of interest.³¹¹ Since the law cannot dictate market clearing interest rates,³¹² these legal doctrines can attack any of the other four variables. The statute of limitations extinguishes old options.³¹³ The duty to mitigate damages reduces uncertainty and option value by eliminating the incentive to wait and see what happens next.³¹⁴ A similar legal doctrine is ratification, which effectively imposes a duty to act in a timely manner.³¹⁵ For example, A's broker makes an unauthorized trade and tells A. A cannot simply take the option to wait and see if the value of the stock goes up while preserving a cause of action if the account incurs losses.³¹⁶ Limitations on punitive damages, while arguably bad from the perspective of deterrent effect, do have the virtue of lowering the value of the option to litigate a claim with few merits.³¹⁷ Jurisdictional limits and standing requirements are also option-reducing doctrines.³¹⁸

Another legal rule that lowers the value of the option to proceed with litigation is the American rule that parties pay their own legal costs.³¹⁹ This might initially seem counterintuitive because many litigation reformers operate under the assumption that people will be less likely to litigate high-risk claims if the loser has to pay the winner's costs.³²⁰ However, Professor Cornell demonstrated under reasonable assumptions that the alternative English

310. Klock, *supra* note 24, at 10.

311. See BREALEY & MYERS, *supra* note 2, at 602-03.

312. See STIGLITZ, *supra* note 136, at 113-17 (explaining the consequences of interfering with market clearing prices).

313. *E.g.*, N.Y. GEN. OBLIG. LAW § 17-101 (2001).

314. See *Glenn Distribs. Corp. v. Carlisle Plastics, Inc.*, 297 F.3d 294, 302 (3d Cir. 2002) (observing the nonbreaching party's general duty to mitigate damages).

315. See *Altschul v. Paine, Webber, Jackson & Curtis, Inc.*, 518 F. Supp. 591, 594 (S.D.N.Y. 1981) ("By failing to object to the course of trading in the accounts for approximately two years despite ample opportunity to do so, the [plaintiffs] must be held to have ratified the transactions conducted on their behalf.").

316. See *id.* (calling this strategy "the 'heads I win, tails you lose' proposition").

317. See Cornell, *supra* note 18, at 183.

318. See, *e.g.*, *Valley Forge Christian Coll. v. Ams. United for Separation of Church & State, Inc.*, 454 U.S. 464, 489 n.26 (1982) (observing the effects of justiciability limitations).

319. Donohue, *supra* note 217, at 1093.

320. See Cornell, *supra* note 18, at 186.

rule of “loser pays” increases the variance of the award in litigation and hence increases the value of the option to litigate.³²¹

As discussed previously, crime can be modeled as an option to borrow against future human capital that will be in the money for those with infinite borrowing rates. In this model, a theoretical method for reducing the value of the option would be to raise the penalty to infinite cost too³²²—that is, to expand the set of crimes for which capital punishment can be administered. Obviously, this involves moral issues that are beyond this analysis. I am not advocating that we actually execute shoplifters; I am merely raising this for pedagogical purposes to assist in illustrating the use of the options perspective. People can reasonably argue that capital punishment is not a deterrent to murder and is immoral in any case, but one can also reasonably argue that severe punishment would be a deterrent to the marginal thief.³²³ Along the same lines, Professor Cole has proposed a mild form of debtors’ prison for credit card abuse.³²⁴ Such strategies can be viewed as increasing the exercise price of the option.

A historically interesting doctrine limiting the value of exploitive options has been eliminated.³²⁵ At one time, it was common practice in the United States to limit voting rights to property owners.³²⁶ This could be interpreted as a requirement that those fully participating in collective decisions have something to lose—in other words, not be in a position where their potential losses from political and legal changes are truncated at zero.³²⁷

321. *Id.*

322. *See* Stigler, *supra* note 301, at 531 (raising the expected penalty lowers the gain from crime).

323. *See* Ann Dryden Witte, *Estimating the Economic Model of Crime with Individual Data*, 94 Q.J. ECON. 57, 81 (1980) (concluding that stronger punishment deters crime). *But cf.* Stigler, *supra* note 301, at 527-28 (observing that the severity of punishment for minor offenses will not alone provide deterrence).

324. Cole, *supra* note 294, at 275.

325. *See* Harper v. Virginia Bd. of Elections, 383 U.S. 663, 666 (1966) (“Voter qualifications have no relation to wealth nor to paying or not paying this or any other tax.”).

326. *See id.* at 684 (Harlan, J., dissenting) (“Property qualifications and poll taxes have been a traditional part of our political structure.”).

327. *Id.* at 684-85. Justice Harlan, joined by Justice Stewart, wrote:

Similarly with property qualifications, it is only by fiat that it can be said, especially in the context of American history, that there can be no rational debate as to their advisability. Most of the early Colonies had them; many of the States have had them during much of their histories; and, whether one agrees or not, arguments have been and still can be made in favor of them. For example, it is certainly a rational argument that payment of some minimal poll tax promotes civic responsibility, weeding out those who do not care enough about public affairs to pay \$1.50 or thereabouts a year for the exercise of the franchise. It is also arguable, indeed it was probably accepted as sound political theory by a large percentage of Americans through most of our history, that people with some property have a deeper stake in community affairs, and are consequently more responsible, more educated, more knowledgeable, more worthy of confidence, than those without means, and that the community and Nation would be better managed if the franchise were restricted to such citizens.

Id. (internal footnotes omitted).

IV. POLICY PRESCRIPTIONS AND EMPIRICAL IMPLICATIONS

A. *Contract Law and Arbitration Reform*

The policy problem at hand is to strike a balance between giving people the freedom to make their best choices while curtailing their ability to exploit others opportunistically. This section discusses some examples of potential policy changes. This Article has already observed that there is a large body of commentary on bankruptcy reform, with both formal and informal empirical analysis suggesting that bankruptcy decisions have been driven by financial opportunism, which should be curtailed by lowering the value of such opportunism and perhaps making bankruptcy less convenient.³²⁸ Another contractual area which option theory suggests could be a candidate for reform can be found in form contracts assigning one party the option to select the forum.

A common feature of form contracts is to assign one party the option to select arbitration over court.³²⁹ Alternative dispute resolution literature often assumes it is less expensive than the legal system,³³⁰ but this assertion is subject to challenge.³³¹ Reports suggest it can be more expensive.³³² Furthermore, it can have procedural disadvantages such as limited discovery, making the formal hearing process the stage at which much discovery occurs, and therefore making it difficult to summarily dispose of claims early in the process.

If the costs of one forum are clearly less, then, according to Coase, the parties would agree to use the less costly forum.³³³ Contracts can always be modified by mutual assent.³³⁴ Giving one party the option to choose the forum without mutual assent is exploitive. A rule that prohibited assignment of this option would seem to be efficient, with the penalty being to give the option to the party that did not draft the form contract.

B. *Tort Reform and Contingency Fees*

Litigation reform that is aimed at discouraging litigation of low economic value and encouraging settlement should draw from the implications of option theory. Reduction in uncertainty and truncation of gains will both

328. See Cole, *supra* note 294, at 275.

329. See, e.g., Harris v. Green Tree Fin. Corp., 183 F.3d 173, 177-78 (3d Cir. 1999) (giving example of an enforceable one-sided arbitration clause).

330. See James F. Henry, *Some Reflections on ADR*, 2000 J. DISP. RESOL. 63, 64 ("ADR's early years emphasized its potential to reduce litigation costs . . .").

331. See Craig A. McEwen, *Managing Corporate Disputing: Overcoming Barriers to the Effective Use of Mediation for Reducing the Cost and Time of Litigation*, 14 OHIO ST. J. ON DISP. RESOL. 1, 9-14 (1998).

332. JAMES S. KAKALIK ET AL., AN EVALUATION OF MEDIATION AND EARLY NEUTRAL EVALUATION UNDER THE CIVIL JUSTICE REFORM ACT 29-53 (1996).

333. See Donohue, *supra* note 217, at 1099.

334. E.g., U.C.C. § 2-209 (1999).

lower option value.³³⁵ Less flexibility in methodologies for calculating damages will reduce uncertainty.³³⁶ Caps on punitive damages and awards for specific types of injuries clearly lower the value of the option to bring frivolous claims.³³⁷

Frivolous litigation is difficult to define.³³⁸ Typically, discussions of frivolous litigation are not centered around utterly frivolous claims.³³⁹ If no colorable claim exists, the attorney bringing it is subject to sanctions.³⁴⁰ But the threshold of colorable is a low one.³⁴¹ Some have provided a working definition of frivolous in terms of the expected costs exceeding the expected benefits,³⁴² but this definition is not useful in an options framework. An alternative definition of a frivolous claim might be a claim that can survive summary judgment, but for which there is only a trivial chance that the trier of fact would consider the evidence sufficient to meet the burden of proof at the conclusion of the case.³⁴³ Procedural systems that make summary dismissal difficult increase frivolous litigation.³⁴⁴ It is also important to remember that frivolity is not merely a potential problem in plaintiffs' complaints but can also be a potential problem in defendants' answers.

Another obvious candidate for modification would be contingent legal fees. Contingent fees clearly exacerbate exploitive options by lowering the cost to exercise the option to file. Contingent fee arrangements turn claims into speculative options on options for the attorneys and result in costly rent-seeking.³⁴⁵ It would be reasonable to put restrictions on contingent fees. The standard argument for contingent fees is that they permit the poor, who could not afford to pay fees out-of-pocket, to bring claims.³⁴⁶ This could readily be addressed by having a process similar to certification of a class action claim. It would be reasonable for the plaintiff to demonstrate an in-

335. See Cornell, *supra* note 18, at 182-83 (“[T]he value of an option grows when the variance of the underlying random variable rises, increasing uncertainty regarding court awards will make filing a lawsuit a more attractive investment. . . . [T]he granting of a few huge awards can greatly increase the incentive to sue by making litigation options more valuable.”).

336. See *id.* at 184-85.

337. See *id.* at 182-83.

338. Guthrie, *supra* note 17, at 185.

339. See *id.* at 186.

340. See FED. R. CIV. P. 11.

341. See Elliott J. Weiss, *The New Securities Fraud Pleading Requirement: Speed Bump or Road Block?*, 38 ARIZ. L. REV. 675, 677-78 (1996) (describing the ease of turning a securities fraud claim with no merit into a pleading capable of surviving a motion to dismiss).

342. See Bebachuk, *supra* note 231, at 1.

343. See I.P.L. P'ng, *Strategic Behavior in Suit, Settlement and Trial*, 14 BELL J. ECON. 539, 548 (1983) (“It seems reasonable to characterize a frivolous suit as an action where both sides know that it is very unlikely that a trial outcome will favor the plaintiff.”).

344. See Weiss, *supra* note 341, at 679.

345. For a discussion of the view that litigation is primarily redistributive rent-seeking rather than productive activity, see Cross, *supra* note 213, at 654.

346. See Elihu Inselbuch, *Contingent Fees and Tort Reform: A Reassessment and Reality Check*, 64 LAW & CONTEMP. PROBS. 175, 175 (2001) (“Many consumer organizations, public advocates, labor unions, and plaintiffs’ lawyers view the United States’ system of contingent fees as nothing less than the average citizen’s ‘key to the courthouse door,’ giving all aggrieved persons access to our system of justice without regard to their financial state.”).

ability to otherwise bring the claim, as well as some merit to the claim, prior to certification as a contingent fee-eligible claim.

C. Procedural Reform

Procedural rules can have an enormous impact on option value.³⁴⁷ The initial option to file might be exercised regardless of the current estimated value of the claim because it sets the stage to continue if unforeseen favorable events come to light, and the cost of taking that option is quite low.³⁴⁸ Logically, the same can be said for exercise of the initial option to defend against a claim that is not realistically in dispute. Accelerating the litigation process and shortening discovery will reduce the option value.³⁴⁹ Anything reducing uncertainty will lower the option value.³⁵⁰ Advance knowledge of the judge trying the case could be provided by having more judges doing more specializing in type of case assignments. At least trial judges could be assigned at filing. Even potential appellate panels could be assigned at filing.

Discovery is an example of exploitation through options. Parties can use the free option to seek discovery because it costs almost nothing to make the request, but complying with the request might be high.³⁵¹ Parties can also use the free option to hide evidence because it costs relatively little to produce boxcars of documents, but it is costly to search through them for the smoking gun.³⁵² Perhaps something as simple as sharing discovery costs would alleviate the wasteful exercise of exploitive options. Experimentation by a few small states would provide useful data.

Perhaps most importantly, we should note that the modern, liberalizing rules of procedure permitting alternative theories and modification of claims create problems that might not have been contemplated.³⁵³ The Federal Rules of Civil Procedure were adopted long before option value was understood.³⁵⁴ The option to revise a complaint has significant value, analogous to the option to exchange one financial asset for another.³⁵⁵ It would be rea-

347. See Cornell, *supra* note 18, at 184 (“Legal procedure also can affect the value of litigation options directly. Litigation options derive their value from the choices they give the plaintiff. The more such choices a plaintiff has, the greater the total value of his litigation options.”).

348. See P’ng, *supra* note 343, at 540 (explaining the strategy behind filing negative value claims). See also *id.* at 549 (“It cannot be overemphasized that the revelation of information during discovery is a problem of strategic choice for the two parties.”).

349. See Cornell, *supra* note 18, at 183.

350. BREALEY & MYERS, *supra* note 2, at 581.

351. COOTER & ULEN, *supra* note 19, at 396.

352. Cf. Stiglitz, *supra* note 127, at 473 (stating that actions can be designed to conceal information).

353. See FED. R. CIV. P. 15 (requiring courts to freely grant leave to amend pleadings when justice requires).

354. The theory of option valuation was first developed in 1973. See Black & Scholes, *supra* note 1, at 637.

355. See William Margrabe, *The Value of an Option to Exchange One Asset for Another*, 33 J. FIN. 177, 177 (1978) (developing the theory of the value of an option to exchange one risky asset for another).

sonable to revisit these rules with an understanding of the costs of providing flexibility in pleadings.

Burdensome discovery requests are close to free. Challenges to bona fide discovery requests are close to free. Policy should be designed to selectively target these using an option perspective. Shortening expiration dates, expanding the loss region, limiting gains, and reducing uncertainty are general principles for accomplishing this objective.

D. Criminal Law Reform

This analysis, along with John Lott's analysis, suggests that there could be an economic reason for treating white-collar criminals differently from other criminals.³⁵⁶ Professors Kahan and Posner wrote:

Before the advent of the [Federal Sentencing] Guidelines, imprisonment was an extraordinary disposition for an offender convicted of a federal white-collar offense. Even controlling for the relative seriousness of various crimes, white-collar offenders were much more likely to be fined and much less likely to be incarcerated than were common ones. This pattern reflected the perception of federal judges that white-collar offenders were relatively more amenable to regulation by fines, both because white-collar offenders typically have more valuable assets than common crime offenders and because they suffer greater stigma from conviction. Empirical studies suggest that federal judges' inclination toward fines for white-collar offenders was efficient.

As economically sensible as it might have been, however, the disparity in imprisonment across offense categories proved politically unacceptable. Responding to a perceived congressional directive, the U.S. Sentencing Commission authorized imprisonment for many white-collar offenses that previously were punished only with fines and probation. Since then the Guidelines' prison sentences for white-collar offenders have become only longer.

But . . . fines are not the only alternative to imprisonment. In fact, shame is making a much-heralded comeback as a criminal punishment in American law. Judges in numerous states now require offenders to buy newspaper ads, post signs on their property, put bumper stickers on their cars, and even wear distinctive items of clothing announcing their crimes. Such penalties are being used . . . for more serious common offenses that would otherwise be pun-

356. See Lott, *supra* note 143, at 245 (explaining why the poor are more likely to commit crimes); John R. Lott, Jr., *Should the Wealthy Be Able to "Buy Justice"?*, 95 J. POL. ECON. 1307, 1307-08 (1987) (reconciling the optimal penalty literature with sentencing practices affected by wealth).

ished by imprisonment, including drunk driving, larceny, nonaggravated assault, burglary, and drug possession.³⁵⁷

The argument is effectively that white-collar criminals have more human capital at stake and can be deterred with lesser penalties.³⁵⁸ Of course, this is only part of the equation.³⁵⁹ It could be that white-collar crime causes more social injury through loss of confidence in markets and should be punished more. To some extent, individuals can make their own decisions about protection of personal property by spending resources to guard and secure it. Only the public can protect confidence in markets.³⁶⁰ On the other hand, if the least costly method of protecting personal property is to stay home at all times, the damage to the economy would be large enough to warrant severe penalties for other types of property crimes, including violent crime.

E. Voting Reform

The idea that people should earn the right to vote should not be summarily dismissed.³⁶¹ Rights that are given away are not as valuable as rights that are earned. All people should be treated with common courtesy, but they should earn treatment with respect.

Requiring that individuals have a vested interest in order to vote does not mean returning to the days when only property owners could vote. Not only might that be too high of a threshold, but the definition would also be difficult to delineate. However, one could establish a set of criteria any one of which would qualify an individual to fully participate. In addition to property ownership, a college degree, a skilled trade, a pension plan, or other asset could fulfill a vesting requirement.

This admittedly radical idea in the contemporary world merits consideration because the existence of certain types of laws that are known to be socially harmful can be explained by the support they receive from those who have nothing to lose. One example of this is rent control. We know that permitting tenants to rent at below-market rates both causes housing shortages and dilapidation of neighborhoods.³⁶² To the extent that people are not vested in society, they lack concern for policies that turn cities into ghettos.

357. Dan M. Kahan & Eric A. Posner, *Shaming White-Collar Criminals: A Proposal for Reform of the Federal Sentencing Guidelines*, 42 J.L. & ECON. 365, 366 (1999).

358. *Id.*

359. See Stigler, *supra* note 301, at 533 (providing rule for optimal penalty which depends in part on the social costs of the crime).

360. See Lawrence M. Ausubel, *Insider Trading in a Rational Expectations Economy*, 80 AM. ECON. REV. 1022, 1023 (1990) (explaining the relationship between government regulation and confidence in public markets).

361. See *Harper v. Virginia Bd. of Elections*, 383 U.S. 663, 684 (1966) (Harlan, J., dissenting) (“[I]t is certainly a rational argument that payment of some minimal poll tax promotes civic responsibility, weeding out those who do not care enough about public affairs to pay . . .”).

362. STIGLITZ, *supra* note 136, at 114-16.

“Living wage” legislation is another example.³⁶³ We know such laws hurt society, but they can receive support from those who have nothing to lose.

F. Empirical Implications

One obvious implication of the option perspective is that in many situations one would prefer to defer the option to file a claim until the option is about to expire under the statute of limitations.³⁶⁴ A decision to postpone a decision on filing has little downside risk. Therefore, the option to file the claim later will often be more valuable than filing the claim now due to the fact that valuable information could be revealed by waiting. Of course, there are situations in which it would be more valuable to file immediately. This would occur when either there is little uncertainty about the outcome and damages, or when there is no prospect of uncertainty being resolved without invoking discovery methods that are unavailable prior to filing. Additionally, during periods of high interest rates that lower the present value of damages, there should be a larger proportion of earlier filings, other things equal. In principle, these are testable hypotheses. The obvious difficulty, however, is that we do not have data on claims that are not filed.³⁶⁵ Excluding cases that lawyers accept but that are allowed to expire or settle without filing will bias results.³⁶⁶ Even if one could obtain such privileged data from some firms, we still cannot observe claims that clients did not bring to lawyers because the claims expired. Nevertheless, it would at least be nice to collect whatever information could be had about the distribution of filings relative to the statute of limitations, along with other observable information.

Policy implications should be connected to empirical observation.³⁶⁷ Is litigation an efficient method of producing valuable information, or is it a costly rent-seeking activity? Does the answer depend on whether the plain-

363. See John Tierney, *The Big City; Puzzling Out the Logic in Living Wage*, N.Y. TIMES, May 10, 2002, at B1 (describing the social costs of living wage legislation which mandates wages substantially higher than those determined in the employment market). See also Nurith C. Aizenman, *Prince George's Council Ponders 'Living Wage' Bill*, WASH. POST, Feb. 12, 2003, at B1 (stating that approximately eighty jurisdictions nationwide recently adopted living wage legislation).

364. This follows from the fact that options are worth more alive than dead. Merton, *supra* note 55, at 144. Another analogy is in the real option literature pointing out that it is often beneficial to postpone decisions due to the flexibility of postponement. AMRAM & KULATILAKA, *supra* note 8, at 25. For a legal analogy, see Walt, *supra* note 104, at 1234 (describing inaction as deliberate use of the option to delay action until later).

365. See Lederman, *supra* note 205, at 325-26 (“[I]t is difficult to obtain information about settled cases, and with only tried cases in a sample, it is impossible to determine how the cases that settled differ from the cases that went to trial.”) (internal footnotes omitted). See generally George L. Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUD. 1, 1-6 (1984) (describing problems associated with inferences about the population of claims based on observed samples).

366. See Kimberly A. Moore, *Judges, Juries, and Patent Cases—An Empirical Peek Inside the Black Box*, 99 MICH. L. REV. 365, 374 (2000) (“For the rate of plaintiff verdicts to be an accurate measure of the influence of a legal standard, of judicial or jury attitudes, or of the substantive fairness of any adjudicatory process, litigated disputes must be representative of the entire class of underlying disputes.”).

367. See Klock, *supra* note 206, at 1062 (suggesting that assessment of policy changes is an empirical matter).

tiff's attorney is working on a contingent fee arrangement? If litigation produces socially valuable information on the margin, perhaps we should stimulate investments in the options created by filing claims. However, it seems likely that at least some types of litigation involve significant elements of exploitive options and should be deterred.

V. CONCLUSION

Economic analysis of law has become more widespread and fashionable in the last twenty years.³⁶⁸ However, most of the theory brought to the analysis has come from economic theorizing about the real sector rather than the financial sector.³⁶⁹ There is an irony in the fact that the financial sector most closely approximates the common simplifying assumptions: homogeneous products, mobility, divisibility, lack of barriers, and small transactions costs.³⁷⁰ Although financial theory has been heavily drawn on in areas related to corporate law, it has not been as widely applied to other areas.³⁷¹ Insights from financial theory, such as the theory of option valuation, can help the analysis of law.³⁷²

There have been critics of the economic analysis of law who characterize economists as invading amoral barbarians who should be walled out.³⁷³ Even scholars who acknowledge positive value to economic analysis are sometimes inclined to sling arrows. Judge Calabresi argued that the concept of Pareto superiority has no practical role to play in real world policy analysis.³⁷⁴ His argument is that since all transactions are costly, all changes in the status quo must be Pareto inferior.³⁷⁵ He concludes that justice and equity should drive policy analysis.³⁷⁶ One problem with this type of refutation of economics—that it must be secondary to concepts such as fairness—

368. COOTER & ULEN, *supra* note 19, at ix.

369. *See id.* at 9 (“The economic analysis of law draws upon the principles of microeconomic theory . . .”).

370. *See* Ray Ball, *The Theory of Stock Market Efficiency: Accomplishments and Limitations*, in *THE NEW CORPORATE FINANCE* 35, 48 (Donald H. Chew, Jr., ed., 2d ed. 1999).

The economic theory of competitive markets now seems unlikely to be dislodged from its central role in stock market research, for several reasons. First, stock markets must rank highly among markets on a *a priori* likelihood of being competitive: there are no entry barriers; there are many buyers and sellers, who by and large appear to be greedy and enterprising people; and transactions costs are relatively low.

Id.

371. *See* Huang, *supra* note 10, at 573 (stating that the financial perspective on options is too important to restrict its exposure in the law school curriculum to students taking corporate finance).

372. *See id.* at 574 (“The option perspective offers important and fundamental insights to many areas of law besides the corporate area.”).

373. *See, e.g.,* David Campbell, *The Relational Constitution of Contract and the Limits of Economics: Kenneth Arrow on the Social Background of Markets*, in *CONTRACTS, COOPERATION, AND COMPETITION* 307, 326 (Simon Deakin & Jonathan Michie eds., 1997) (labeling economic policy prescriptions as morally repugnant and calling to confine economics to its proper place).

374. Calabresi, *supra* note 108, at 1227.

375. *Id.* at 1231.

376. *Id.* at 1237 n.79 and accompanying text.

is that fairness is necessarily an internally inconsistent concept in theory.³⁷⁷ This is so because it is a multidimensional concept that cannot be implemented without creating an arbitrary and capricious scale.³⁷⁸ As Professors Epstein and King eloquently explained in their commentary on the current state of empirical legal research, measurement of such concepts necessarily involves simplification and distortion.³⁷⁹ For example, to evaluate whether a policy is more fair or less fair, we need to measure fairness. Two key principles of fairness are to treat equals equally and to treat unequals unequally. There is an immediately obvious tension between these principles when we recognize that people are similar and different in many dimensions and any classification system for individuals is necessarily arbitrary. Evaluating policies on fairness is like sorting heterogeneous objects from biggest to smallest without any clear purpose underlying the ordering.³⁸⁰ We could arbitrarily sort based on weight, height, displacement, or any arbitrarily chosen function combining these aspects of size. The ordering will of course be dependent on arbitrary choices.³⁸¹

In theory, the value of an option can always be calculated given simplifying assumptions.³⁸² But the calculation depends critically on unobservable parameters and functions (relationships between variables).³⁸³ In order to complete the calculations, assumptions must be made about functional forms and parameters must be replaced by estimates.³⁸⁴ These estimates may be so poor that they are nearly void of informative content.³⁸⁵ In my opinion, efforts to quantify the value of most legal options under general circumstance would only lead to reification. Nevertheless, just because we cannot accurately calculate a numerical answer to a precise question does not mean that we cannot gain from a better understanding of the relationships and the factors that will affect the value.³⁸⁶ The option perspective provides such insight.³⁸⁷

377. See KENNETH J. ARROW, *SOCIAL CHOICE AND INDIVIDUAL VALUES* 59 (2d ed. 1963) (showing that his theorem 2 proves it is impossible to construct any method of voting that will result in rational social choices without restricting individual preferences); Cheryl D. Block, *Truth and Probability—Ironies in the Evolution of Social Choice Theory*, 76 WASH. U. L.Q. 975, 975-81 (1998) (observing the pervasiveness of Professor Arrow's proof that collective decisions cannot be made in such a manner that they will obey basic principles of rationality).

378. See Klock, *supra* note 41, at 95 (explaining that measurement of risk is necessarily arbitrary because of its multidimensional nature).

379. Epstein & King, *supra* note 152, at 81.

380. *Cf. id.* (summarizing President George W. Bush solely with a measurement of his height).

381. See Klock, *supra* note 41, at 95 ("There is no limit to the number of arbitrary definitions we might reasonably use to implement a measure of size.").

382. See JARROW & TURNBULL, *supra* note 277, at 211-13 (giving the simplifying assumptions used by the Black-Scholes formula).

383. See *id.* at 228 ("[T]he volatility, cannot be observed directly and must be estimated.").

384. See Klock, *supra* note 41, at 96 (describing difficulties in estimating value).

385. *Id.*

386. See Cornell, *supra* note 18, at 186.

387. TRIGEORGIS, *supra* note 9, at 4.

