

THE EFFECT OF RISK ON LEGAL VALUATION

ROBERT J. RHEE*

From a financial economic perspective, the governing condition of a meritorious civil action is the uncertainty of outcome. Expectation and outcome deviate, and the spread is the measure of uncertainty (or variance). During litigation each party has an option to settle or select trial. The decision standard can be seen as an option strike price and a finding of liability as an "in-the-money" call option. This apparent optionality suggests the application of an option pricing model to legal valuation, and a small but growing body of scholarship endorses this concept. However, option theory is not the only concept. Under an asset pricing model, the value of an asset is the sum of its expected cashflow discounted by its risk. Uncertainty is the key variable in the values of an option and an asset, but risk has a bipolar effect on value. Greater risk increases option value, but decreases asset value. At issue is the essential nature of a disputed right: is a lawsuit conceptually an option or an asset? This article argues that the essential nature of a lawsuit is best viewed as an asset. Uncertainty diminishes lawsuit value consistent with the prediction of asset pricing principles. This article shows that expected value, which has been a durable concept in law and economic literature, does not equal true economic value. The assumption of risk neutrality assumes away the most difficult aspect of the valational analysis and fails to account for a risk-adjusted discount reflecting the quality of the forecast. Thus, two cases with the same expected value are not valational equivalents if the variance of returns is perceived differently, and this article analyzes how parties account for different perceptions of risk in valuation.

* Associate Professor of Law, Washburn University School of Law; M.B.A., University of Pennsylvania (Wharton); J.D., George Washington University; B.A., University of Chicago. I thank Marc Banik, Brad Borden, Christopher Drahozal, Joseph Grundfest, Bill Rich, David Ross and Stephen Ware for their helpful comments. I thank Franklin Allen, Marc Galanter, Chris Guthrie, Peter Huang, Richard Shell, and Joel Waldfogel for responding to my inquiries regarding issues in this article. This article was presented to the Canadian Law and Economics Association conference, held at the University of Toronto, September 29-30, 2006, and the Midwestern Law & Economics Association conference, held at the University of Kansas School of Law, October 20-21, 2006. I thank my wife Nicki for her unconditional support.

INTRODUCTION

For many years, law and economics scholarship has subscribed to the conventional wisdom that the value of a legal dispute is its expected value, defined as the probability of liability multiplied by the expected judgment amount.¹ The cost-benefit analysis provides a simple method of analyzing value in the absence of market pricing.² The model assumes that expected value discounts the inherent uncertainty of litigation by its probability. This theory supports the prescription that if parties can agree on expected value, settlement is superior to litigation since economic surplus can be extracted from foregone litigation cost. This prescription derives from Ronald Coase's work on transaction cost economics.³ It has been argued that transaction cost constitutes a source of economic inefficiency, prompting a legion of scholarship to condemn litigation as a wasteful activity.⁴ Thus, the key variables in pricing a dis-

1. See, e.g., John P. Gould, *The Economics of Legal Conflicts*, 2 J. LEGAL STUD. 279 (1973); William M. Landes, *An Economic Analysis of the Courts*, 14 J. L. & ECON. 61 (1971); Richard A. Posner, *An Economic Approach to Legal Procedure and Judicial Administration*, 2 J. LEGAL STUD. 399 (1973); George L. Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUD. 1 (1984); Alan E. Friedman, Note, *An Analysis of Settlement*, 22 STAN. L. REV. 67 (1969).

2. The central problem is that settlement values cannot be checked against an independent market valuation. Ronald J. Gilson, *Value Creation by Business Lawyers: Legal Skills and Asset Pricing*, 94 YALE L.J. 239, 254-55 (1984) (noting that "real-world" legal problems center on achieving "correctly priced" assets in the absence of efficient market pricing). This problem has long since been recognized. See, e.g., *Chaplin v. Hicks*, 2 K.B. 786, 792 (1911) (discussing the problem of when there is "no market for the particular class of goods" in assessing damages).

3. Landes credits Coase for laying the doctrinal foundation for an economic approach to negotiation. Landes, *supra* note 1, at 102 n.61 (citing Ronald H. Coase, *The Problem of Social Cost*, 3 J. L. & ECON. 1 (1960)).

4. The list is too long for a comprehensive citation. See, e.g., Stephen McG. Bundy, *The Policy in Favor of Settlement in an Adversary System*, 44 HASTINGS L.J. 1 (1992); Robert D. Cooter & Daniel L. Rubinfeld, *Economic Analysis of Legal Disputes and Their Resolution*, 27 J. ECON. LITERATURE 1067, 1074 (1989) (trials are "mistakes"); Margaret Meriwether Cordray, *Settlement Agreements and the Supreme Court*, 48 HASTINGS L.J. 9, 36 (1996) ("Settlement is favored in the law for a variety of reasons."); Samuel R. Gross & Kent D. Syverud, *Don't Try: Civil Jury Verdicts in a System Geared to Settlement*, 44 UCLA L. REV. 1, 3 (1996) (footnote omitted) ("Trial is a disease, not generally fatal, but serious enough to be avoided at any reasonable cost."); Russell Korobkin & Chris Guthrie, *Psychological Barriers to Litigation Settlement: An Experimental Approach*, 93 MICH. L. REV. 107, 107-08 (1994) (suggesting that most scholars consider trials "mistakes" that leave "society worse off"); David M. Trubek et al., *The Costs of Ordinary Litigation*, 31 UCLA L. REV. 72, 122 (1983) (stating that settlement is "perhaps the most cost-effective activity"). Only a minority of scholars view litigation and trial as a socially productive activity or compatible with notions of economic efficiency. See Paul Butler, *The Case for Trials: Considering the Intangibles*, 1 J. EMPIRICAL LEGAL STUD. 627 (2004); Arthur R. Miller, *The Pretrial Rush to Judgment: Are the "Litigation Explosion," "Liability Crisis," and Efficiency Clichés Eroding Our Day in Court and Jury Trial Commitments?*, 78 N.Y.U. L. REV. 982 (2003); Robert J. Rhee, *A Price Theory of Legal Bar-*

pute have been identified as transaction cost and expected value.

Around the same time that Coase published *The Problem of Social Cost*, financial economics was rapidly developing with the Nobel Prize-winning works of Harry Markowitz, William Sharpe, Robert Merton, Fischer Black, and Myron Scholes.⁵ Their works produced Portfolio Theory, the Capital Asset Pricing Model, and the Black-Scholes-Merton option pricing models. In the course of the past fifty years, these ideas revolutionized the modern derivatives and capital markets.⁶ Financial economics is the branch of economics that deals with valuation. It fundamentally involves “the valuation of cash flows that extend over time and are usually uncertain,”⁷ an apt description of the economics of a legal dispute. Finance theory offers a fresh way to analyze lawsuit value, and this analysis is richer than the linear reductions of the expected value model. Also, unlike some other branches of economics perhaps, financial economics enjoys a tangible “symbiosis” between theory and empirical observation of market practices.⁸ Yet, there is a “remarkable gap” between scholarship in financial economics and legal bargaining.⁹ Only recently have scholars begun to bridge this gap.¹⁰ By analogizing lawsuits to investments, scholars view legal valuation not from the perspective of standard cost-benefit analysis, which ideally requires information completeness,¹¹ but from the perspective of risk management, which assumes that uncertainty is the governing condition. This is a critical shift

gaining: *An Inquiry into the Selection of Settlement and Litigation under Uncertainty*, 56 EMORY L.J. 617 (forthcoming 2007) (manuscript on file with author); Owen M. Fiss, Comment, *Against Settlement*, 93 YALE L.J. 1073 (1984). Cf. Mark Galanter, *An Oil Strike in Hell: Contemporary Legends About the Civil Justice System*, 40 ARIZ. L. REV. 717 (1998); Marc Galanter, *The Quality of Settlements*, 1988 J. DISP. RESOL. 55 (1988).

5. See Fischer Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973); Harry Markowitz, *Portfolio Selection*, 7 J. FIN. 77 (1952); Robert C. Merton, *Theory of Rational Option Pricing*, 4 BELL J. ECON. & MGMT. SCI. 141 (1973); William F. Sharpe, *Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk*, 19 J. FIN. 425 (1964).

6. See Christopher Farrell, *Three Wise Men of Finance*, BUS. WEEK, Oct. 11, 2004, at 20 (noting the pioneering works of Harry Markowitz, William Sharpe and Merton Miller as having profound impacts on modern finance). See generally PETER L. BERNSTEIN, *CAPITAL IDEAS: THE IMPROBABLE ORIGINS OF MODERN WALL STREET* (1992);

7. STEPHEN A. ROSS, *NEOCCLASSICAL FINANCE* 1 (2005).

8. Sam Peltzman, *The Handbook of Industrial Organization: A Review Article*, 99 J. POL. ECON. 201, 211 (1991).

9. Joseph A. Grundfest & Peter H. Huang, *The Unexpected Value of Litigation: A Real Options Perspective*, 58 STAN. L. REV. 1267, 1270–71 (2006).

10. See Bradford Cornell, *The Incentive to Sue: An Option-Pricing Approach*, 19 J. LEGAL STUD. 173 (1990) (first application of option analysis to legal bargaining); Grundfest & Huang, *supra* note 9; Rhee, *supra* note 4.

11. See Rhee, *supra* note 4 (manuscript at 40–41, on file with author) (arguing that standard cost-benefit analysis depends on completeness of information) (citing AMARTYA SEN, *RATIONALITY AND FREEDOM* 563–65 (2002)).

in analytic framework.

Despite the promise of an interdisciplinary analysis, the debate is unsettled as to the valuational method. The risk of a lawsuit is the variance of the outcome, and this uncertainty must affect value.¹² But risk impacts valuation differently. At the crossroad of this debate are two broad concepts: option pricing and asset pricing models. If these concepts are complementary, the debate would be merely academic. But the effect of risk in valuation has a Jekyll-Hyde duality. Greater riskiness of the underlying asset increases option value, whereas greater riskiness of expected cashflow discounts asset value. Because the essential nature of a legal dispute resembles both an option and an asset, harmonizing this dichotomy is imperative in establishing a conceptual framework of legal valuation. Because risk affects value differently in the context of that which is valued, harmonization requires a clear understanding of the objects of valuation.

The tug and pull of uncertainty on valuation underscores the importance of the issue. Scholarship is split on the proper application of financial economics, but, thus far, no scholar has analyzed this dichotomy.¹³ This article reconciles the tension between the apparent option and asset qualities of a lawsuit, and provides a valuation framework under finance theory. It advances two essential propositions.

First, a lawsuit is fundamentally an asset and should be valued under asset pricing principles. This is not to suggest that option pricing theory is irrelevant. Embedded in a lawsuit is a real option to go to trial, which derives its value from the underlying disputed right.¹⁴ This option has greater value with increased uncertainty. It is important, however, to distinguish this procedural right from the underlying substantive right, which must be priced as an asset.

Second, expected value is simply a probabilistic forecast of the future return and does not adjust the return on the basis of its risk. In other words, it states the quantity of a future cashflow, but bears no relation to its quality. A proper valuation should discount expected value by its risk, which is the measure of variance from expectation. This discounting, a commonly seen empirical observation in the financial market, is a way in which parties account for risk, and this article establishes a rela-

12. The terms risk and uncertainty are used synonymously. See *infra* note 28.

13. Most scholars have proposed option analytics. See Lucian Arye Bebchuk, *A New Theory Concerning the Credibility and Success of Threats to Sue*, 25 J. LEGAL STUD. 1 (1996); Cornell, *supra* note 10; Grundfest & Huang, *supra* note 9; see also Paul G. Mahoney, *Contract Remedies and Options Pricing*, 24 J. LEGAL STUD. 139 (1995). In a recent article, I applied principles of asset pricing to construct a price theory of legal bargaining. Rhee, *supra* note 4.

14. A real option is an option embedded in an asset. See *infra* note 69 and accompanying text.

tionship between the size of the discount and the value of the real option.

I. ASSUMPTIONS, SCOPE AND DEFINITIONS

Since economic analysis depends on simplifying assumptions, they must be clearly stated.¹⁵ A rational investor in an economic venture seeks to maximize profit and minimize loss and risk.¹⁶ An assumption of risk neutrality is inconsistent with the behavior of financial markets, which rewards risk bearers with return.¹⁷ Most people are not indifferent to risk, or undertake risk gratuitously. If the anticipated returns are the same, they prefer the certain return over the probabilistically equivalent one. The market convention is that one should undertake risk only if there is a commensurate prospect of increased return. These assumptions are based on Harry Markowitz's Portfolio Theory, which prescribes that a rational investor should seek to maximize return at the lowest possible risk and that risk should be undertaken only with the compensation of enhanced return.¹⁸

This article does not explore issues relating to game theory or psychology.¹⁹ To this end, I assume equitable bargaining. The factors of valuation are transparent as between the parties. Each party has knowledge of the other's view of probability, variance, and payouts—factors that all parties strive to learn in the course of bargaining and litigation. This assumption eliminates much of the game theory aspect of bargaining and the transactional friction from information asymmetry. Impor-

15. See A. MITCHELL POLINSKY, AN INTRODUCTION TO LAW AND ECONOMICS 2—6 (3d ed. 2003) (noting the limitations placed on economic theory by the necessary use of assumptions).

16. See Cornell, *supra* note 10, at 173 (considering lawsuit as an “investment”); Grundfest & Huang, *supra* note 9, at 1269–70, 1269 n.1 (“Lawsuits and investment projects have much in common.”); Rhee, *supra* note 4 (manuscript at 9, on file with author) (“The perspective is that of a financier or investor in an economic project.”); see also Robert J. Rhee, *The Application of Finance Theory to Increased Risk Harms in Toxic Tort Litigation*, 23 VA. ENV'T'L L.J. 111, 156–57 (2004) [hereinafter Rhee, *Application of Finance Theory*] (analogizing lawsuit to a financial project in which “plaintiff provides the business opportunity, and the attorney provides not only the intellectual capital and labor but often the financial capital in the form of contingent attorney's fees and costs”).

17. See SERGIO M. FOCARDI & FRANK J. FABOZZI, THE MATHEMATICS OF FINANCIAL MODELING AND INVESTMENT MANAGEMENT 484 (2004) (“A reasonable assumption is that investors are *risk averse*.”).

18. Markowitz, *supra* note 5.

19. These issues are important in the larger scope of bargaining theory. The scholarship in these areas is rich, and a comprehensive citation would be too voluminous. See, e.g., Robert Cooter, *The Cost of Coase*, 11 J. LEGAL STUD. 1, 14–29 (1982) (noting the problem of strategic bargaining); Korobkin & Guthrie, *supra* note 4 (discussing psychological barriers). See generally JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES (Daniel Kahneman, Paul Slovic & Amos Tversky, eds., Cambridge Univ. Press 1982).

tantly, the parties are assumed to engage in relative valuation. The factors of value cannot be limited to one's own view of the case, but each party, in theory and in practice, seeks the other's view of the case as a factor of valuation. The parties then make adjustments to value based on the knowledge learned. Just like other exercises in valuation, the assumption is that settlement value is always subject to a market check, even if that "market" constitutes the parties only.

This article applies primarily to meritorious, contested cases that are not subject to pretrial disposition.²⁰ Pretrial dispositions eliminate most cases where the possibility of success is remote.²¹ The possibility of dismissal raises the risk of a case, and so the concepts here apply comfortably to such cases. Nevertheless, it is simpler to evaluate settlement value against the expected trial outcome without considering the contingency of sudden dismissals for remoteness of success.

This article does not explore the issue of agency cost. This issue is complex, and its exploration in conjunction with an analysis of the general framework of economic valuation would cloud the latter. Agency cost is assumed to be zero, meaning that there is no divergence of interests between attorney and client or that the dispute is resolved without attorneys. This is an unrealistic assumption since we expect that the agency nature of attorney representation would impose cost on the client in some cases at least,²² but the issue is better left for another day. That said, this article explores some ways in which attorneys play a critical role within the asset pricing scheme of dispute resolution.²³

The above assumptions create a set of conditions under which the problem of comparative valuation between settlement and trial is isolated. Additionally, clear definitions of several concepts are important. First, *transaction cost* is defined narrowly as the direct economic cost of

20. See Trubek et al., *supra* note 4, at 89 (22.5% of cases are dismissed or decided on the merits before trial).

21. Pretrial dispositive motions result in the dismissal of cases that have remote possibility of success because the claims either are unsupported by sufficient facts or lack legal support. See FED. R. CIV. P. 12(b)(6), 50(a), 56(c); *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 252 (1986) (stating that "mere existence of a scintilla of evidence" is insufficient to defeat summary judgment or directed verdict); *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 594-95 (1986) (summary judgment is allowed when the supporting evidence is "speculative"); *Conley v. Gibson*, 355 U.S. 41, 45-46 (1957) ("[the] complaint should not be dismissed for failure to state a claim unless it appears beyond doubt that the plaintiff can prove no set of facts in support of his claim . . ."); *Galloway v. United States*, 319 U.S. 372, 395 (1943) (holding, in a directed verdict, that "the essential requirement is that mere speculation be not allowed").

22. See Bruce L. Hay, *Contingent Fees and Agency Costs*, 25 J. LEGAL STUD. 503 (1996).

23. See *infra* Section VI.E.

attorneys and other expenses related to resolving a dispute such as the cost of time and energy—all costs that are typically associated with the expense of litigation and reducible to a cash equivalent.²⁴ The *cost of resolution* means the total economic cost of resolving a dispute through litigation or settlement. Transaction cost is only a component of the cost of resolution. Its other major part is not reducible to a cash or cash equivalent expense. Like a firm's cost of capital, it may be imbedded in the valuation of the dispute through a discount to value.²⁵ Thus, it may not be readily apparent but is equally consequential.²⁶

Second, *variance* is defined in financial economics as the statistical mean squared deviation from the expected value, which is the risk of an expected return.²⁷ With zero variance, there is no risk as the expected result is certain. *Risk* and *uncertainty* are used synonymously.²⁸ In the legal context, meaningful statistical or quantitative measurements are unavailable or inapplicable. Thus, variance is defined as the measure of one's belief about the possible deviations of a judgment from expectation, and it gauges the subjective perception of uncertainty. Risk is perceived *ex ante*. It is pointless to analyze a matter from an *ex post* perspective when the task at hand is to manage risk whose definition is uncertainty of outcome.²⁹

Third, the concept of *probability* pervades law and economics literature.³⁰ It is often assumed as a relative frequency, a number between

24. Because the perspective is that of a rational investor (and not that of good citizen, judge or legislator), the concept of transaction cost is not considered in the context of a normative scheme to allocate social cost or externalities. Cf. GUIDO CALABRESI, *THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS* (1970); Coase, *supra* note 3.

25. See *infra* Section III.A (discussing the implication of cost of capital as calculated by the Capital Asset Pricing Model on valuation).

26. See Rhee, *supra* note 4 (manuscript at 5, on file with author).

27. RICHARD A. BREALEY, STEWART C. MYERS & FRANKLIN ALLEN, *PRINCIPLES OF CORPORATE FINANCE* 1005 (8th ed. 2006). *Variance* and *volatility* are synonymous in financial economics. *Id.* at 556.

28. The economic literature sometimes distinguishes *risk* and *uncertainty* in that risk "consists of future states in which the outcomes, though unknown, follow a known distribution, while uncertainty consists of those future states for which the distributions are also unknown." Larry T. Garvin, *Disproportionality and the Law of Consequential Damages: Default Theory and Cognitive Reality*, 59 OHIO ST. L.J. 339, 365 n.141 (1998) (citing FRANK H. KNIGHT, *RISK, UNCERTAINTY AND PROFIT* 233–34 (1921)). Because distributions in legal analysis are elusive and not particularly helpful in shedding light on any specific case, I do not make this distinction and use the two terms interchangeably.

29. "Once the outcomes are observed, it usually is easy to say what would have been the best decision. However, we cannot evaluate decisions from this perspective, which is why probability distributions are so important." SCOTT E. HARRINGTON & GREGORY R. NIEHAUS, *RISK MANAGEMENT AND INSURANCE* 37 (1999).

30. Perhaps the most famous application of probability is the Hand formula. See *United States v. Carroll Towing Co.*, 159 F.2d 169, 173 (2d Cir. 1947); see also Richard A. Posner, *A Theory of Negligence*, 1 J. LEGAL STUD. 29, 32–33 (1972) (commenting that the Hand formula

zero and one.³¹ Relative frequency has little application in legal assessment in either theory or practice.³² Probability is “the degree of belief which it is rational to place in a hypothesis or proposition on given evidence.”³³ Legal assessment is a subjective endeavor, and thus “it is not always possible to say that the degree of our rational belief in one conclusion is either equal to, greater than, or less than the degree of our belief in another.”³⁴ It is fundamentally a “judgment of credibility,”³⁵ involving a range of plausible reasoning and producing multivariate outcomes that are neither probabilistically predictable nor objectively assessable. Probability is subjective and lacks a quantitative foundation to support a cost-benefit analysis that would purport to derive a “clear optimal outcome.”³⁶ But given that most law and economics literature discusses probability as a relative frequency, the familiar language is used only to facilitate communication of the subjective degrees of rational beliefs and to avoid a repetition of arguments made in the past.³⁷

Lastly, the *standard model* refers to the generally accepted cost-benefit analysis of legal bargaining. The theory is simple. The plaintiff's minimum settlement value is the expected value, being the expected judgment multiplied by the probability of liability, minus litigation costs.³⁸ The same analysis applies for the defendant, except that transac-

provides an applicable test for the determination of negligence); Richard W. Wright, *Hand, Posner, and the Myth of the “Hand Formula,”* 4 THEORETICAL INQUIRIES IN LAW 145 (2003) (criticizing the Hand Formula and its perceived importance in the field of tort law).

31. See, e.g., Grundfest & Huang, *supra* note 9, at 1286 (treating probability as a relative frequency); Jeffrey O'Connell, Jeremy Kidd & Evan Stephenson, *An Economic Model Costing “Early Offers” Medical Malpractice Reform: Trading Noneconomic Damages for Prompt Payment of Economic Damages*, 35 N.M. L. REV. 259 (2005) (same); Posner, *supra* note 1 (same); Priest & Klein, *supra* note 1 (same). Even when scholars recognize the subjective nature of probability, its implications are not explored. See, e.g., WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF TORT LAW 55 (1987) (noting that the utility function depends on “subjective probability” but failing to discuss the implications on tort theory). As Robert Cooter explains, there is an assumption of rational expectation where “expectations contain no systematic bias, that is, the subjective expectations correspond to the objective frequencies of the random event.” Cooter, *supra* note 19, at 22.

32. See Rhee, *supra* note 4 (manuscript at 17–24, on file with author) (discussing the difference between statistical probability and inductive probability). For a vigorous articulation of inductive probability, see JOHN MAYNARD KEYNES, A TREATISE ON PROBABILITY (1921).

33. M.G. BULMER, PRINCIPLES OF STATISTICS 5 (1979).

34. KEYNES, *supra* note 32, at 34. At times, law and economics scholars acknowledge the subjective nature of probability. See LANDES & POSNER, *supra* note 31, at 55. Nevertheless, the implications of inductive probability on theory are not explored. See *id.*

35. A.J. AYER, PROBABILITY AND EVIDENCE 28 (1972).

36. SEN, *supra* note 11, at 565.

37. See Rhee, *supra* note 4.

38. Richard Posner and William Landes are credited with formulating the standard model. Priest & Klein, *supra* note 1, at 4–5 n.16. The literature should also recognize that Alan Friedman made a substantial contribution to the economic literature in an earlier student note

tion cost is added to the settlement value. We ignore for convenience the cost of processing settlement, which is typically small compared to the litigation cost.³⁹ The key concept is expected value, defined as the expected judgment amount discounted by its probability. These relationships are summarized in algebraic formulas where V is settlement valuation, J expected judgment amount, P probability of judgment, and T transaction cost. A defendant's maximum settlement value is $V_d \leq J \times P + T$, and a plaintiff's minimum settlement value is $V_p \geq J \times P - T$.⁴⁰ As long as the defendant's maximum value is greater than the plaintiff's minimum value, there is a positive contract zone from which a settlement may result. This cost-benefit analysis has been the cornerstone in the economic study of legal bargaining, and it has remained remarkably durable over the years.⁴¹

II. RISK AND VALUE

A. Asset Valuation

The first principle of financial economics is that risk and reward are conjoined twins. The greater the expected return, the greater is the valuation; but the greater the risk to that return, the less is the value. Value is determined by "the future expected cash flow discounted at a rate that reflects the riskiness of the cash flow."⁴² This relationship is captured in the process of *discounting*. This process adjusts the future

in the Stanford Law Review. The note set forth all the essential elements and arguments of the standard model. Friedman, *supra* note 1. Posner, one of the leading proponents of the standard model, states the valuational concept as follows: "The plaintiff's minimum offer is the expected value of the litigation to him plus his settlement costs, the expected value of the litigation being the present value of the judgment if he wins, multiplied by the probability (as he estimates it) of his winning, minus the present value of his litigation expenses." Posner, *supra* note 1, at 418; see Friedman, *supra* note 1, at 70–80.

39. See Cooter & Rubinfeld, *supra* note 4, at 1075 (assuming cost of settlement to be "nil" given that it is so low compared to cost of litigation).

40. See RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 568–69 (6th ed. 2003).

41. See, e.g., Cooter & Rubinfeld, *supra* note 4, at 1075; Don L. Coursey & Linda R. Stanley, *Pretrial Bargaining Behavior Within the Shadow of the Law: Theory and Experimental Evidence*, 8 INT'L REV. L. & ECON. 161 (1988); Priest & Klein, *supra* note 1, at 12–13 (adopting the expected value formulation of discounting with probability); Donald Wittman, *Dispute Resolution, Bargaining, and the Selection of Cases for Trial: A Study of the Generation of Biased and Unbiased Data*, 17 J. LEGAL STUD. 313 (1988); see also Evans v. Jeff D., 475 U.S. 717, 734 (1986) ("Most defendants are unlikely to settle unless the cost of the predicted judgment, discounted by its probability, plus the transaction costs of further litigation, are greater than the cost of the settlement package.").

42. THOMAS E. COPELAND ET AL., VALUATION: MEASURING AND MANAGING THE VALUE OF COMPANIES 73 (2d ed. 1995).

expected return for time value of money and discount for risk. Although the time value of money is an important ministerial task, the more salient point for the purpose of the theory of valuation is the discount for risk, which is missing from the formulation of the standard model.⁴³ In the calculation of true economic value, the present value (PV) equals the expected future value (FV) discounted by time and risk, such that $PV = FV \div (1 + R)^n$ where R is the discount rate and n is time. The discount rate R incorporates a discount factor not only for the time value of money but also for the risk of the investment. Intuitively, an uncertain expected dollar should be worth less than a present certain dollar even if the time value of money is disregarded. The process of discounting captures this intuition.

In the financial market, risk is captured in the concept of cost of capital. A firm uses capital to generate cashflows. Capital has a cost. If the capital is debt, its cost is the yield on the debt less the tax shield for interest expense deduction.⁴⁴ The problem is calculating the cost of equity since dividends are not legally mandated.⁴⁵ Before the mid-1960s, the market had no way to measure a firm's risk, and so the cost of capital was incalculable.⁴⁶ The Capital Asset Pricing Model ("CAPM") solved

43. The formulation of the standard model suggests a time value adjustment. See Posner, *supra* note 1, at 420–21; Friedman, *supra* note 1, at 78–79. This calculation is a ministerial task of practical importance. The median time to trial in federal court is approximately 20 months. Marc Galanter, *The Vanishing Trial: An Examination of Trials and Related Matters in Federal and State Courts*, 1 J. EMPIRICAL LEGAL STUD. 459, 480 (2004). If we assume a risk-free rate of 5% to adjust for the time delay in payment, the time value adjustment is not inconsequential. If the expected value is \$100, the discounted value for a period of 20 months is \$92 ($= \$100 \div (1+5\%)^{5/3}$). However, note that this discount is not a risk adjustment, but, rather, a time value adjustment. By definition, the present value and the future values are the same once the time value is adjusted, meaning that \$92 now is the same as \$100 to be received 20 months from now if that future payment is certain. Time value adjustment is a ministerial point and really irrelevant to the theory of legal valuation. This article ignores this administrative point. Rather, the larger issue is a discounting process for the risk, which assumes that the future payment (judgment) is uncertain.

44. See COPELAND ET AL., *supra* note 42, at 247–49. Businesses can deduct interest expense from taxable income. I.R.C. §§ 162–163 (2000).

45. Most companies are not legally mandated to pay dividends. See FRANKLIN A. GEVURTZ, CORPORATION LAW 153 (2000); DEL. CODE ANN. tit. 8, § 170(a) (2004) (stating that board of directors “may declare and pay dividends”). Certain regulated companies require minimum levels of distributions to shareholders. See 26 U.S.C. § 857(a)(1) (2000) (requiring that real estate investment trusts (REITs) distribute at least 90% of taxable income as dividends).

46. Only recently, after the pioneering works of Markowitz, Sharpe, Black, and Scholes, just to name a few, did risk become a quantitative endeavor. “Throughout most of the history of stock markets . . . it never occurred to anyone to define risk with a number. Stocks were risky and some were riskier than others, and people let it go at that. Risk was in the gut, not in the numbers.” PETER L. BERNSTEIN, AGAINST THE GODS: THE REMARKABLE STORY OF RISK 247 (1996).

this problem and provided a quantitative method for calculating the cost of equity.⁴⁷ Cost of equity is best understood as an opportunity cost of capital. The greater the risk of a firm as measured against the market risk, the greater should be a firm's cost of capital. This cost of capital is the discount rate used to value a firm's future cashflow.

With the cost of equity problem solved, a rigorous valuation became possible. The generally accepted technique is the discounted cash flow (DCF) method. Under the DCF, value depends on expected cashflow and the risk to that cashflow. The exercise is a two-step process: (1) forecast the future cashflow, and (2) discount it by the cost of capital. Similarly, the net present value (NPV) of a project calculates the true economic profitability of an investment project. It weighs the initial capital investment C_i against the future cashflows ($C_1 \dots C_n$) which are discounted by the cost of capital.

Value is the sum of the risk-adjusted cashflow. The financial logic is quite elegant. A firm uses capital to generate cashflow that belongs to the shareholders. This capital is not free. An investment in a firm is risky, and investors want a return for the risk taken. The future cashflow must be discounted by the cost of capital, a measure of the firm's risk. For higher risk investments, investors demand higher return; this suggests a higher cost of capital charged to the firm, meaning that its expected cashflow will be discounted more. As a result, the firm's valuation is diminished. For lower risk investments, the process is reversed. In sum, the discounting process matches the return with the appropriate risk level through the valuation process. Although the cost of equity is a less accessible concept than the cash expense of the cost of debt, it is just as real and consequential because the cost is imbedded in the firm's valuation.⁴⁸

47. The CAPM was jointly derived by William Sharpe, John Lintner, and Jack Treynor. See John Lintner, *The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets*, 47 REV. ECON. & STAT. 13 (1965); Sharpe, *supra* note 5. Treynor's article is not published. See BREALEY ET AL., *supra* note 27, at 189 n.9. The CAPM postulates that the cost of an asset is $R_a = \beta (R_m - R_f) + R_f$, where R_f is the risk-free rate, R_m the market return, and β the stock's beta (beta will be defined subsequently). *Id.* at 189. Beta is the important innovation. It is the comparative measure of the expected return versus the market return. *Id.* at 167–68. Statistically, beta is the covariance of the stock return to the market return over the variance of the market return. *Id.* at 170. A beta of 2.0 means that when the market rises one percent, the stock is expected to rise two percent. *Id.* at 167.

48. These concepts are consistently seen in the financial market. Consider two storied American companies traded on the New York Stock Exchange: Goldman Sachs (NYSE: GS) and General Electric (NYSE: GE). Goldman Sachs, the former firm of both Robert Rubin and Henry Paulson, is the world's premier investment bank. See LISA ENDLICH, *GOLDMAN SACHS: THE CULTURE OF SUCCESS* (2000) (providing history of the firm). Investment banking is a complex business, entailing great risk-taking activities. On any given trade or deal, an investment banking firm can gain or lose millions of dollars. GE is a premier diversified con-

As evident, the concept of discounting for risk in a NPV analysis is malleable to the legal context, where C_i represents the transaction cost of litigation and C_n is the anticipated judgment (expected value). But equally evident is the incompleteness of the analogy. The missing elements of this analysis are the analytic equivalent of a discount rate in the legal setting and the conceptual framework for risk-adjusted discounting in valuation.

Thus, there are three points relevant to legal valuation: (1) increased risk reduces the asset value of the firm; (2) the process of projecting a forecast is distinct from the process of assessing the risk to that forecast; and (3) the ex ante economic profitability of a transaction is determined by projecting an expected cashflow and discounting it by its risk.

B. Option Valuation

An option is one of the most basic derivatives, security instruments that derive their value from some other asset or variable.⁴⁹ A call option is a contract wherein an issuer sells for a premium an option giving the holder the right, but not the obligation, to buy from the issuer a specified asset at a fixed strike price on or before a maturity date.⁵⁰ At maturity, if

glomerate, providing everything from consumer products to jet engines. See Geoffrey Colvin, *What Makes GE Great?*, FORTUNE, Mar. 6, 2006, at 50–53 (ranking GE the most admired company for the sixth time in ten years). Its business is also complex, but the overall risk is lower than that of an investment bank. As of the fiscal year 2005, GE and Goldman Sachs had net incomes of \$16.3 billion and \$5.6 billion, respectively, a ratio of about 3:1. See General Electric Statement of Earnings, http://www.ge.com/en/company/investor/ar/cfs_e.htm (last visited Oct. 18, 2006); Goldman Sachs 2005 Annual Report, http://www2.goldmansachs.com/our_firm (follow “Annual Reports” hyperlink; then follow “2005 Annual Report” hyperlink; choose “Online Version;” then follow “Financial Highlights” hyperlink) (last visited Oct. 18, 2006). But GE’s market capitalization (about \$350 billion) is nearly six times Goldman Sachs’s value (about \$61 billion). See <http://finance.yahoo.com> (as of Mar. 12, 2006). GE trades at a higher valuation than Goldman Sachs even accounting for the 3:1 ratio difference in earnings. This is seen in its P/E multiple of 21.8x earnings, compared to Goldman Sachs’s 12.5x. See *id.* If Goldman Sachs was valued at GE’s multiple, it would have a market capitalization of about \$123 billion. But the market recognizes that the quality of the expected earnings of the two firms are different. It discounts the value of firms, even a storied franchise like Goldman Sachs, having greater risk associated with their expected cashflows.

49. JOHN HULL, *OPTIONS, FUTURES AND OTHER DERIVATIVES* 1 (6th ed. 2006). Option contracts have been traded since antiquity. Aristotle described financial options as devices involving “a principle of universal application” and recounted how they were used to monopolize the ancient olive oil market. ARISTOTLE, *POLITICS*, bk. I, ch. 11 (1831), *reprinted in* THE BASIC WORKS OF ARISTOTLE 1142 (Richard McKeon ed., 2001).

50. See JOHN C. COX & MARK RUBENSTEIN, *OPTIONS MARKETS* 1–3 (1985); HULL, *supra* note 49, at 6–8. An “American” option can be exercised any time before or at maturity whereas a “European” option can be exercised only at maturity. Black & Scholes, *supra* note 5, at 637.

the market value of this asset is worth more than the strike price, the option is “in-the-money” and the holder profits since he has the right to buy the asset at a below market price.⁵¹ At any given point in time, the exercise value of an option may be calculated.⁵² If a call option is in-the-money, the holder’s profit is the stock price minus the exercise price and the option premium. If it is out of the money, the exercise value is zero, and thus the holder’s loss is the option premium. The problem is that the exercise value equals the option value only at maturity. Before maturity, the option value is variable. The value depends on the interplay of six variables: the current stock price, the strike price, time to maturity, the variance of the stock, dividend yield, and the risk-free rate. For example, time value alone adds value, i.e., the longer the maturity date the greater should be the option value.⁵³ The complexity is great, and a theory of option value was elusive.

In 1973, Fischer Black and Myron Scholes solved the problem.⁵⁴ Their option pricing formula is mathematically complex, but the solution is based on the simple principle that the issuer of an option can hedge the risk of the option being called against him by constructing a synthetic portfolio of stock and debt that funds the purchase of the stock, both of which are assets and liabilities that can be readily valued.⁵⁵ Since a riskless arbitrage opportunity is unsustainable in a competitive market,⁵⁶ the

51. A put option gives the holder the right to sell a specified asset to the issuer. At maturity, if the market value of this asset is worth less than the strike price, the option is “in-the-money” and the holder profits since she has the right to sell the asset at a more expensive price. If an option is “out of the money,” the holder will not exercise the option and the loss is the option premium, which is the issuer’s gain. An option transaction is zero-sum in that absent transaction costs, the issuer’s loss is the holder’s gain, and vice versa.

52. The profit or loss of the holder of a call option is $V = \max [(S - X - p), -p]$ where S is the stock price, X is the strike price, and p is the option premium. If the payoff is negative, meaning $X > S$ at maturity, the option would not be exercised, the payoff would be zero, and the loss would be the premium. The issuer’s profit or loss is $V = \min [(X - S + p), p]$. See COX & RUBENSTEIN, *supra* note 50, at 3.

53. The lapse of time decays option value since the opportunity for the option to become in-the-money diminishes. See Black & Scholes, *supra* note 5, at 638 (“Normally, the value of an option declines as its maturity date approaches, if the value of the stock does not change.”).

54. See *id.* at 641–42.

55. See *id.*

56. Arbitrage is the simultaneous purchase and sale of securities that creates a riskless profit. See RANDALL S. BILLINGSLEY, UNDERSTANDING ARBITRAGE: AN INTUITIVE APPROACH TO FINANCIAL ANALYSIS 2 (2006). Much of finance theory rests on the principle that market participants will ruthlessly exploit riskless arbitrage opportunities, making such opportunities unsustainable. *Id.* at 9–13. The possibility of arbitrage leads to the most fundamental principle of financial theory, the Principle of Absence of Arbitrage, which states that there is always a tradeoff between risk and reward because, in the long term, there are no unbounded riskless gains. See FOCARDI & FABOZZI, *supra* note 17, 393; BILLINGSLEY, *supra* note 56, at 8–9 (discussing the relationship between arbitrage and the Law of One Price). Arbitrage keeps prices of the same assets consistent in spite of the different ways these assets

value of the synthetic portfolio must always equal the value of the option. Under this model, increased variance of the underlying asset increases option value.⁵⁷ The intuition is that since an option derives its value from an underlying asset, the more the value of that asset has a propensity to move, regardless of direction, the more chance there is that it will exceed the strike price.⁵⁸ This being the case, the synthetic portfolio, which hedges the issuer's risk of having the option called against him, must hold a greater portion of the underlying stock in the event the stock price exceeds the exercise price. Thus, the synthetic portfolio value increases with an increase in the stock holding, meaning that the option value must also increase.

The uses of options are relevant to legal valuation. Options are primarily used for "hedging or speculation; that is, they can be used either to reduce risks or to take risks."⁵⁹ A hedge is a risk mitigation measure. In the gaming context, it is an additional bet placed to offset the potential loss from another bet.⁶⁰ In the market context, a hedge reduces or eliminates the risk of an investment through a secondary transaction that offsets any potential loss.⁶¹ Another use of a derivative is speculation through leveraged investment. Whereas hedging reduces risk, leverage allows an investor to assume greater risk for greater reward.⁶²

This short discussion highlights two points relevant to legal valuation: (1) the more risky an underlying asset, the greater is the option value—all else being equal, option holders prefer "riskier" assets and option issuers prefer "safer" ones; and (2) options are double edged swords as they can be used to hedge or leverage risk. For less risk-averse or risk-seeking investors, options provide opportunities for speculation and higher returns. For more risk-averse investors, they provide a way to reduce or eliminate uncertainty in the value fluctuation of an underlying

may be packaged.

57. See BREALEY ET AL., *supra* note 27, at 566–67 (providing example of option calculation through the construction of a synthetic portfolio); COX & RUBENSTEIN, *supra* note 50, at 33–34 (same).

58. While variance is an important factor in valuation, assumptions about its direction are irrelevant. This is an ingenious insight by Black and Scholes: "[i]f the hedge is maintained continuously, then the approximations mentioned above become exact, and the return on the hedged position is completely independent of the change in the value of the stock." Black & Scholes, *supra* note 5, at 641.

59. HULL, *supra* note 49, at 541. Derivatives, such as options, have many uses. See COX & RUBENSTEIN, *supra* note 50, at 44–59.

60. BILLINGSLEY, *supra* note 56, at 9.

61. *Id.* For example, one way to think about an insurance policy is as a put option. It protects the insured against the risk of a downside movement in the value of the underlying asset.

62. Options can be used to structure a portfolio where the returns on the option would be greater than buying the underlying stock. See COX & RUBENSTEIN, *supra* note 50, at 45–46.

asset.

C. *Duality of Risk*

The above discussion shows that the effect of risk on value is bipolar. Normally, investors in a capital asset consider “yield to be a good thing; risk, a bad thing; and gambling, to be avoided.”⁶³ In the case of options, however, the general rule is the mirror opposite since the holder of an option prefers greater risk. As between option and asset valuations then, risk plays a dual role. The standard text on corporate finance describes the impact of risk on assets and options:

In most financial settings, risk is a bad thing; you have to be paid to bear it. Investors in risky (high-beta) stocks demand higher expected rates of return. High risk capital investment projects have correspondingly high costs of capital and have to beat higher hurdle rates to achieve positive NPV [net present value].

For options it's the other way around. As we have just seen, options 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.⁶⁴

Principles of financial economics provide the most appropriate analytic framework to conceptualize the value of a lawsuit. But their application requires a resolution of the option-asset dichotomy and a proper characterization of the essential nature of a lawsuit.

III. REAL OPTION ANALYSIS

A. *Grundfest-Huang Option Model*

A lawsuit has attributes of an option. The decision standard of a deliberative body can be thought of as the strike price. The plaintiff is said to hold a call option, which the legal institution forces the defendant to issue.⁶⁵ Upon a finding of liability, the call option is in-the-money and

63. Markowitz, *supra* note 5, at 91.

64. BREALEY ET AL., *supra* note 27, at 557.

65. See Cornell, *supra* note 10, at 175 (“When a lawsuit is filed, the defendant is forced to write litigation options at prices that depend on the plaintiff’s cost of pursuing the suit.”); Grundfest & Huang, *supra* note 9, at 1288 (“When a plaintiff files a lawsuit, the plaintiff ac-

the judgment amount determines the parties' profit or loss. Given the apparent optionality of a lawsuit, some scholars have applied option pricing concepts to lawsuit valuation.⁶⁶ An early proponent of option theory was Bradford Cornell, who applied a variation of the binomial option pricing model to value litigation.⁶⁷ This model depends on calculating the potential distribution and probabilities of outcomes, and then works backwards to calculate the "option" price value of a lawsuit.

Recently, Joseph Grundfest and Peter Huang incorporated previous works in the field and proposed a formal model of litigation valuation.⁶⁸ They argue that a lawsuit is a real option (an option embedded in a real asset),⁶⁹ and this option analysis should apply. Their model generates closed-form solutions that provide "precise equilibrium estimates of litigation's option settlement value" and identify the determinants of value.⁷⁰ Consistent with option theory, their key conclusion is that "if the variance of the information is sufficiently large, the lawsuit's real option settlement value will exceed its single-stage expected settlement value."⁷¹ Since the Grundfest-Huang real option model is the most comprehensive argument for the application of option pricing theory as a general framework for legal valuation, it merits close study.

quires a call option whose terminal value is defined by the lawsuit's judgment upon its conclusion."). Unlike a financial option, a lawsuit is not zero-sum because both parties incur transaction costs. Grundfest & Huang, *supra* note 9, at 1289.

66. See Bebchuk, *supra* note 13; Cornell, *supra* note 10; Grundfest & Huang, *supra* note 9.

67. Cornell, *supra* note 10; see BREALEY ET AL., *supra* note 27, at 570–75 (discussing the binomial option pricing model); COX & RUBENSTEIN, *supra* note 50, at 171–78 (same).

68. The works of Bebchuk and Cornell are antecedents. Grundfest & Huang, *supra* note 9, at 1290–91; see Bebchuk, *supra* note 13; Cornell, *supra* note 10.

69. See ASWATH DAMODARAN, CORPORATE FINANCE: THEORY AND PRACTICE 886–94 (2d ed. 2001). Assets are typically valued on the principles of DCF, CAPM and NPV. Not all financial projects are "buy and hold" projects. At any given time a project can be expanded, shrunk, abandoned, delayed, or otherwise modified from the original plan. Where there are contingencies in a project, real option analysis may apply. See BREALEY ET AL., *supra* note 27, at 597–614. There are two types of real options that have application to legal bargain. First is the option to delay a project. See *id.* at 602–03. By delaying the project with the right to proceed, an investor can wait until new information suggests that the project would be NPV positive or the projected cashflows are more certain. This is particularly the case when the variance in the project is high. The second real option is the option to abandon a project. See *id.* at 605–10. Here, a financial project is initiated upon estimation of a positive NPV, but subsequently the expected cashflow is less than previously anticipated. There is value to the option to abandon a project. See *id.* at 605.

70. Grundfest & Huang, *supra* note 9, at 1291. The authors support their work with formal propositions and mathematical proofs. See *id.* at 1328–36. In contrast, Cornell notes in his article that the goal "is not to provide precise estimates of the value of litigation options, but to offer general insights into how such options affect the incentive to sue." Cornell, *supra* note 10, at 176.

71. Grundfest & Huang, *supra* note 9, at 1295.

The argument begins by criticizing the standard economic model of bargaining, which is attributed as deriving from the asset pricing principles of the DCF (discounted cash flow) and NPV (net present value) models.⁷² The standard model fails to account for the effect of variance on the value of lawsuits since the determinants are probability, judgment amount, and transaction cost.⁷³ For example, if we simplify litigation expectations as binary outcomes, it is irrelevant whether the expected outcomes are [100, 0] or [51, 49] since the expected value for both is 50. With risk neutrality as the assumption, one is indifferent to variance. Under a real option analysis, however, variance can increase valuation.

A series of numeric examples give an intuitive understanding of the formal mathematical model. The analysis first examines a positive expected value (PEV) lawsuit, defined as a case where the expected value exceeds the litigation costs.⁷⁴ The case has an expected value of 100 with litigation costs of 70. Under the standard model, the plaintiff's minimum settlement value is 30, and the defendant's maximum value is 170. With equitable bargaining, the parties settle at the expected value of 100. Complexity is then introduced by splitting the litigation process into two stages with equally allocated transaction cost (35 per stage).⁷⁵ This allows an analysis via backward induction. Backward induction considers the strategic decisions of the parties at a future point in time and then works backwards to determine the optimal strategy.⁷⁶ The logic is that the consequences of a present decision depend on the expected future decisions of the parties; thus, future choices are analyzed first, and an inductive analysis works backwards to suggest the optimal present choice.

With the litigation split into two time periods, the key assumption is "that the information to be disclosed at the end of the first period is a ruling on a question of law that has a value of either $A = 400$ or $B = -200$ and that the probability of each outcome is 0.5, as previously described."⁷⁷ This changes the variance of the outcome, but still preserves the expected value of 100. At Stage 1, the parties litigate and spend 35 in transaction costs. At Stage 2, if the court rules A , the expected value would be 400; the plaintiff would settle for 365; the defendant would settle for 435; with equitable bargaining, the parties would settle at 400.⁷⁸ If

72. *Id.* at 1272–74; *see infra* note 126 and accompanying text.

73. Grundfest & Huang, *supra* note 9, at 1276.

74. *Id.* at 1293–94 (discussing the illustrative case).

75. This analysis of multistage litigation borrows the technique first applied by Bebchuk. *See* Bebchuk, *supra* note 13, at 7–9.

76. Bebchuk, *supra* note 13, at 6 & n.7.

77. Grundfest & Huang, *supra* note 9, at 1294.

78. Note that the 35 in transaction cost spent in Stage 1 is irrelevant because it is a sunk

the court rules B, the plaintiff would have no credible threat to continue the lawsuit since she would incur a cost of 35 for a payoff of -200 ; knowing this, the defendant would offer nothing; the plaintiff would abandon the lawsuit; the settlement value would be 0. Thus, just before the revelation of the selection of A or B, the expected value would be 200. Applying backward induction at the beginning of Stage 1, the plaintiff reasons that she would spend 35 to reach a settlement of 200 at the end of Stage 1, and, so, she values settlement at 165. The defendant reasons the same and values settlement at 235. With equitable bargaining, the parties settle for 200—a most startling outcome given that it is twice the expected value of 100 predicted by the standard model.⁷⁹

The next analysis is a negative expected value (NEV) case, defined as a case where the litigation cost exceeds the expected value.⁸⁰ The standard model suggests that these cases should never be brought because they lack credibility. When, however, the lawsuit is divided into stages, some NEV cases can have positive value.⁸¹ The reasoning goes like this. Assume an expected value of 100 with transaction cost of 140. Under the standard model, the expected value is -40 , making the case worthless. This case is then split into two time periods with a cost of 70 per period and backward induction is applied. The plaintiff would spend 70 to reach Stage 2, at which point he would spend another 70 to win 100 in expected value at trial;⁸² thus, he would accept a settlement of 30 at the beginning of Stage 2. Reasoning similarly, the defendant would offer

cost. BREALEY ET AL., *supra* note 27, at 116 (“Sunk costs are like spilled milk: They are past and irreversible outflows. Because sunk costs are bygones, they cannot be affected by the decision to accept or reject the project, and so they should be ignored.”).

79. Grundfest & Huang, *supra* note 9, at 1294–95. Variance is a key determinant. At low to medium levels of variance, settlement values are identical to those from the standard model. Value is 100 when the variance between A and B are $[100, 100]$, $[165, 35]$ and $[165 - \epsilon, 35 + \epsilon]$ where ϵ represents an arbitrarily small positive number. *Id.* at 1295–96. But, there is a point where settlement value experiences a “discontinuity.” *Id.* at 1297. When variance is changed slightly to $[165 + \epsilon, 35 - \epsilon]$, value suddenly decreases to $(82.5 + \epsilon/2)$. This precipitous drop in value results because B becomes a noncredible option given that no plaintiff would spend a transaction cost of 35 to pursue an expected judgment of $35 - \epsilon$, and, so, only A would have value. *Id.* at 1295–96. As variance increases, however, settlement value increases monotonically at a rate measured by $A/2$, the intuition being that as A rises, the value of the real option rises as well. *Id.* at 1297, 1298 fig.1. Thus, when the variance between A and B reach $[400, -200]$, settlement value reaches 200, or double the value from the standard model. *Id.* at 1298 fig.1.

80. *Id.* at 1299.

81. This part of the analysis is borrowed from Bebchuk. *Id.* at 1299–1301. See Bebchuk, *supra* note 13.

82. If the plaintiff litigates in Stage 1, the decision to continue litigation in Stage 2 is rational. The cost spent in Stage 1 is sunk cost, and thus should be irrelevant to the decision at Stage 2 under the American rule of attorney fees. It is a question of whether the initial decision to pursue litigation at Stage 1 is rational or not. See *infra* Part IV.B.

170 to settle at this point. With equitable bargaining, the parties would settle at 100. At the beginning of Stage 1, each party understands that a cost expenditure of 70 would result in a settlement of 100 at the beginning of Stage 2. As a result, the plaintiff would settle at 30 and the defendant would settle at 170. Once again, the outcome is quite surprising: even though in a single stage analysis the expected value of the litigation is -40, with equitable bargaining, the parties settle at 100 at the beginning of Stage 1.

The real option model allows variance to affect value. Assume that judicial decisions A and B determine the binomial outcomes [180, 20] with the transaction cost of 140 divisible into two stages (a NEV case under the standard model since the expected outcome is -40). If the court selects A, the plaintiff would spend an additional 70 in Stage 2 to get a judgment of 180, inducing the plaintiff to settle for 110. Reasoning the same, the defendant would pay 250 to settle. With equitable bargaining, the parties would settle at 180. If, however, the court selects B, the plaintiff's claim loses credibility and the case is worthless. The expected value of A and B would be 90. At Stage 1, the parties realize that each would spend 70 in costs to settle at 90 at Stage 2, and so they would settle at 20 and 160. With equitable bargaining, they would settle at 90, or 10 less than the lawsuit's expected value.⁸³ As the authors explain it, "introducing a learning option into an environment where an abandonment option is already present does not invariably increase a lawsuit's settlement value, particularly if variance is not sufficiently large."⁸⁴

Consistent with the payout profile of a call option, which increases monotonically without limit upon surpassing the strike price, litigation value increases monotonically with an increase in variance. For example, with binary outcomes [200, 0], settlement value is 100; with [300, -100], it is 150; with [400, -200], it is 200; with [500, -300], it is 250, and so forth.⁸⁵ Theoretically, this means that the potential payout of a lawsuit is infinite, consistent with the characteristic of a call option. In a call option, the realistic expectation of the potential profit is the upper limit of expected share price. Similarly, although the point is not made clear, one presumes that the litigation payout is bounded by the rational limit of the value of the injury.⁸⁶

83. Grundfest & Huang, *supra* note 9, at 1301.

84. *Id.* at 1301.

85. *See id.* at 1303 fig.2. "Indeed, every NEV lawsuit can be made credible if one assumes a sufficiently large variance, just as the value of every out-of-the-money call option can be increased to exceed any fixed premium value if the variance of the underlying instrument is allowed to become sufficiently large." *Id.* at 1316.

86. Aside from the rational judgment of deliberative bodies, various legal mechanisms cap judgments. *See, e.g.*, 42 U.S.C. § 1981a(b)(3) (2000) (providing caps on compensatory

A number of other examples are given to show how the valuations from option pricing theory diverge from the prediction of the standard model,⁸⁷ but the above examples are sufficient to show how the model basically works. While the real option model is technically detailed, the thesis is straightforward. The most important and admirable innovation is the incorporation of variance into valuation. Variance *must* affect value, but, as the authors correctly note, the standard model fails to account for it. The key conclusion under an option price theory is that “once variance becomes sufficiently large, the effect of an increase in variance is an unambiguous increase in a lawsuit’s option settlement value.”⁸⁸ This conclusion is the inevitable end of applying option pricing theory to the general framework of legal valuation.

B. Critique of Real Option Analysis

The attributes of optionality in a lawsuit are not disputed. The question is whether option theory provides the general analytic framework, or whether it is a technique to value the procedural option to pursue trial vis-à-vis the value of the disputed substantive right. This distinction is important because the value of a lawsuit has two parts: the larger part is, of course, the value of the underlying substantive right that is the basis of the claim or injury, and the ancillary part is the procedural right to opt for trial. Despite the many innovations and keen insights offered by the Grundfest-Huang real option model, the general application of option theory to value a lawsuit raises a number of problems: (1) the use of backward induction in the litigation context of imperfect information and multistage processes, (2) the limited concept of variance, (3) the problem

and punitive damages in civil rights cases); *State Farm Mut. Auto. Ins. Co. v. Campbell*, 538 U.S. 408, 410 (2003) (suggesting that “few awards exceeding a single-digit ratio between punitive and compensatory damages . . . will satisfy due process.”); *Dimick v. Schiedt*, 293 U.S. 474, 482–83 (1934) (discussing remittitur).

87. The authors find that all PEV lawsuits are credible. On the other hand, NEV lawsuits are credible only at certain levels of sufficiently large variance. Grundfest & Huang, *supra* note 9, at 1301–02. “In addition, some NEV lawsuits exhibit an intriguing pattern in which they are credible for sufficiently low levels of variance, lose credibility over intermediate levels of variance, and then regain credibility over sufficiently high levels of variance.” *Id.* at 1302. Based on backward induction, the pattern of returns is: (1) where $100 \leq A < 130 - \epsilon$, settlement value is 100; (2) where $130 \leq A \leq 140$, the lawsuit is noncredible and so settlement value is 0 (a “dead zone” in the settlement range); (3) where $A = 140 + \epsilon$, settlement value is $70 + \epsilon/2$; and (4) where A increases in value thereafter, settlement value increases monotonically. *Id.* at 1302–03, 1303 fig.2.

88. *Id.* at 1316. This is consistent with Cornell’s conclusion: “[b]ecause the 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.” See Cornell, *supra* note 10, at 182.

of perspective, and (4) the implication on risk-reward preferences of parties. These issues are addressed in order.

1. Backward Induction

Backward induction does not apply well to litigation. It is most useful in games of complete and perfect information, where the parameters are limited and the time horizon is finite.⁸⁹ In these closed-form problems, a dominant strategy may emerge based on a projection of the decisions at the end point of a decision tree. When the decision tree becomes complex (like the game of chess) or information is not perfect or complete (like the game of litigation), backward induction cannot predict optimum solutions.⁹⁰ Thus, backward induction is more useful when complexity and opportunities for slight deviations from the optimal strategy are minimized.⁹¹

Of course, litigation is hardly a game of perfect and complete information, and mutual cooperation is often opportunistically engaged as a strategy.⁹² Uncertainty begets the lawsuit.⁹³ An agreement as to the

89. DAVID M. KREPS, A COURSE IN MICROECONOMIC THEORY 400–01 (1990).

90. *See id.* at 401–02; DOUGLAS G. BAIRD, ROBERT H. GERTNER & RANDAL C. PICKER, GAME THEORY AND THE LAW 163–64 (1994).

91. A popular example shows how backward induction leads to misleading and poor results. *See* KREPS, *supra* note 89, at 401–02; BAIRD ET AL., *supra* note 90, at 163–64. The game is a long series of decisions at divisible points $\{1 \dots n\}$. At each point, a player may keep proceeding towards the final end point n (option A) or terminate the game early with an alternative payoff (option B). Think of a long centipede where the series of option A at points $\{1 \dots n\}$ connect to form the long body of a centipede and option B at each node forms the many sets of centipede legs. Each decision is based on a complete information set (i.e., the payoffs are known). If both players select option A all the way through to the final point n , the payoffs for Players 1 and 2 are $[100, 100]$. At the penultimate point $(n - 1)$, the alternative payoffs for option B are $[101, 98]$; at $(n - 2)$, the alternative payoffs are $[99, 99]$. The alternative payoffs continue to diminish down the chain with slight differences that incentivize selection of option B for one or the other party. At point 0, the alternative payoffs are $[0, 0]$. Now, consider the decision at point $(n - 1)$. Player 1 would select option B with the 101 payoff rather than proceed to the final point n where the payoff is 100. Knowing this, Player 2 would select option B at point $(n - 2)$ with a 99 payoff rather than proceed with option A to $(n - 1)$ where the payoff would be 98 if Player 1 selects option B. Backward induction unravels this chain down to the root where neither party engages in what would otherwise be a profitable transaction at point n . The predicted solution is that each party would select a payoff of 0 rather than 100, a patently irrational result. The process of backward induction places “unusual weight on the assumption that the payoffs that the parties enjoy are common knowledge.” BAIRD ET AL., *supra* note 90, at 164. There must be mutual rationality and trust over a prolonged period where slight deviations in expected behavior undermine the optimal solution. *See* KREPS, *supra* note 89, at 402 (“[M]any rounds of iterated dominance is sometimes a bit too much to believe.”).

92. *See* Grundfest & Huang, *supra* note 9, at 1318 (“It is well understood, however, that litigation is a highly imperfect process.”).

93. “One of the primary causes of disagreements between adverse parties is the vague-

outcome of a case should result in settlement,⁹⁴ and thus backward induction is really irrelevant. The more difficult question in settlement is not whether the parties agree on the outcome of the case, but whether they can agree on the price of the lawsuit despite differences in predicted outcome or confidence therein. Like a financial market that exists because traders disagree on value, the legal market exists only because parties disagree on the proper valuation of the disputed right. Sometimes, parties agree on all relevant determinants of value, and they settle. Sometimes, however, lawsuits are settled despite disagreements over the expected outcome because the parties can still agree on a range of mutually acceptable prices. These points are analyzed in greater detail later in Section VI of this article.

In fairness, the use of backward induction is a simplifying assumption, a heuristic used to analyze the effect of variance. Even so, Grundfest and Huang suggest that a real option analysis offers techniques for “quantifying the often subjective uncertainty” and posit that a working option pricing model of litigation valuation is possible.⁹⁵ This argument,

ness of the legal decision standard; the more vague the standard, the greater the uncertainty as to any given case’s outcome, and the greater the probability of litigation.” O’Connell et al, *supra* note 31, at 272; 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, 169 (Summer 1988) (“The principal uncertainties revolved around likely legal judgments that both parties had equivalent capacities to predict.”).

94. See STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW 402 (2004) (“It is clear that if the plaintiff and the defendant have the same beliefs about the trial outcome, then there should always exist mutually beneficial settlements, because they can each escape trial costs by settling.”); Priest & Klein, *supra* note 1, at 17 (“In litigation, as in gambling, agreement over the outcome leads parties to drop out.”).

95. Grundfest & Huang, *supra* note 9, at 1283 (stating the model provides “techniques for quantifying the often subjective uncertainty that arises in . . . lawsuits”). I do not believe that lawsuits are suited for quantitative modeling on an *individual basis*, though it is sometimes nice to think what might be. A model may be analytically sound for the purpose of conceptual understanding, but lack practical application. Scholars in finance have noted that the theory of real option meets the practical difficulties of application. See BREALEY ET AL., *supra* note 27, at 614–15; DAMODARAN, *supra* note 69, at 892–93, 899, 904. Real options are easier to conceive than to apply. Where the option has many variables, quantification may be impossible as a practical matter. Hard numbers must be generated to feed a formal model, but I question how they would be generated and whether a numeric output is any more accurate or predictive than the subjective views generated through the unquantifiable workings of human intelligence. The real option must be valued in relation to the options that are available to the competitor, and so game theory, a separate branch of economics, cannot be operationally separated from real option valuation. Lawsuits as a collective whole can be subject to modeling, particularly for repeat players such as insurance companies, because they can be thought of as a random mass phenomenon (unpredictable in the individual case but bearing a certain proportion on the whole). See GEORGE POLYA, MATHEMATICS AND PLAUSIBLE REASONING 56 (1968). Even so, the limitations of proper categorization are daunting, and any such data must be taken with a rather large grain of salt. See Rhee, *supra* note 4 (manuscript at 20–22, on file with author). Of course, the capability of aggregate analysis should not be imputed to an individual

however, fails to consider that uncertainty is the essential characteristic of a lawsuit. The broader criticism is that objective probabilistic predictions of the outcomes are notoriously difficult, if not impossible to ascertain. If probabilities were standard fare, much of the work of the legal profession would give way to a new profession of legal risk analysts and a primary or derivative market in legal claims. The application of backward induction to predict litigation behavior is suspect as a theoretical device and unrealistic as a practical matter.⁹⁶

2. Variance in Lawsuits

The definition of variance and its use in the real option model is conceptually troubling. Consider the example of a PEV (positive expected value) lawsuit in which the binary outcomes are $A = 400$ and $B = -200$. The analysis produces a litigation value of 200 even though the expected value is 100. However, this technique uses a numeric artifice. How can a plaintiff incur a negative payoff greater than the transaction cost?⁹⁷ The authors note this conceptual difficulty:

However, as explained in greater detail below, this example of PEV litigation settling for an amount greater than its corresponding single-state expected value arises only because we have assumed that the variance of the information disclosed is large enough to cause the value of B to be negative. Indeed, because of our assumption that the underlying distribution is binomial and mean preserving, it can be proved that if the value of B is constrained to be nonnegative then this lawsuit would settle for no more than its equivalent single-stage expected value of 100. This feature of our model can, however, be shown to be an artifact of our simplifying assumption that the underlying probability distribution is binomial.⁹⁸

party in theory or in practice. This information is available only to highly sophisticated repeat players who are incentivized to expend the cost of procuring such data. Moreover, even with such data, the analysis of any given lawsuit should focus on the unique facts and circumstances of the case rather than some aggregate average, lest the party risk making decisions on the basis of irrelevant noise rather than information.

96. Empirical evidence suggests that the perfect equilibrium solutions derived from backward inductive process have "little predictive power." See Jack Ochs & Alvin E. Roth, *An Experimental Study of Sequential Bargaining*, 79 AM. ECON. REV. 355, 355 (1989).

97. A plaintiff's economic payoff can only fall below the transaction cost if there is a counterclaim. Grundfest & Huang, *supra* note 9, at 1286 n.65. But, this special case does not change the analysis. *Id.* 1293–95. It simply means that the parties reverse roles. The lawsuit can just as easily be broken down into its various claims, and the standard analysis would apply to each part.

98. *Id.* at 1295; see also *id.* at 1287 n.65 ("Given the constraints of such a distribution, the only possible means of generating a sufficiently large variance is, on occasion, by assum-

The concept of a negative payoff is more jarring given that a lawsuit is analogized to a call option.⁹⁹ The maximum loss from holding a call option is the option premium, which is the price the holder paid for the option right. In the case of a lawsuit, the premium is identified as the transaction cost. The problem stems from the requirement of a mean preserving condition. Consider two hypothetical lawsuits, each with transaction cost of 70 per party, divisible into two stages. Each case has equal probability, judicial decisions A and B with payoffs of [200, 0], and [100, 100]. Both lawsuits have an expected value of 100, but variance differs significantly. The first is high risk, and the other is riskless. These dramatic variations would suggest differences in valuation, but the application of the real option analysis produces the same result as the standard model. This result is inconsistent with option pricing theory and the principle that variance must affect valuation.¹⁰⁰

Only when the artifice of a negative payoff is assumed does the real option model produce a valuation in excess of the expected value. Realizing this problem, the authors explain that “if we assume that the distribution is lognormal (an assumption that would significantly complicate our analysis), then negative returns to the plaintiff are not necessary for the option value of a two-stage PEV settlement to diverge from its equivalent single-stage expected value.”¹⁰¹ But this assumption creates further dissonance. In most contested actions the distribution does not take a lognormal distribution. The distribution of a meritorious action, if it exists at all, would be bimodal since trial outcomes would be split along some proportion between findings of no liability and liability, and judgments on liability may cluster around some mean value.¹⁰² A log-

ing a negative value of B.”).

99. *Id.* at 1288.

100. The result is more puzzling if we consider intermediate cases that produce “discontinuities.” *See supra* note 79. As discussed before, if the expected outcomes are [180, 20], the settlement value is 90. Applying the same valuation technique, a case of [150, 50] yields a value of 75. If we reduce the variance even more to [130, 70], the value is 65. The import of these calculations is that value diminishes as the parties reduce the variance of expectation. If the expectation changes to $[130 - \epsilon, 70 + \epsilon]$, the value suddenly jumps from 65 to 100. Other than the mathematical method that produces these calculations, there is no empirical evidence that supports the proposition that greater certainty in the expected outcomes of a lawsuit diminishes its value. Rather, the commonsensical prediction is that the valuation “firms up” with a reduced spread of possible outcomes.

101. Grundfest & Huang, *supra* note 9, at 1295; *see also id.* at 1287 n.65 (“If, however, we assume different forms of probability distributions that are truncated to have no negative values, such as the lognormal, then none of these interpretive issues arises and the qualitative results of our model remain unchanged.”).

102. Such an assumption runs into the obvious problem of fitting a particular case into a particular class for the purpose of forming the distribution. Should all securities class actions constitute a class? All tort cases? Negligence cases only? All cases in the district of Arizona?

normal distribution would be an oddity rather than the norm, and it better describes a frivolous or low success case than most contested actions in which the distribution of outcomes have a range of expected outcomes.¹⁰³

At the root of these interpretative difficulties is the definition of variance. In the real option model, variance is the type of risk that produces “sudden changes” to assessment from one procedural state to another.¹⁰⁴ This definition limits the application of the model. These abrupt changes result from three common developments: disclosure of “smoking gun” evidence that changes the entire complexion of a case, a mid-litigation ruling that changes the legal theory, or the granting of a dispositive motion that dismisses the case.¹⁰⁵ Without such sudden inter-procedural changes, “a lawsuit’s option settlement value can equal the expected value of the judgment as calculated through traditional DCF (discounted cash flow) or NPV (net present value) techniques.”¹⁰⁶ Accordingly, the real option model can be interpreted “more narrowly” in the minority of cases that are subject to pretrial dispositions,¹⁰⁷ which are the types of cases that had little chance of viability in the first place.¹⁰⁸

In the aggregate, the success levels of plaintiffs and defendants are substantially above 0 percent and below 100 percent. See Priest & Klein, *supra* note 1, at 18–19 (positing that the rate of success for plaintiffs at trial will be close to 50 percent). But see Daniel Kessler, Thomas Meites & Geoffrey Miller, *Explaining Deviations from the Fifty-Percent Rule: A Multimodal Approach to the Selection of Cases for Litigation*, 25 J. LEGAL STUD. 233, 233 (1996) (“[E]xtensive empirical literature has documented that plaintiffs win far fewer than half of their cases.”). However, from this obvious point, it is difficult to define a class from which a distribution is inferred.

103. Consider a medical malpractice action in which the key determinant is the issue of negligence. Assume that an average award upon liability is \$2 million. If the exact case was tried one hundred times, we would finally see the elusive distribution from which we may infer a statistical probability. If the case is close, we may see a bimodal distribution. Assume for argument that the breakdown of judgments is precisely binomial: 50 cases (no liability) and 50 cases (\$2 million). Applying the process of backward induction, the parties would settle at the expected value of \$1 million. Now, inject a bit of reality into the hypothetical. What would happen if the variance of outcomes is increased while preserving the mean? We can imagine a more realistic distribution that looks like this: 50 cases of no liability, 5 cases of \$0.5 million judgments, 10 cases of \$1 million, 20 cases of \$2 million, 10 cases of \$3 million, and 5 cases of \$3.5 million. The expected value is still \$1 million, except that the variance now is greater. Under the real option model, the value *still* equals the prediction of the standard model.

104. Grundfest & Huang, *supra* note 9, at 1278.

105. *Id.* at 1279 (discussing claims that hinge “critically on the testimony of a single witness or on the outcome of a key judicial ruling”).

106. *Id.* at 1295.

107. “Thus, the model can be interpreted more narrowly so that the information disclosed at the beginning of Stage 2 is precisely the sort of information that is in fact correlated with dismissal by court order with no subsequent effort to reinstitute the claim.” *Id.* at 1288 n.67; see sources cited *supra* note 20 and accompanying text (dismissals are in the range of about 20 percent of filed cases).

108. See sources cited *supra* note 21 and accompanying text.

Legal assessment is ordinarily a cumulative process. A case assessment follows a “random walk” during which the starting assessment may deviate significantly from the final assessment or outcome. Many contested lawsuits do not undergo dramatic changes from one preceding procedural stage to the next. No doubt that in any given case there are key rulings and disclosures, but these events typically form the basis for the random walk. A case ordinarily starts with a degree of uncertainty that diminishes to a level where each party becomes more confident in the assessment. If this observation describes a majority of lawsuits, the two-stage model is irrelevant since most changes in risk profile between various procedural states are incremental rather than seismic.

The concept of uncertainty can be distinguished in finer grades. Variance is better defined as the potential deviation of *current* assessment, at whatever point in the procedural process, from the final outcome. This analytic framework more resembles the single-stage model. Under this definition, variance is a proxy for the confidence one has in the assessment.¹⁰⁹ Consider the situation where only a small fraction of the evidence has been disclosed so far, and this evidence unambiguously suggests that the defendant is liable.¹¹⁰ The plaintiff may assess the probability of liability as high given the known facts, but cannot be too confident in this assessment. Variance impacts the degree of confidence one has in the expectation of the trial outcome (a similar concept to a confidence interval in statistics).¹¹¹ We know from experience that certain cases are high variance (e.g., securities class actions),¹¹² and this risk is reduced marginally through the litigation process up to the trial verdict, while other cases are less volatile in their outcomes (e.g., routine auto accidents).¹¹³ Variance as a legal concept goes to the level of con-

109. See Rhee, *supra* note 4 (manuscript at 29–35, on file with author).

110. Cf. George Lowenstein & Don A. Moore, *When Ignorance Is Bliss: Information Exchange and Inefficiency in Bargaining*, 33 J. LEGAL STUD. 37, 37 (2004) (“[S]hared information, if open to multiple interpretations, is likely to be interpreted egocentrically by the disputants, which can cause beliefs to diverge rather than converge.”).

111. In statistics, a confidence interval is calculated as a function of the available data set. BULMER, *supra* note 33, at 164–68; EDWIN L. CROW, FRANCES A. DAVIS & MARGARET W. MAXFIELD, *STATISTICS MANUAL* 18 (1960). Sometimes, probability and confidence get confused. When a person says, “I’m 99 percent sure of X,” there are two potential meanings in ordinary speech: (1) the statement could mean “if the event were to repeat 100 times, I believe X will occur 99 times;” or (2) it could also mean “I believe more likely than not that X will occur, and I am very confident of my prediction.” The first comment is a comment on true probability, and the second comment is actually a statement of confidence.

112. See, e.g., Janet Cooper Alexander, *Do the Merits Matter? A Study of Settlements in Securities Class Action*, 43 STAN. L. REV. 497 (1991) (discussing high risk of securities class actions).

113. See, e.g., LAURENCE ROSS, *SETTLED OUT OF COURT: THE SOCIAL PROCESS OF INSURANCE CLAIMS ADJUSTMENTS* 133–35 (1970) (noting that simple cases are “routinized”).

fidence one has in a probability assessment, particularly since objective data is lacking.

Variance can also describe the relationship between frequency of an adverse judgment and severity of the judgment amount. Consider a case where the probability of liability is small, but a finding of liability may mean an extraordinary payout.¹¹⁴ Imagine a case where the payouts are [1000, 0] with corresponding probabilities of 1 and 99 percent. The expected value is 10. In these types of cases, rational parties may settle at a value higher than the expected value. In his study of insurance settlements, Laurence Ross observed that insurance companies may offer “danger value,” which is a premium in excess of the expected value, to eliminate exposure to a potentially severe jury verdict.¹¹⁵ This is surprising since insurance companies are pure players in the risk trade and are viewed as being risk neutral. The effect of risk on insurers, however, is more subtle. Insurers build in a premium to the price when the risk is unusual or particularly incalculable,¹¹⁶ and the same concept is at work in the claims process. In both the front-end of underwriting and the back-end of claims processing, the goal of an insurer, a pure trader in risk, is to smooth out potentially violent swings in expected outcomes since volatility of earnings increases its cost of capital. Thus, high variance of outcomes is not a positive economic trait even for a typically risk neutral person.

3. Problem of Perspective

The real option model lacks a degree of perspective, a connection between theory and empirical observation, particularly in the analysis of NEV (negative expected value) cases. Recall that a case with an ex-

in insurance claims process). However, the forecasting of judicial outcomes is “certainly more complex and more sensitive to the particular aspects of a given claim than the procedure used in routine cases.” *Id.* at 115. Factfinding always involves “a measure of speculation and conjecture.” *Lavender v. Kurn*, 327 U.S. 645, 653 (1946).

114. In insurance, the underwriting of low frequency, high severity risks poses unique difficulties. See Robert J. Rhee, *Terrorism Risk in a Post-9/11 Economy: The Convergence of Capital Markets, Insurance, and Government Action*, 37 ARIZ. ST. L.J. 435, 473–74 (2005) (stating insurance can cover unusual risks).

115. ROSS, *supra* note 113, at 202. Ross justified the rationality of danger pay on the basis of transaction cost savings. *Id.* at 203.

116. In underwriting, insurance premium is determined by the following formula: $P = E(S) + k + R$ where $E(S)$ is the expected value of the claim, k is the operating expenses, and R is a “risk premium which allows for coverage of unforeseen deviations in the claims amount to be paid.” See ERIC BRIYS & FRANÇOIS DE VARENNE, *INSURANCE: FROM UNDERWRITING TO DERIVATIVES* 6 (2001). Obviously, the greater this potential unforeseen deviation, the greater would be the risk premium.

pected judgment of 100 and transaction cost of 140 may still produce a settlement value of 100 even though the expected value is -40 . While the precise mathematical procedure deriving this result is clear, what is unclear is its relationship to the empirical world. Most NEV cases are either not brought or are settled for nominal nuisance value, absent mistake or incompetence. In the real option model, the large settlement value of an NEV case rests on the assumption that a plaintiff *would* pursue a losing case on a limited basis. If this threat is not credible, a defendant will not settle. The plaintiff likewise understands this. This situation creates a problem of strategy.

While PEV (positive expected value) cases are positive-yielding, an NEV case is a speculative endeavor. Under a real option analysis, a positive settlement value is not a certainty or even a reasonable expectation. The defendant may rationally opt to wait rather than offer a settlement immediately. If so, the plaintiff must initiate the litigation to have any hope of a positive outcome, lest the game is one of waiting in which case the plaintiff always loses. This situation creates a potential for brinksmanship. Settlement depends on the credibility of the plaintiff's willingness to engage in risky behavior. If he does not engage in litigation, there may be no return. If he engages in litigation, the best possible outcomes are a settlement of 100 at the end of Stage 1 (a net positive 30 return after deducting cost) or litigation through Stage 2 resulting in a net loss of -40 .¹¹⁷ Given the spread of these returns, the "investment" in an NEV case must be considered highly speculative. In this light, the defendant would have little incentive to pay 100, a princely sum in light of the poor prospects of the plaintiff's return, precisely because the credibility of the threat is marginal. Accordingly, the most likely prediction is that the plaintiff would not initiate the lawsuit or the defendant would settle for a small nuisance value. This is a far simpler explanation that in fact correlates with empirical observation.

4. Implication on Risk Preference

Perhaps the most troubling aspect of the real option model of valuation is its implication regarding the nature of risk preferences. Recall that derivatives have two general purposes in the market—hedging and speculation. The real option model emphasizes the importance of speculation:

117. Since the litigation cost of 70 spent in Stage 1 is sunk cost, it is rational to pursue litigation at the cost of 70 to earn a return of 100.

[It] suggests that “riskier” lawsuits can be more valuable to risk-neutral plaintiffs than “safer” lawsuits if the plaintiff is able to reduce or eliminate his litigation expenditures sufficiently in the event the lawsuit evolves poorly from the plaintiff’s perspective. . . . [R]isk-neutral defendants in our model can act as though they are risk-averse, and risk-neutral plaintiffs can act as though they are risk-seeking¹¹⁸

This conclusion is consistent with an option framework that analogizes the plaintiff to the holder of a call option. Since variance increases option value, holders like riskier assets whereas issuers prefer the opposite.

This distinction in attitudes towards risk is illusory. That the plaintiff is the holder of a call option seems intuitive enough. But the defendant is not only an issuer; he is also a holder of a put option on the underlying substantive right.¹¹⁹ A defendant gains if this right declines in value. To put it differently, this put option is in-the-money if there is a finding of no liability, a positive payoff to the defendant, albeit it is not a *cash* payoff. In the analysis of legal risk, it is best not to think in terms of cash payoffs, i.e., whether the defendant must pay the plaintiff. We start with the fact that each party is subject to a negative outcome from trial. The negative outcome to the defendant is obvious. For the plaintiff, the analogy of a lawsuit to a call option implies that he has nothing to lose but the option premium (transaction cost).¹²⁰ If true, it makes sense that he would prefer high variance. This proposition is misleading, however. It assumes that the only cost involved in the resolution of a dispute is the transaction cost (a cash cost), and arbitrarily starts the timeframe for the transaction at the time of filing the action. In reality, the injury to the plaintiff is also a cost, and the transactional timeframe begins upon the occurrence of the alleged wrong. At issue is an ambiguous right. It is unknown who owns the substantive right: whether the plaintiff has a right to compensation or the defendant has a right to harm. As Coase famously intuited, each party has harmed the other and the law simply allocates the right to do so.¹²¹ Litigation assigns the cost of this injury. A plaintiff’s loss of a case means that the cost must be internalized, and thus she has far more to lose than simply transaction cost.

If option theory is applied to a lawsuit, the analysis should recognize a put-call option parity in the relationship between plaintiff and de-

118. Grundfest & Huang, *supra* note 9, at 1315–16.

119. See *supra* note 51 (defining put option).

120. *Id.* at 1288.

121. Coase, *supra* note 3, at 13.

fendant.¹²² Upon the transaction giving rise to the injury, the defendant forces the plaintiff to issue a put option where the underlying asset is the substantive right. Upon filing of a claim, the plaintiff forces the defendant to issue a call option on the same asset. If the put option is in-the-money (a finding of no liability), the plaintiff loses the value of her injury, which is the defendant's gain. If the call option is in-the-money (a judgment of liability), the defendant loses the value of the injury, which is the plaintiff's gain. There is symmetry here. The transaction giving rise to the dispute resulted in a cost that has been *initially assigned* to the plaintiff. The ultimate assignment of this cost remains unclear. The best possible outcome for any party is the *original position* of zero cost (the plaintiff is remedied or the defendant owes nothing). Each party, in effect then, starts from the premise of the original position with an uncertainty of ultimately having the cost judicially assigned. The parties are tied together by the underlying transaction and the litigation payoffs are zero-sum.¹²³ Viewed this way, it is inaccurate to suggest that the defendant is only an issuer of a call option for there is no benefit that inures to him (recall that the transaction cost of litigation goes to the attorney). But the defendant has a potential benefit (winning the case), and the payoff of this benefit can be seen through the prism of a put option. Although the parties' payouts are mirror opposites, this put-call parity suggests that the risks are the same. The option analogy fails in the sense that the payoff of an in-the-money option simply places the parties in their original position, without profit or loss.

The conclusion that parties have different preferences for "riskier" and "safer" cases is thus suspect. If lawsuits are indeed real options, both the plaintiff and the defendant would exhibit risk seeking preferences as may be the case of option holders. The question is whether this behavioral prediction comports with observations of the empirical world, including settlement practices. It does not. Rather, parties behave in a manner generally consistent with risk aversion, which is assumed in asset pricing models.

122. This terminology is borrowed from the "put-call parity" principle of options markets. This principle says that the value of a call and put option on the same stock under the same terms must be governed by a precise mathematical relationship. See COX & RUBENSTEIN, *supra* note 50, at 39–44 (discussing the put-call parity).

123. The payout of a judgment amount is zero sum in that a defendant's loss is precisely the plaintiff's gain. The allocation of transaction cost is not a zero-sum game and can take the form of a cooperative game. Moreover, the valuational constructs between the parties may not be zero sum. For example, the disclosure of information may not have perfectly inverse correlative effect on mutual valuations.

V. INCOMPLETENESS OF THE STANDARD MODEL ANALYSIS

It is easy to see an analogy between an option and a lawsuit,¹²⁴ but option pricing theory does not apply well to the general framework of legal valuation. A fundamental problem is one of definition. An option is not a thing that generates its own value; it derives its value from the underlying asset. This is the case even for real options. We must be careful to distinguish option value from asset value. The standard text on corporate finance makes this distinction: "Notice that real options analysis does *not* replace DCF [discounted cash flow]. You typically need DCF to value the underlying asset."¹²⁵ An option analogy must recognize that the underlying asset is the dispute over the substantive right. The real option embedded in a lawsuit is the procedural option to litigate or settle. It has a value that is distinct from the value of the underlying right.

The definition of a derivative also explains the behavior and risk preferences of option holders and issuers. The holder of an option prefers higher variance of the price of the underlying asset, and the issuer prefers the opposite. This raises the question: is it true that, all else being equal, plaintiffs prefer higher risk lawsuits? The intuitive answer seems to be "no." After all, the ubiquitous refrain is that litigation is an endeavor that should be avoided if possible, and the rates of settlement and trial suggest that disputants heed this message. Moreover, the intuitive answer is consistent with the view that parties are investors in an economic venture. Most people dislike risk and they discount the value of an asset accordingly.

The suggestion is not that option theory is irrelevant. Every meritorious lawsuit has a degree of uncertainty. Without it, there would be no dispute since, by definition, the parties would agree on the outcome. Litigation reduces uncertainty through information acquisition. This procedural option must have value, suggesting that the greater the ambiguity surrounding the disputed right, the greater should be the value of this procedural right. Thus, the procedural right derives its value from the underlying asset (the substance of the dispute), which is consistent with the definition of a derivative.

Seen in this context, a lawsuit is fundamentally an asset that generates a future, uncertain cashflow. Asset pricing principles must govern

124. Indeed, in an earlier article, I too noted that a lawsuit "shares the essential characteristics of a financial option." See Rhee, *Application of Finance Theory*, *supra* note 16, at 137 (citing 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, 1955 (1998)).

125. BREALEY ET AL., *supra* note 27, at 598.

its valuation. In this regard, the standard model is an incomplete asset pricing model.¹²⁶ Probability simply calculates the expected value, but a mean value bears no relation to the variance of the data within. Thus, probability cannot account for a risk adjustment in the discounting process. The problem is the assumption of risk neutrality, which creates a glaring contradiction. If uncertainty is the ruling condition of a lawsuit, how can risk neutrality be the standard assumption?

As described above, DCF and NPV valuation is a two-step process. The first step forecasts a future cashflow. This forecast is simply the best guess as to the future—the expected value. Since this projection is subject to the vagaries of forecasting in an uncertain world, its sum cannot equal true economic value. The second step discounts the expected value by its risk. An expected value bears no relation to the risk therein. It is a probabilistic calculation; many sets of variables can produce the same expected value. Under the standard model two cases that are expected to produce binary outcomes [100, 0] and [51, 49] are valued at the same expected value of 50. This result ignores the marked differences in variance. Yet risk cannot be ignored in a valuational model simply by positing an assumption of risk neutrality. Accounting for risk should be a fundamental valuational consideration.

A simple corporate finance example is illustrative. Consider three firms with various businesses that generate income. Firm A has one line of business, which has an equal probability of generating earnings of 200 or 0. Firm B has two lines of business, each of which has an equal probability of generating earnings of 100 or 0. Firm C has one line of business that is certain to generate earnings of 100. The *quantity* of future cashflow of all three firms is the same (expected value of 100), but the *quality* of these earnings is not the same. Since the earnings of Firm C are certain, it has the lowest variance even though it is undiversified. The highest risk cashflow belongs to Firm A, followed by Firm B. If an investor was to provide capital, which firm would be charged the highest cost of capital? It must be Firm A due to its highest risk cashflow. It has an all-or-nothing prospect that makes its earnings more risky than the others. Thus, Firm A would have the lowest market value while Firm C would have the highest even though both firms are expected to produce

126. Most scholars assume that the standard model is an asset pricing model. See Cornell, *supra* note 10, at 178 (“[a]ccording to the discounted cash flow model, the value of a lawsuit equals the expected value of the payment at trial minus the cost of litigation.”); Grundfest & Huang, *supra* note 9, at 1273 (“[w]hen NPV analysis is applied to litigation, the lawsuit’s expected value is typically described as the probability that the plaintiff will prevail multiplied by the likely award.”); POSNER, *ECONOMIC ANALYSIS*, *supra* note 40, at 568 (“plaintiff’s net expected gain from litigating is the judgment if he wins discounted by his estimate of the probability that he will win, minus his litigation costs”).

the same cashflow on a probabilistic basis.¹²⁷

This intuitive understanding of the impact of probability and risk on valuation is portable to legal valuation. Consider three cases. Case A is a tort case for increased risk of a future harm from exposure to a carcinogen. If the future injury is proved by a preponderance of the evidence, the plaintiff recovers 200. If not, there is no liability. The entire case depends on the credibility of the two conflicting expert witnesses. Case B is a negligence action as a result of the plaintiff slipping on a banana peel on the supermarket floor. It is undisputed that the plaintiff broke her arm, causing a damage of 50, but the parties dispute the permanence of her disability. Upon a finding of permanent disability, the plaintiff would be entitled to another 100 in damage. The finding of permanent disability depends on the credibility of two expert witnesses who have offered conflicting testimony. Case C is a medical malpractice action in which the surgeon accidentally left a scalpel in the plaintiff's thoracic cavity, and the scalpel subsequently moved during ordinary body movement and cut a major vessel in the heart, killing the plaintiff instantly. The case of liability is clear, and the jurisdiction has consistently awarded 100 for wrongful death. The expected value of these three cases is 100, or thereabouts, but obviously the qualitative assessment of risk is different. Case A is highly speculative. Case C is not risky at all as liability and damage are clear. Case B falls in between. Although the probabilistic calculation of expected value yields approximately the same outcome, we recognize that risk must affect the value of these cases.

Just as a firm has a cost of capital, the risk of a lawsuit, which is the variance of return, determines the cost of resolution. Unlike the cash expense of transaction cost, the cost of resolution is less accessible because it is incorporated into the valuation. While it is correct that under the standard model "changes in variance have no effect on a lawsuit's credibility or settlement value,"¹²⁸ we must distinguish the deficiency of the standard model from any perceived shortcoming of asset pricing theory. Under asset pricing principles, risk *must* affect the value of an asset and the standard model fails to account for this concept.

Fundamentally, the process of dispute resolution is an exercise in risk management. In the above corporate finance example, we saw in rudimentary fashion how risk is reduced through diversification (Firm B is more diversified than Firm A and thus less risky). It is true that a single lawsuit cannot be diversified in the traditional sense if a party does not hold a portfolio of lawsuits. If there was a primary trading market

127. See *supra* note 48 (providing a market example of this concept).

128. Grundfest & Huang, *supra* note 9, at 1316.

for legal actions, or a derivative market to trade risk, much of the task of private dispute resolution would be governed by market pricing, and perhaps the legal profession of lawyers would share a role with a new profession of risk management firms. I recognize that these markets do not exist, and likely cannot exist for most classes of cases.¹²⁹ But there is a larger point beyond the merits of diversification. Each lawsuit has a level of risk associated with its expected value, and each party can take risk mitigation measures during the dispute resolution process. In the absence of market pricing, each lawsuit is a market onto itself, and each party is forced to be a “market-maker” for the other. As explained in the next section, the pricing of transactions within this micro-market determines settlement and litigation values.

VI. ESSENTIAL NATURE OF A LAWSUIT

A. *Portfolio Risk and Preference for Settlement*

The inherent benefit of reducing variance suggests that the assumption of risk neutrality in bargaining literature is unrealistic and misleading. Risk neutrality is defined as indifference between a sum certain and its expected value equivalent.¹³⁰ In a Coasian world of zero litigation cost, this implies that a risk neutral person would be indifferent between a certain settlement at the expected value and an uncertain trial, at least under the standard model. With identical views of probability, trials and settlements would be equally likely. With moderate variations of probability and risk preferences among parties, trials would still be frequent because differences in valuations resulting from different probability assessments may be offset by the premiums and discounts associated with differences in risk preferences. In the real world, however, trial is a highly infrequent event, and most cases settle.¹³¹ This empirical obser-

129. See Rhee, *supra* note 4 (manuscript at 24–29, on file with author) (explaining that legal disputes are not conducive to objective pricing). But see Marc J. Shukaitis, *A Market in Personal Injury Tort Claims*, 16 J. LEGAL STUD. 329, 334–41 (1987) (describing the benefits of a market in tort claims).

130. See, e.g., LANDES & POSNER, *supra* note 31, at 55–56; POSNER, *supra* note 40, at 11.

131. See Galanter, *supra* note 43, at 463 tbl.1, 507 tbl.4 (trial rate in federal civil actions declined from 11.5 to 1.8 percent); Gillian K. Hadfield, *Where Have All the Trials Gone? Settlements, Nontrial Adjudications, and Statistical Artifacts in the Changing Disposition of Federal Civil Cases*, 1 J. EMPIR. L. STUD. 705, tbl.7 at 730 (2004) (settlement rate for contested federal civil cases is approximately 68.7 percent). Indeed, most disputes settle without the intervention of law. See ROSS, *supra* note 113, at 141 (95 percent of automobile insurance claims are settled); ROBERT C. ELLICKSON, *ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES* 4–6 (1991) (most disputes among neighbors are settled).

vation raises two questions. First, why do parties settle? Second, how do they settle? The conventional wisdom focuses on the relative cash costs of settlement and litigation processing. The assumption is that settlement is far less costly than litigation, thus explaining the empirical observation.¹³² While these considerations are certainly valid, transaction cost economics, which focuses on processing costs, is an incomplete answer.¹³³

Transaction cost economics predicts that the incentive to settle diminishes with continued litigation since spent transaction cost is a sunk cost under the American rule of attorney fees.¹³⁴ Parties should be most likely to settle early when the economic surplus is the greatest. But empirical observation belies the prediction. Settlements occur at all stages of litigation, seemingly at random points in time.¹³⁵ Many cases settle at a point when virtually all transaction costs have been expended.¹³⁶ If transaction cost considerations account for the tendency to settle, continued litigation should spiral toward trial. These phenomena and contradictions have puzzled scholars and attorneys alike.¹³⁷ There is a perception of wasteful activity, a forlorn mourning of lost possibilities upon hindsight, and a frustration with the apparent inefficiency in the legal system where the attorneys, if not the clients, are repeat players.¹³⁸

132. See Cooter & Rubinfeld, *supra* note 4, at 1075.

133. When the stake at dispute is small relative to the transaction cost involved, then transaction cost saving is the predominant factor. Many small cases are settled primarily with transaction cost in mind. See ROSS, *supra* note 113, at 141. However, when cost becomes relatively smaller, it is not a predominant factor, but simply one of many factors that go into the decision of settlement or trial. See *id.* at 163 (“This study and others have found that proportionally more large cases than small cases do in fact go to trial, consistent with the hypothesis that trial reflects manifest disagreement in negotiation.”); Posner, *supra* note 1, at 419 n.29 (“There is empirical evidence that higher stakes do increase the likelihood of litigation.”).

134. See Rhee, *supra* note 4 (manuscript at 34, on file with author).

135. See POSNER, *supra* note 40, at 574 (“A final question about settlement is, when does it occur? It can be at any time in the course of a legal dispute, including before suit is filed and after judgment is rendered by the trial court. Many cases in fact are settled on the eve of trial.”).

136. See Leandra Lederman & Warren B. Hrun, *Do Attorneys Do Their Clients Justice? An Empirical Study of Lawyers' Effects on Tax Court Litigation Outcomes*, 41 WAKE FOREST L. REV. 1235, 1273 (2006) (“more settlements will occur later in the litigation process—and close to the date set for trial—than earlier in the litigation”).

137. See O'Connell, *supra* note 31, at 259, 269 (“Rather, we have a system that results in prolonged, expensive fights over whether claimants are deserving. . . . If early offers benefit both claimants and defendants, why don't parties reach the early offers result in the current system through pretrial bargaining?”).

138. The common explanation for settlement in the face of exhausted costs focuses on the assumption that probability assessments have converged. See POSNER, *supra* note 40, at 568. But this is more of an assumption that conveniently explains away the empirical observation. See Rhee, *supra* note 4 (manuscript at 34, on file with author); see also Lowenstein & Moore, *supra* note 110, at 37 (suggesting that the disclosure of information leads to divergence of

This problem is more apparent than real. It is the inevitable product of a limited definition of cost. If transaction cost is the only cost of resolution, settlement would be far cheaper, thus the "axiom that a bad settlement is almost always better than a good trial."¹³⁹ But the conventional wisdom underestimates the true cost of resolution. The cost of settlement is small only if it is seen as a cash expense of processing. While this is the common understanding, it is an incorrect view. Settlement cannot be a cost-free endeavor because it is a risky transaction. This risk is not recognized in a cash expense, but is imbedded in the valuation. It is difficult to grasp or measure. But the acceptance of an unsupported valuation early in the litigation to save transaction costs may prove the enduring adage "penny wise, pound foolish." The process of settlement can result in a deal that is substantially below the "fair" value of a lawsuit. The proverbial fear among parties of leaving money on the table, a known empirical observation, suggests that litigants implicitly consider the true cost of resolution.¹⁴⁰ Settlement can be a process where one cost is simply swapped for another without apparent advantage. Thus viewed, transaction cost economics is an incomplete answer to the question of settlement.

The primary reason parties settle is to terminate the uncertainty of trial.¹⁴¹ Simple in concept, this statement requires some unpacking. We start with the basic premise of risk. Here, Markowitz's seminal work on Portfolio Theory provides a good analytical tool. Any given portfolio of investments has an expected return and risk. Risk is measured as dispersion about the expected return.¹⁴² Markowitz rejected the once-standard rule of investment that "the investor does (or should) maximize discounted expected, or anticipated, returns."¹⁴³ This rule of expected value is inferior because it implies that variance is irrelevant.¹⁴⁴ He observed

views on probability as each party interprets ambiguous evidence egocentrically).

139. *In re Warner Communications Sec. Litig.*, 618 F.Supp. 735, 740 (S.D.N.Y. 1985), *aff'd*, 798 F.2d 35 (2d Cir. 1986).

140. See Chris Guthrie, *Better Settle Than Sorry: The Regret Aversion Theory of Litigation Behavior*, 1999 ILL. L. REV. 43 (1999) (positing that parties make bargaining decisions to minimize the emotion of post-transaction regret). The fear of regret is based on sound financial economic principles.

141. In the context of insurance disputes, Ross suggests the primary reason why parties prefer settlement: "The claimant can eliminate the chance of no award and the defendant can eliminate the possibility of a 'runaway' jury verdict by a compromise that violates the letter of the formal law but accords with the spirit of negotiation." ROSS, *supra* note 113, at 141.

142. Markowitz, *supra* note 5, at 89.

143. *Id.* at 77.

144. *Id.* This rule prescribes that if an investor believes Enron, for example, is a good investment, he should buy as many shares as possible. Apparently, Ken Lay, former chief executive officer of Enron, had most of his wealth in Enron stock, and at one point it reached an approximate value of \$400 million. KURT EICHENWALD, CONSPIRACY OF FOOLS: A TRUE

that diversification reduces variance such that a diversified portfolio with an expected return is superior to an undiversified one with the same expected return.¹⁴⁵ Rather, the better rule is that “the investor does (or should) consider expected return a desirable thing *and* variance of return an undesirable thing.”¹⁴⁶ Consequently, the prescription is that an investor should maximize return at the lowest risk.

Portfolio Theory explains the preference for settlement. There is a parallel between the rule of investment that Markowitz rejected and the standard model of legal bargaining. The standard model implies indifference between a sum certain and its expected value equivalent in a costless world. Since litigation is not “free,” transaction cost constitutes the primary basis for the policy favoring settlement, as well as the empirical observation that most cases settle. But Portfolio Theory suggests that an investor should not be risk neutral when there is an opportunity to eliminate it without conceding expected value. If the prevailing valuation construct assumes that most people are risk averse, an investor should seek the expected value at the lowest variance. One should only be indifferent between a *risk-adjusted* sum and its expected value equivalent. Without this adjustment one should prefer the certain return over its probabilistically equivalent return for the simple reason that the investor is not being paid to bear risk. All things being equal (a significant condition), settlement is preferred because it reduces the variability of outcome. Thus, the elimination of variance is the key inducement to bargaining.

B. Risk Hedging in Settlement

If risk fundamentally defines a lawsuit from an economic perspective, dispute resolution is an exercise in portfolio risk management. Under this framework, differences in perceived variance, *even with the same view of probability and expected value*, produce different valuations. We start with the simple case where the parties agree on probability *and* variance. In a Coasian world of zero cost, the expected payoffs are equal probability, binary outcomes of [100, 0]. The parties are exposed to the variance of outcome since trial is an all-or-nothing proposition. If they

STORY 370, 418 (2005). Despite urgings from his family members to diversify, he did not do so, saying “Why sell a stock when you feel strongly it’s going to continue on up?” *Id.* at 370.

145. The concept that diversification reduces risk is not new, but is found in interesting places. See WILLIAM SHAKESPEARE, *THE MERCHANT OF VENICE*, act 1, sc. 1 (“My ventures are not in one bottom trusted, nor to one place; nor is my whole estate upon the fortune of this present year; Therefore, my merchandise makes me not sad.”).

146. Markowitz, *supra* note 5, at 77.

wish to eliminate this risk, the expected value of 50 must be realized through settlement at the midpoint. This is clear enough. But the transactional mechanics achieving this Solomonic result are more nuanced. Each party hedges the risk of variable outcome by implicitly executing mutual gaming (or derivative) transactions.¹⁴⁷ If the judgment is 100, the plaintiff would pay the defendant 50; but if the judgment is 0, the defendant would pay the plaintiff 50. Each party bets 50, and thus the betting odds are even at 1:1. When these bets are in place, the risk is perfectly hedged and the trial outcome is irrelevant.¹⁴⁸ The risk-reward profile is efficient in the sense that the expected return is maximized at the lowest risk.¹⁴⁹ It is true that each party could achieve a better result *ex post* by risking trial, but this point is irrelevant because risk management is an *ex ante* exercise. Settlement must be the preferred outcome even in a costless world. Table 1 illustrates the hedging transaction.

Table 1: *Hedging Transaction*

	<u>Outcome</u>	<u>Bet</u>	<u>Net Cash</u>
<u>Scenario 1</u>			
Plaintiff	+100	-50	+50
Defendant	-100	+50	-50
<u>Scenario 2</u>			
Plaintiff	0	+50	+50
Defendant	0	-50	-50

In the parlance of finance, each party hedges its position by issuing a put option *against* its most favorable outcome. When there is mutual-ity of hedges, the returns are locked in and there is settlement. Since a gaming analogy is more intuitive than an analogy to financial derivative transactions, the remainder of this section applies a gaming perspective.

147. A derivative transaction is very much like a gaming wager in which each party makes a bet on the movement and volatility of the underlying asset or index. *See supra* Part III.B.

148. Gould conducted a similar analysis: "a 'probabilistic' settlement is made wherein A agrees to reduce his claim against B in the event that A wins in court in exchange for an agreement that B will pay A something if A loses in court." Gould, *supra* note 1, at 290. Gould analyzed the case of differing probabilities and expected value. *Id.* at 296 ("If differences in probability estimates exist, then individuals will go to court and make what is in effect a 'side bet' on the outcome."). The analysis, here, maintains probability and expected value as a constant and varies the perceived risk.

149. From the defendant's perspective, the return is maximized when the cash outflow is minimized.

Here, settlement is possible because a common wager fixes the profit or loss for both parties. Even in a zero transaction cost world, there is no incentive to litigate. No party can “profit” any further, and consequently there is no incentive to “trade” in the underlying legal dispute. This result is independent of transaction cost considerations. Thus, a simple definition of settlement is the following: *In the special case where the parties agree on the expected value and variance of outcomes, a rational settlement is achieved when returns are fixed and variance is eliminated through a mutual series of implied hedging transactions.*

The inclusion of transaction cost does not change this analysis, except that a common return to both parties is impossible. For example, if transaction cost is 10 for each party, the expected value of the lawsuit is still 50, but a matching bet of 50 results in plaintiff’s cash inflow of 40 and defendant’s outflow of 60. But the important point is preserved: the expected value is fixed for each party. The parties would still settle at 50 since variance is eliminated, except that we recognize an important benefit of extracting economic surplus from saved transaction cost. For the moment, the following examples exclude transaction costs, but they are not forgotten for long.

If there is no mutual hedging strategy, litigation can continue even in a costless world. This conclusion apparently differs from the prediction of the Coase Theorem, which states that in a costless world the initial assignment of legal rights is “without effect” since parties will achieve a private ordering that efficiently allocates economic resources.¹⁵⁰ The theorem assumes that “the results of legal actions [are] easy to forecast.”¹⁵¹ Yet, if the outcome is highly uncertain, as would be the case at the start of most lawsuits, parties are incentivized to resolve this ambiguity for there would be a wealth effect of that judicial assignment of right. The key assumption of the Coase Theorem is that economic assets are allocated efficiently under “conditions of perfect competition” where “the price system is assumed to work smoothly (that is, costless).”¹⁵² The real market, Coase reasoned, is one of transactional friction, and cost must be a substantial consideration. Implicit in Coase’s conception of transaction cost is the recognition that sound risk-reward analysis disfavors speculation. As a result, cost expenditure is needed to determine the price of the transaction.

150. Coase, *supra* note 3, at 10; see Guido Calabresi, *Transaction Costs, Resource Allocation and Liability Rules — A Comment*, 11 J. L. & ECON. 67, 68 (1968) (“If one assumes rationality, no transaction costs, and no legal impediments to bargaining, all misallocation of resources will be fully cured in the market by bargains.”).

151. Coase, *supra* note 3, at 19.

152. *Id.* at 6.

In most cases, probability, variance and risk preference are different between parties. If an independent gaming market exists, each party can construct their own portfolios of risk and the cost would simply be the fee charged by the bookmaker or the risk management firm.¹⁵³ Since an independent gaming market does not exist, the parties must replicate the transactions internally. Thus, we must ask: what conditions dictate these implicit wagers? A key concept in answering this question is confidence. Confidence determines the level of investment, which is considered an informed bet on a future outcome. In his landmark work *The General Theory of Employment, Interest, and Money*, John Maynard Keynes noted the role of confidence in investment:

It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain. It is reasonable, therefore, to be guided to a considerable degree by the facts about which we feel somewhat confident, even though they may be less decisively relevant to the issue than other facts about which our knowledge is vague and scanty. For this reason the facts of the existing situation enter, in a sense disproportionately, into the formation of our long-term expectations; our usual practice being to take the existing situation and to project it into the future, modified only to the extent that we have more or less definite reasons for expecting a change.

The state of long-term expectation, upon which our decisions are based, does not solely depend, therefore, on the most probable forecast we can make. It also depends on the *confidence* with which we make this forecast—on how highly we rate the likelihood of our best forecast turning out quite wrong. If we expect large changes but are very uncertain as to what precise form these changes will take, then our confidence will be weak.

The *state of confidence*, as they term it, is a matter to which practical men always pay the closest and most anxious attention. But economists have not analyzed it carefully and have been content, as a rule[,] to discuss it in general terms.¹⁵⁴

Keynes's idea addressed capital investments in the macroeconomic context, but it easily applies to the microeconomic context of legal bar-

153. See Rhee, *supra* note 4 (manuscript at 32–33, on file with author).

154. JOHN MAYNARD KEYNES, *THE GENERAL THEORY OF EMPLOYMENT, INTEREST, AND MONEY* 148–49 (Harbinger 1965) (1935).

gaining. Where the goal is investment vis-à-vis speculation,¹⁵⁵ an uninformed bet is an irrational one. Confidence is one arbiter of rationality. When uncertainty is perceived to be low, parties rationally place greater bets because they are more confident. But when variance is high, as is typical in beginning of a legal action, it would be foolish to wager without the receipt of offsetting odds for the risk taken. High risk cases are problematic because the amount of wager necessary is high, but the economics dictate lower wagers. When both parties face the same uncertainty, it would be tempting to view the mutuality requirement as offsetting risks, i.e., speculative bets by the parties on opposite propositions could be seen as offsetting. However, there would be a paradox in that the rationality of one's act would depend on the irrationality of the other's. If mutual speculation is rational, it would be equally rational to decide the case on the basis of a coin flip. Rational investment means an informed decision.¹⁵⁶

The matter is also complicated if two parties do not hold the same view of risk. In a philosophical sense, the uncertainty in a case is perhaps one objective state (only an experiment of repeated trials would confirm this), but, absent omniscience, the important consideration is the *perception* of uncertainty, which varies with the subjective views of the parties. In the early stages of litigation then, settlement is more difficult because the amount of the betting required to fix a rate of return would be higher than what the parties may be willing to underwrite even considering the anticipated transaction cost.

Consider a simple case where the parties share the same view of probability and expected value, but differ on variance. The plaintiff views the case as high variance with expected outcomes [100, 0], and the defendant views it as slightly lower variance [75, 25]. The expected value under both perceptions is 50, but the plaintiff believes there is a good chance of losing the case while the defendant believes liability is a foregone conclusion and the case will turn on the extent of damages. The two cases may represent the temporal (or procedural) evolution of a case from filing, when little may be known about the case, to a later procedural stage, when some of the variance has been reduced through the

155. Markowitz distinguished investment from speculation in that investment entails behavior that maximizes return at the lowest risk whereas speculation entails the assumption of risk without appropriate return. Markowitz, *supra* note 5, at 87–89.

156. See Kenneth J. Arrow, *Information Acquisition and the Resolution of Conflict*, BARRIERS TO CONFLICT RESOLUTION 259 (Kenneth Arrow et. al, editors, 1995) (“It is common to say that conflicts can be resolved more easily under full information, when all parties concerned understand the consequences of the alternative possible policies or other decisions.”).

process of discovery and court rulings.¹⁵⁷ For now, assume they are the same case at the same point in time, except that the parties hold different views of risk. Under both the standard model and the Grundfest-Huang real option model, the settlement value would be the expected value of 50.¹⁵⁸ If the proposition that variance must affect valuation is to have meaning, the valuations must be different.

The analysis starts with the betting amount. Since the parties differ on risk, there is no longer one bet that fixes the returns for both parties. We note the outcome most favorable to the plaintiff, either 100 in the plaintiff's view or 75 in the defendant's view, as Scenario 1, and the outcome favorable to the defendant, either 0 or 25, as Scenario 2. To fix the expected value at 50, the plaintiff must bet 50 but the defendant can only bet 25. For the defendant, a bet of 50 results in net cash of -25 for Scenario 1 and -75 for Scenario 2, the same net result if no bet was placed. Table 2 illustrates the problem of mutuality.

Table 2: *Problem of Mutuality*

	High Variance Plaintiff's Perception			Low Variance Defendant's Perception		
	Outcome	Bet	Net Cash	Outcome	Bet	Net Cash
<u>Scenario 1</u>						
Plaintiff	+100	-50	+50	+75	-50	+25
Defendant	-100	+50	-50	-75	+50	-25
<u>Scenario 2</u>						
Plaintiff	0	+50	+50	+25	+50	+75
Defendant	0	-50	-50	-25	-50	-75

Mutuality at the plaintiff's required bet of 50 is impossible because the defendant receives no benefit in the reduction of risk (i.e., the returns are the same post-bet). Any bet outside of 25 would be pointless for the defendant. For example, if he bets 30, the returns are [-45, -55], the same returns if the bet was 20. Thus he has no incentive to bet outside of the range 0-25. The defendant's position is the constraint. Mutuality at

157. At the start of a case, notice pleading practice only requires that the complaint be a "short and plain statement" of the claim and defense, and the ethical obligation requires only "an inquiry reasonable under the circumstances." FED. R. CIV. P. 8(a)-(b), 11(b).

158. For the purpose of the real option model, we would need to know the level of transaction cost. If we assume transaction cost of 20 divisible into two stages, the settlement value would be 50 for both scenarios.

the defendant's maximum bet of 25 fixes his return, but produces a variable return for the plaintiff of [75, 25]. If the parties select trial with these bets in place, the defendant's position is perfectly hedged at the expected value of -50 and he has no risk.¹⁵⁹ But the plaintiff's position is variable and she bears the cost of variance. Table 3 shows the outcomes when the bets are placed under the defendant's constraints.

Table 3: *Bets Under the Defendant's Constraint*

	High Variance Plaintiff's Perception			Low Variance Defendant's Perception		
	Outcome	Bet	Net Cash	Outcome	Bet	Net Cash
<u>Scenario 1</u>						
Plaintiff	+100	-25	+75	+75	-25	+50
Defendant	-100	+25	-75	-75	+25	-50
<u>Scenario 2</u>						
Plaintiff	0	+25	+25	+25	+25	+50
Defendant	0	-25	-25	-25	-25	-50

This risk analysis simply states the obvious starting point—the plaintiff's position is riskier. If risk is a bad thing, she has two options. She can eliminate the risk by selling it to the defendant, who will only buy it for a price (i.e., concession in expected value), or by reducing it through continued litigation.

Consider first the choice of settlement through a concession in valuation. We start with the rule that risk and reward are tradeoffs. Under Portfolio Theory, there is an efficient horizon of risk and reward, suggesting that one cannot increase return without assuming greater risk.¹⁶⁰ Reducing risk is not per se a superior proposition; rather assuming *unnecessary* risk is an inferior proposition. The prescription is to reduce risk to the lowest level to achieve the expected return. Like arbitrage in the financial market, these rules play an important role in regulating price in legal disputes.

When one party perceives higher risk, a common wager amount that fixes the returns for both parties is impossible. Although the expected value is the same, the risk is different. The party perceiving the higher

159. The expected value of -50 cannot be considered a risk. It is simply a forecast of the projected cash outflow. The risk is the deviation from this expectation.

160. See BREALEY ET AL., *supra* note 27, at 180-92 (discussing Markowitz's efficient portfolio horizon).

risk must offer a discount, in the form of a concession to the expected value, to reduce the greater risk. The maximum discount is the expected value equivalent of the difference between the maximum wager amounts of both parties: $0 < \delta \leq W_H - W_L$ where W is the wager of the parties perceiving the high and low variance and δ is the discount. In the above case, the maximum discount is 25 ($= 50 - 25$). Thus the discount range is 0-25, which can be translated into a betting spread in the range of $1:1 < \delta \leq 1:3$. As a matter of terminology, this betting spread is called the *hedge ratio*. The hedge ratio determines the risk-reward tradeoff. The hedge ratio selected within the discount range is a function of each party's risk preferences.

Assuming that the parties share similar risk preferences and agree on the expected value and variance, we see that the hedge ratio is always 1:1. Absent strategic behavior or imperfection in information dissemination or acquisition, these conditions should always yield settlement. In the above case, the maximum hedge ratio of 1:3 means that the plaintiff implicitly bets 75 in exchange for the defendant's bet of 25. The bet at 1:3 fixes the plaintiff's return at 25. The defendant's position is now variable at $[0, -50]$, but the expected value of -25 is better than the -50 he was expecting with a bet of 25 at the 1:1 hedge ratio. The defendant assumes greater risk (a variable return) for greater return (a reduction in expected value). Given these bets and the resulting reallocation of the portfolio risk, the expected value has changed from ± 50 to ± 25 . Table 4 shows the transaction at a 1:3 hedge ratio.

Table 4: Transaction at 1:3 Hedge Ratio

	High Variance Plaintiff's Perception			Low Variance Defendant's Perception		
	Outcome	Bet	Net Cash	Outcome	Bet	Net Cash
<u>Scenario 1</u>						
Plaintiff	+100	-75	+25	+75	-75	0
Defendant	-100	+75	-25	-75	+75	0
<u>Scenario 2</u>						
Plaintiff	0	+25	+25	+25	+25	+50
Defendant	0	-25	-25	-25	-25	-50

Differences in perceived variance affect settlement valuation even when the parties agree on the expected value. In practice, settlement cannot be valued only in terms of expected value. In most cases, expected value does not equal true economic value. Thus viewed, we mod-

ify the definition of settlement: *In the case where parties agree on a common expected value but differ on variance of outcomes, a settlement is achieved when variance (risk) and expected value (reward) are exchanged through a mutual series of implied hedging transactions such that one party reduces variance and the other increases expected value.*

This article does not dispute that expected value is the most important determinant of value in the sense that it sets the general range of settlement values, i.e., the proverbial “are the parties playing in the same ballpark.”¹⁶¹ If parties cannot agree on the broad valuation parameters, there is little hope of private resolution. Once this general range is accepted, expected value loses much of its relevance: once the ballpark is identified, the game still remains to be played. Here, the perceptions of risk play a critical role in valuation. Higher risk results in greater discount to value. If a low risk case is valued at x , the party perceiving the higher risk case concedes a risk-adjusted discount δ : if the plaintiff ($x - \delta$), and if the defendant ($x + \delta$). Uncertainty is the fundamental driver of valuation and settlement behavior. The assumption of risk neutrality is not only irrelevant but also nonsensical in the context of bargaining. To ignore risk through an assumption of risk neutrality is essentially to ignore the most difficult part of the analysis.

Relative risk preference and perception are important factors. The proportions in which expected value and variance are exchanged in this implied bargain depend on the individual risk preference and cost of variance. Consider the situations of single-play individuals and repeat-play corporations. Repeat players such as insurers can take a less risk averse (perhaps even a risk-neutral) position on the variance of individual cases since a portfolio of assets and liabilities can reduce variance.¹⁶² Moreover, shareholders in a corporation can diversify away the risk of an investment in the corporation by holding a diversified portfolio. Single-play parties, typically individuals, are subject to the variance of an individual case and cannot diversify their risks by holding a portfolio. The only method of hedging the risk of variance of outcome is to engage in the implied series of gaming/derivative transactions described above. The same case, with operative facts and laws viewed similarly, can still present different risks, e.g., the risk of a portfolio versus an undiversified single event, or the differences in the impact of an adverse outcome. These differences may create a cost of variance differential. Thus, there is a potential for two different valuations though the parties may share

161. See ROSS, *supra* note 113, at 146 (“The expected value in litigation is thus the most important factor influencing the general level of settlement for a serious bodily injury claim.”).

162. See *id.* at 214 (“[T]he insurance company as a whole in defending large numbers of claims is unaffected by uncertainty with respect to any one claim”).

similar views of expected value.

Empirical observations confirm the application of risk-adjusted discounts in settlement practice. In his classic study of settlement behavior of insurance companies, Laurence Ross analyzed the way insurers and insureds treated risk and revealed this insight into real world practice.

The claimant contemplating settlement or litigation is faced with a calculus of probabilities. Settlement offers a known award with certainty whereas litigation offers an unknown award with an unknown probability, although both the award and probability may be estimated by the experienced attorney. In other words, litigation involves not only additional processing costs from the claimant's viewpoint; it also involves a gamble that may be totally lost. By taking many such gambles in litigating large numbers of cases, the insurance company is able to regard the choice between the certainty and the gamble with indifference. In the words of another analyst:

Generally speaking there will often be asymmetry between the parties, insofar as the suit is a regular, calculable element in business operations for one of them, and a unique event for the other. It means that the former will be . . . much less deterred by the likelihood of losing individual cases, providing he can transfer the loss to a group of customers or clients.

The insurance negotiator therefore expects the claimant to yield a discount for the certain payment:

We should always try to fix the fair settlement value from the standpoint of what a judge or jury would award. This does not mean that the defendant should pay in settlement the full sum that he feels would constitute the jury's verdict. He should force proper reductions from that sum by taking advantage of the considerations that the outcome of a lawsuit is always uncertain and that the defendant has some opportunities of emerging victorious.

Moreover, this expectation is shared by the claimant's side of the bar:

I have always recommended to the injured person that a

settlement of 75 to 80 per cent of the probable recovery should be accepted.¹⁶³

It is important not to attribute Ross's observations to just differences in risk preference between single-play policyholders and repeat-play insurers. For an insurer, a lawsuit is "a regular, calculable element in business operations" whereas for an individual it is "a unique event for the other."¹⁶⁴ Also, relative to one's wealth, the litigation stake is far greater for most individuals than it is for most corporations, suggesting that the cost of a negative outcome will have greater impact on the former group. Thus, different perceptions and impact of risk and effects of variance of outcome result in different valuations.¹⁶⁵

C. *Litigation Option*

In the above example, we reasoned that the plaintiff may need to offer as much as a 1:3 hedge ratio, suggesting a settlement value of 25 when the expected value is 50. This may represent too much of a discount because litigation may present an opportunity to reduce the uncertainty associated with this discount at a marginal rate. Consider then the choice of litigation. Litigation is the product of the tension that always exists between settlement and speculation: the elimination of variance is good, but speculative betting is bad. Each party must reconcile this tension. When a settlement leans more towards speculation, the compromise is continued litigation, which reduces variance and avoids or delays a speculative bet. In the above case, the plaintiff may forego settlement if she considers the discount too high. This seems like an odd result in light of the standard model, which prescribes that if the defendant values a case higher than the plaintiff, there is a positive contract zone from which the parties can and should strike a deal. The reason for this incongruity is risk. Because risk imposes a higher cost of resolution, which reduces valuation, litigation may yield better pricing. No one can expect continued litigation to increase a party's probability of prevailing *qua* expected value. The expected value may increase, decrease or remain static; the assessment of a case follows a random walk that is largely unpredictable.¹⁶⁶ But it is rational to expect that continued litigation re-

163. *Id.* at 214–15 (citations omitted).

164. *Id.* at 214.

165. "Ordinarily, the parties prefer negotiation partly because of its certain recovery, and the claimant usually prefers the certain recovery even more than the insurance company, thus yielding a discount from the expected value in litigation." *Id.* at 218.

166. The knowledge that there is yet undisclosed information has no relevance to probability since probability is formed upon a rational connection among known facts. *See Rhee, su-*

duces uncertainty. Each party has a procedural option to litigate rather than to settle under unfavorable conditions. Since this real option is a right, it must have value.

Variance increases option value of the procedural right because there is more benefit to litigation.¹⁶⁷ This can be seen in a simple example. Consider a tort action in which it is unknown whether the defendant breached the standard of care. There is a set of facts $\{f_1 \dots f_{20}\}$ that bear on this issue. Each piece of information favors one party or the other with equal impact (noted as x), and they are disclosed smoothly throughout litigation along with a commensurate expenditure of transaction cost $\{T_1 \dots T_{20}\}$.¹⁶⁸ At the start of a case, assume that equal probability is a reasonable approximation.¹⁶⁹ If f_i is disclosed and it is favorable to the plaintiff, the parties must assess the plaintiff's probability of success as $P_1 = 0.5 + x$. This is the best assessment available at this point. The disclosure of f_i increases probability, but the confidence in these assessments must be low given that most facts $\{f_2 \dots f_{20}\}$ have not been disclosed.

Confidence is intimately linked to the perception of risk. In any given case, the risk of a lawsuit can be categorized into general and unique risk. General risk is the risk associated with the inherent uncertainty of human decisionmaking given a set of facts and laws from which plausible reasoning can produce multivariate outcomes. Unique risk is the risk specific to the case such as the applicable laws and unique set of facts and circumstances that define the case.¹⁷⁰ General risk can never be eliminated absent a bribe, undue influence or other illegality.¹⁷¹ Dis-

pra note 4 (manuscript at 30, on file with author). In other words, if λ represents the impact of undisclosed information, then $P = \lambda \cdot P$.

167. See Grundfest & Huang, *supra* note 9, at 1276 ("[T]he larger the variance, the more dramatic and potentially valuable the information waiting to be disclosed during the course of the lawsuit. . ."). If the future is a certainty, there would be no value in the procedural right to pursue trial. Settlement would occur at the price of the certain outcome.

168. I make a distinction between information and noise. Noise is "the arbitrary element in expectations," the diverse array of unrelated elements that causes price to deviate from intrinsic value. Fischer Black, *Noise*, 41 J. FIN. 529, 529-30 (1986). Information is the element that is relevant to discern intrinsic value. *Id.*

169. The statistical Principle of Indifference provides that "two events are equally probable if we have no reason to suppose that one of them will happen rather than the other." BULMER, *supra* note 33, at 8. This is not an absolute rule in legal bargaining. Obviously, each party possesses information, and there is significant information asymmetry. But in many cases parties may be reduced to an assumption of equal probability without the benefit of formal discovery.

170. This concept is borrowed from Markowitz's Portfolio Theory. See BREALEY ET AL., *supra* note 27, at 162 & nn.26-27, 181-82 (discussing the concept of market risk and unique risk in Portfolio Theory).

171. See Rhee, *supra* note 4 (manuscript at 43-44, on file with author). The law implicitly makes distinctions between risk unique to a specific transaction or act, and general risk that is

closure and information mitigates the unique risk of a case, and thus we can say that confidence is a function of the unique risk. The expected value is the best estimation of the trial outcome J' , but a party must also expect deviation from this assessment. The more risky a proposition, the less confidence one has in it. With this in mind, the further in procedural distance the assessment of expected value is from the trial outcome J' , the less confident one would be. In other words, a party should be less confident in his belief of trial outcome at the filing of an action than on the eve of trial.¹⁷² Each fact or ruling moves expected value closer to J' , and the limit of perfect disclosure is general risk. If the sequential disclosure of favorable and unfavorable information is evenly distributed and random, and if the case is litigated a number of times in a controlled experiment, the relative frequency should be close to 0.5, though we would expect individual cases to deviate significantly from the mean as a result of normal distribution. Like stock prices, individual case assessment moves in a random walk through the litigation process.¹⁷³ This motion, or volatility, determines the value of the procedural option.

As probability moves with the legal process, the cumulative impact of the disclosures is subject to a diminishing marginal utility effect.¹⁷⁴ Assuming equal weight of information, we expect that each subsequent disclosure would have less impact on the assessment. For example, the first packet of information f_1 would have a greater influence on probability than the last packet f_{20} . If litigation is broken into two stages of trans-

ubiquitous. For example, this division of general and unique risk is implicit in the scheme for judicial review of arbitration awards. Any error pertaining to matters of unique risk, whether errors of law, procedure, evidence or factfinding, are generally not subject to reversal. *Wilko v. Swan*, 346 U.S. 427, 436–37 (1953) (Federal Arbitration Act does not provide for “judicial review for error”), *overruled on other grounds by* *Rodriguez de Quijas v. Shearson/American Express, Inc.*, 490 U.S. 477 (1989). But judicial review is available for errors related to corruption, fraud, undue means, and misconduct. *See* 9 U.S.C. § 10 (2000); *see also* *First Options of Chi., Inc. v. Kaplan*, 514 U.S. 938, 942 (1995) (judicial review available for “manifest disregard of law”). Likewise, one can make an argument that the doctrine of proximate cause is driven by a conceptual difference between ubiquitous risk that cannot be mitigated and unique risk created by a defendant’s negligent act. *Compare* *Brauer v. N.Y. Cent. & H.R.R. Co.*, 103 A. 166 (N.J. 1918) (defendant who negligently caused a collision is responsible for the petty theft of goods dispersed as a result of the accident), *with* *Watson v. Ky. & Ind. Bridge & R.R.*, 126 S.W. 146 (Ky. 1910) (defendant who negligently caused a derailment is not responsible for the destruction of property as a result of an arsonist igniting gasoline that had leaked due to an accident). The different results from these cases are discussed in terms of foreseeability, but another way to consider cases involving proximate cause is whether a defendant’s action increased a peculiar risk to a plaintiff or whether the relationship between factual causation and risk is simply coincidental.

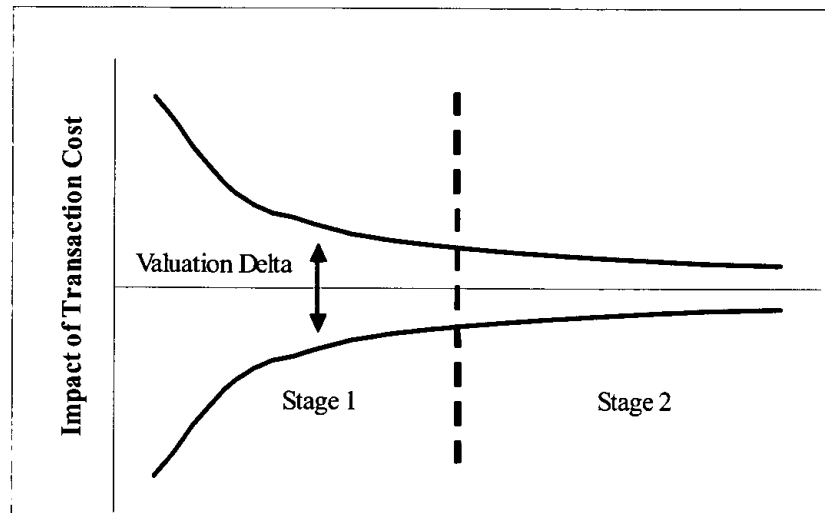
172. This is the same in the financial markets where, say, a speculator would have greater confidence in predicting tomorrow’s stock price than in the one year forward price.

173. *See* Rhee, *supra* note 4 (manuscript at 35–39, on file with author).

174. *See id.* at 47–49.

action costs: Stage 1 = $\{f_1T_1 \dots f_{10}T_{10}\}$ and Stage 2 = $\{f_{11}T_{11} \dots f_{20}T_{20}\}$ with smooth distribution of information, we see that, in our simplified world, litigation in the beginning stage has greater effect of reducing uncertainty.¹⁷⁵

Figure 1: Marginal Utility of Information



The litigation option is bought for a premium, which is the transaction cost. Unlike the premium in a financial option, transaction cost is not fixed, but incurred on a pay-per-use basis. It is the cost of accessing the pricing mechanism; it advances discovery, case theory development, and procurement of legal ruling, which collectively impact probability, reduce perception of variance, and influence settlement. Expending cost to acquire information can be a good thing, but the benefits are subject to diminishing marginal utility.¹⁷⁶ This is consistent with option theory, which says that the passage of time diminishes option value.¹⁷⁷ In litigation, procedural progress and time are approximate equivalents since a lawsuit unfolds in a sequential manner. At some point in the sequence, the cost-benefit analysis may, and often does, reach an equilibrium with transaction cost saving.

175. This assumes that each quantum of new information has equal weight. In a contested action that is not subject to pretrial disposition, evidence may vary as to impact, but sudden and radical shifts in case assessments are uncommon and evidence tends to be more incremental. Thus, the assumption is not too far of a stretch.

176. "Information is valuable; it is also costly, both in resources and in time. Value in improving decisions must be balanced against cost." Arrow, *supra* note 156, at 269.

177. See Cornell, *supra* note 10, at 183 ("Uncertainty is also a function of time. . . . 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.").

The option value changes with perceived variance. We continue the previous example of the high [100, 0] and low [75, 25] variance views. If the defendant values the low case at $V_d = 50$,¹⁷⁸ the plaintiff must value the high case at $V_p = 50 - \delta$. With equitable bargaining, the parties should settle at $(50 - \delta/2)$. But if settlement is struck at this amount, the discount $\delta/2$ represents “value leakage” in settlement and may require speculative betting. The plaintiff must then consider the alternative to settlement.

The trial option, noted as π , can be seen as the opportunity cost of foregoing litigation. Because the plaintiff perceives variance to be greater, we expect that $\pi_p > \pi_d$, and the option delta $\pi' = \pi_p - \pi_d$. Given the same view of expected value, the relative valuation is expressed in the equation: $50 + \pi_d = 50 - \delta + \pi_p$, which reduces to $\pi' = \delta$. The option value is bounded by the discounted amount. Thus, the expected value can be restated as the procedural option value plus the underlying asset value.

The option delta π' measures the discount that separates the parties' valuations at any given time. It may be difficult for the defendant to “buy” the option delta π' to settle because the value of continued litigation for him is only π_d . Payment for π' would offer no additional return to the defendant, which is to say that he should require a discount if the plaintiff holds a higher risk case. If the option is bounded by the discount amount and if the parties hold the same expected value with different views of variance, the parties would disagree on the relative valuations. In the above example, each party in isolation would value their case at 50. In a relative valuation, however, the defendant would discount the plaintiff's value by $\delta/2$ whereas the plaintiff would value her case at 50 since δ and π' are approximately offsetting. Concessions in bargaining then focus on the option delta (or risk discount). Even with a shared view of expected value, the valuations are typically pulled apart by different perceptions of variance as measured by the option delta (see above Figure 1). This is particularly so in the beginning of a case when uncertainty is the greatest and the incentive for concessions is the least due to the aversion to speculation.¹⁷⁹

178. Since the defendant perceives variance, his value must be more than 50. In other words, since he is in a position of acquiring a liability, he would be indifferent to a sum certain $(50 + \delta)$ to a variable outcome of [75, 25]. Note that in this posture, if the plaintiff is certain of the outcome [50, 50], the discount under the above method would be 12.5 and the parties would settle at 62.5, the mirror opposite of the result achieved in the above example. Keeping the defendant's value at 50 without a discount, however, produces no error because the hedging analysis reduces the defendant's position of [75, 25] to a sum certain equivalent [50, 50] by concomitantly reducing the plaintiff's variance from [100, 0] to [75, 25].

179. If litigation would eliminate all risk of trial outcome, we would expect a convergence

It is helpful to see how these concepts work in the context of transaction costs and the progress of litigation. We continue the example of the high [100, 0] and low [75, 25] variance cases. We divide the procedural context into pre-litigation and litigation. If settlement is achieved pre-litigation, assume the transaction cost is 0. If litigation proceeds, transaction cost is 10, twenty percent of the expected value, split into two equal Stages 1 and 2. If settlement is achieved at the end of Stage 1, each party incurs a cost of 5. For simplicity, we assume that probability and expected value do not change with continued litigation, though the ability of the parties to predict this *ex ante* is virtually impossible. For the purpose of modeling, only variance is reduced for both parties. Assume that the defendant's variance is reduced from [75, 25] to [60, 40] at the end of Stage 1. Because the plaintiff's case is riskier from the beginning, assume two possibilities of a future state: a moderate risk reduction [75, 25] and a high risk reduction [60, 40].

1. Pre-Litigation Stage

Based on the above conditions and as previously analyzed, the discount range is 0–25, implying a settlement range of 25–50. With equitable bargaining, the settlement value is 37.5. Since no transaction cost has been spent so far, this is the net value. As suggested above, however, this settlement may be too costly for the plaintiff given the opportunity cost of foregoing litigation. She may select litigation. Given the above assumptions, the choice of litigation may produce a future state of “moderate” or “high” risk reduction. Consider each separately.

2. Stage 1 Litigation (Moderate Risk Reduction)

At this stage, the plaintiff and defendant hold views of [75, 25] and [60, 40]. The plaintiff must bet 25 to eliminate risk, but the defendant can only bet 10. The hedge ratio is 2:5. This implies a maximum discount of 15, and so the valuation range is 35–50. With equitable bargaining, the settlement value is 42.5. Net of transaction cost, the plaintiff receives 37.5 and the defendant pays 47.5. The plaintiff is no better or worse off for litigating up to Stage 1, whereas the defendant is made worse off with litigation.

of true economic value to the gross expected value. This would be true under the discounting formula. In a riskless world where there is no time value of money, the “raw” expected value equals true economic value. For example, a value of 100 expected two years in the future equals a true value of 100 since $100 = 100 \div (1 + 0\%)^2$.

3. Stage 1 Litigation (High Risk Reduction)

Under this scenario, both parties view the outcomes as [60, 40]. Because they agree on probability, expected value, and variance, there is no longer a premium. Both parties would bet 10. With equitable bargaining, the settlement value is 50. Net of transaction cost, the plaintiff's return is 45 and defendant's is 55. This is a dramatic turn of events. By opting for litigation, the plaintiff has increased the value of her asset on a relative basis, while the defendant suffered losses in value. The table below summarizes these case scenarios.

Table 5: Comparison of Case Scenarios

	<u>Expected Outcomes</u>	<u>Bet</u>	<u>Hedged Outcomes</u>	<u>Premium Midpoint</u>	<u>Equitable Settlement</u>	<u>Net Re- turn</u>
<u>Pre-Litigation Stage</u>						
Plaintiff	[100, 0]	25	[75, 25]	12.5	+37.5	+37.5
Defendant	[75, 25]	25	[50, 50]	12.5	-37.5	-37.5
<u>Stage 1: Moderate Risk Reduction</u>						
Plaintiff	[75, 25]	10	[65, 35]	7.5	+42.5	+37.5
Defendant	[60, 40]	10	[50, 50]	7.5	-42.5	-47.5
<u>Stage 1: High Risk Reduction</u>						
Plaintiff	[60, 40]	10	[50, 50]	0	+50	+45
Defendant	[60, 40]	10	[50, 50]	0	-50	-55

The above examples show the connection between the theory of asset pricing and empirical observation. In theory, if parties agree in some general range of probability and expected value, they should settle as early as possible because of the overarching concern over litigation cost. In practice, however, contested cases settle later than earlier.¹⁸⁰ If expected value and probability are kept constant, the convergence of variance leads to a diminishment of the discount. The result is a closing of the valuation gap towards a more similar return. When parties differ on variance, the valuations are pulled apart by the option value. The parties must negotiate these differences, including the amount of the discount (concession to expected value). In the above example, each party has opportunities to achieve a settlement that is better than their own valuation. The plaintiff achieves superior valuation at the end of Stage 1

180. See *supra* notes 135 & 136 and accompanying text.

(High Risk Reduction) scenario net of transaction cost while doing no worse than the Pre-Litigation Stage at the end of Stage 1 (Moderate Risk Reduction) scenario. On the other hand, the defendant achieves better results than his valuation of 50 in the Pre-Litigation Stage and Stage 1 (Moderate Risk Reduction) scenario. When we account for the true impact of risk on valuation, the effect of the cost of resolution—a cost that is imbedded in the valuation—is apparent.

The above examples also show how valuation is intertwined with game theory. With the clarity of hindsight, the defendant could have fared better by demanding less discount as a part of the negotiation strategy. The problem of uncertainty, however, must always be viewed from an *ex ante* perspective: what is the best choice now given the known information and the uncertainty of the future? In the negotiation process, the defendant should have acquired information not only on the plaintiff's view of expected value, but also variance as reflected in the confidence level of assessment. In pre-litigation, the range of rational bargain was 25–50 with an equitable price point of 37.5. In hindsight, any settlement between 37.5 and 47.5 would have yielded better results for the defendant. Perhaps an offer of 40 would have made settlement less costly for the plaintiff, inducing the selection of settlement with an acceptable cost of resolution. The ability to assess these decisions, however, is only possible upon proper acquisition of information, not only about the facts and laws applicable to the case but also about the other party's assessments of probability and variance, a critical analysis needed for a relative valuation of the lawsuit. Such decisions are matters of negotiation tactics and strategy, issues beyond the scope of this article, but the point is that valuation and bargaining strategy are inextricably intertwined.

D. Restatement of Price Theory

At this point, a summary of the argument is helpful. A lawsuit must be valued under an asset pricing model. Expected value calculation under the standard model does not adjust for risk. In practical terms, the risk-adjusted discount depends on the degree of variance from the trial outcome (as measured by the degree of confidence). The primary benefit of settlement is the elimination of variance. In a dispute, a rational party actively manages and hedges risk. Consistent with financial economic principles, the parties implicitly barter for a reduction in variance by agreeing to mutually reduce risk when their views on risk are similar or by swapping expected return for reduction in risk when their views are sufficiently different. In the beginning, a settlement is difficult. There is

a Catch-22 situation in that the goal is risk mitigation but each party may be required to engage in speculation to do so. In the beginning, the risk-adjusted discount is significant. Parties would be averse to betting speculatively without an appropriate return. At any stage in the dispute, each party has a procedural option to litigate, and the premium is the transaction cost. This option value augments the lawsuit value and offsets, in whole or in part, the discount to expected value of the option holder. The greater the uncertainty in litigation, the greater is the option value. But the option value decays along a diminishing marginal utility curve. This decay coincides with a diminishment of the discount to the expected value as variance is reduced. All the while, the assessment of a case is a function of unknown information to be disclosed in the future, and it moves in a random walk as the future impact of undisclosed information is most difficult to predict. The resolution of settlement and litigation is a complex affair in which each party calculates the risk and reward of expected value, option value, transaction cost, and discount. These factors tug and pull on valuation, and the optimal solution is elusive given the lack of market pricing and the subjective nature of the inquiry. This suggests that settlement can take place at any time, and the timing of settlements can appear to be random as valuations converge and diverge at various points in the random walk of litigation.

In an earlier article, I proposed a Price Theory of legal valuation that explains how these valuational components come together to determine the cost of resolution.¹⁸¹ The important innovation of that article is the concept of a selection horizon, which is the indifference point between trial and settlement.¹⁸² The intuition is that there is a price point at which each party would be indifferent between the two, and these selection horizons are unique to each party. The location and shape of the selection horizon depend on each party's risk preference and cost of variance, and they are then mapped against the variables of probability and variance. Valuation, then, is not conducted in isolation, but is relative. Assessment must be considered relative to one's selection horizon, which determines the magnitude of the premium or discount, and this assessment is then compared to the other party's assessment. The effects of probability and risk preferences on value are obvious. By assuming risk neutrality, the standard model eliminates the need to analyze the effect of risk, the governing condition of a legal dispute. The goal of this article is to show the conceptual framework of how risk affects pricing.

181. See Rhee, *supra* note 4 (manuscript at 54–57, on file with author).

182. See *id.*

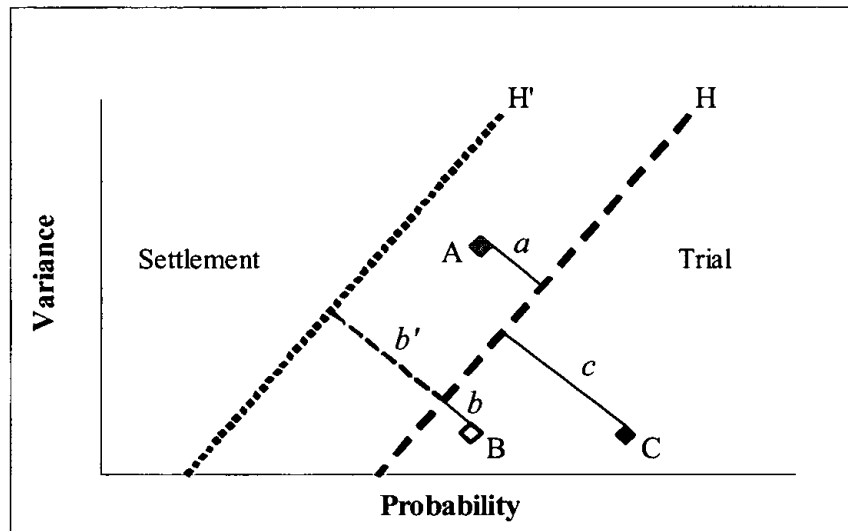
Figure 2: Selection Horizon and Discounting

Figure 2 shows how these ideas come together. A case is assessed as to probability and variance, and the assessment occupies a point in the matrix, in the above points A, B and C. The selection horizons are marked by H and H' . The location of the selection horizon, as determined by the x-intercept, indicates the degree of risk preference: if it moves to the right, trial is less preferred than settlement, indicating a stronger degree of risk aversion, and vice versa. In addition to the location of the selection horizon, we also consider its slope. The slope is a measure of the cost of variance, the degree to which *this* case impacts each party. The amount of the stake at issue is a factor. Also, a repeat player is less sensitive to the outcome of a particular case than a single-play party.¹⁸³ We can say that the repeat player has a lower cost of variance because diversification reduces the variance of outcomes. The intuition is, then, that the selection horizon slopes positively: as variance rises to complete uncertainty of outcome, parties would settle rather than submit to a seemingly random, arbitrary system of justice. As variance and probability approaches zero, trial and settlement are synonymous since the outcome cannot be disputed.¹⁸⁴ The important point here is

183. Single-play parties can also be insensitive to variance of outcome in any given case. For example, wealthy individuals, relative to the stake, may be insensitive to the variance of outcome.

184. Most persons would come to a private agreement. This conclusion applies only to contested, meritorious actions. If the justice system is wholly arbitrary, it is an invitation for frivolous actions. See Gould, *supra* note 1, at 296 ("If the courts acted arbitrarily and without

that the perception of risk is not only understood from a case specific viewpoint, but also from a broader viewpoint of one's portfolio for a repeat player and wealth (or capital holding). As a general matter, we can say that repeat players and institutional parties have higher sloping selection horizons than single-play or less wealthy parties, though even repeat players who are commonly perceived as risk neutral, such as insurance companies, have a cost of capital that is charged against its operating liabilities.

In view of these principles, consider the action between A and B. Both parties hold the same probability assessment (thus expected value), but differ on variance. Assume that they have different selection horizons: A's is H and B's is H' . Based on the shortest distance to the selection horizon H' , B requires a premium of $(b + b')$ because B prefers trial based on the assessment relative to H' . On the other hand, A offers a discount of a because the assessment lies to the left of the selection horizon H . These premiums and discounts can be noted as beta β . Different views on variance and probability and the location of the selection horizon account for the differences in beta. For example, assume B and C hold the same selection horizon H and view of variance but C holds a more favorable view of probability than B: based on the different assessments relative to the common selection horizon H , the premium c is far greater than b .

The concept of a selection horizon captures the interplay of risk preferences, cost of variance, probability, and variance. Beta incorporates the risk adjustment for variance as discussed in the previous section *and* the risk preferences. The value of a lawsuit, then, is represented as: $V = (P \times J) + \pi \pm \beta \pm T$. The cost of resolution in any given case is a multivariable calculation. The option value depends on the perceived variance. Consistent with option pricing principles, only the option value π increases with increased variance. Beta decreases litigation value with increased variance, consistent with asset pricing principles.

An asset pricing model correlates better with the experience of the empirical world. It implies that parties dislike the risk of a trial outcome and, all else being equal (a significant condition), prefer the zero variance achieved through settlement. This simple principle explains in large part why so many cases in fact settle. It also explains in large part why so many cases in fact settle *after* substantial litigation and sunk transaction cost. Litigation can be an economically productive and ra-

precedent, an enormous number of property right disputes would have to be resolved in court, and this would be a costly and serious impediment to the efficient organization of economic activity.”).

tional endeavor, a point that is not emphasized enough in the current environment of almost visceral hostility to lawsuits. Given the complex connections among probability, variance, confidence, weight of evidence, and risk preferences, the process of dispute resolution cannot be reduced to linear deterministic analysis that calls for the reduction of litigation "waste" and more "efficient" dispute resolution. If the persuasive force of such an argument was so strong, we expect that the legal market, as vast as it is, would have adjusted and early settlements in meritorious actions would be rather routine affairs given that attorneys are always repeat players. But settlements occur at all phases of litigation, with apparent randomness, which suggests that factors other than transaction cost savings are at work. Indeed, in pricing a legal dispute, the parties may find that it is not in their best interests to settle early just to create economic surplus from transaction costs.

If an asset pricing model is reasonably accurate as a positive model, the following is an inevitable prediction: *all else being equal, early settlements are typically struck when a party's cost of resolution exceeds the opponent's opportunity cost such that they are priced at unfavorable levels relative to the expected value.*¹⁸⁵ Data on the impact of continued litigation on settlement value does not exist, and my prediction may be difficult to prove empirically. However, there is some support. The tort and insurance areas may provide examples in which a plaintiff's cost of resolution is high enough to exceed the defendant's opportunity cost, resulting in early, low value settlements. Ross observed in *Settled Out of Court* that attorney-represented cases are consistently settled at higher values than unrepresented ones,¹⁸⁶ but that representation "increases delay very impressively."¹⁸⁷ These observations indirectly suggest that late settlements are valued higher than early ones. There are significant caveats to this conclusion: selectivity in case selection skews data,¹⁸⁸ and attorneys are better negotiators than insureds.¹⁸⁹ Empirical inference is difficult for precisely the same reason individual valuation cannot be re-

185. In theory, increased transaction costs should not increase settlement value since under the American rule each party bears their own fees and costs. In practice, it is uncertain whether attorney fees are systematically incorporated into valuation, contrary to the rule of law, to increase the overall settlement values or to incentivize attorneys to recommend settlement. My guess is that it would not, but a study would be interesting.

186. ROSS, *supra* note 113, at 116. "Representation was found to be the most important single factor accounting for payment, apart from liability and damages." *Id.* at 193.

187. *Id.* at 228.

188. *Id.* at 167. Nevertheless, Ross observed that "on the whole, similar claims receive far higher payments when represented than when handled by the claimant directly." *Id.*

189. *Id.* at 168 ("I believe that a good part of the discrepancy between the amounts received by represented and unrepresented claimants stems from the deficiency of the latter in negotiation skills.").

duced to a quantitative science. Market data is lacking; comparative valuation is a slippery concept in application; and public information found in case law may reflect skewed data. These caveats ultimately undermine any inference from Ross's observations of the cause and effect of litigation on value. An empirical study, to be reliable, must be careful in sorting out the obvious selection bias, i.e., early settlements may be struck because the cases are less meritorious or more routine. Perhaps these difficulties are insurmountable, but if we can establish as an empirical observation that later settlements are valued higher than early settlements as predicted by asset pricing theory, this would change the entire discussion of the "inefficiency" of litigation.

E. Attorneys and Asset Pricing

An analysis of attorney behavior and influences supports the proposition that lawsuits are assets. Attorneys are generally agents of their clients.¹⁹⁰ In contingent fee arrangements, however, plaintiff attorneys are not merely agents, but are business partners of their clients. They provide the intellectual and financial capital to the venture.¹⁹¹ Many plaintiff attorneys are co-invested in the financial project and are influenced by economic self-interest.¹⁹² The decision to undertake a case depends on "sound investment decision."¹⁹³ In the other context of defense attorneys who work on hourly fee arrangements, the financial incentives are not as closely linked.¹⁹⁴ The fee arrangement may incentivize inefficient work. No doubt that this agency cost is incurred in practice, but the legal market for attorney services is also competitive. The discipline of market forces—those who are willing to work cheaper and more effectively—should weed out much of the inefficiencies.¹⁹⁵ All in all, al-

190. See George M. Cohen, *When Law and Economics Met Professional Responsibility*, 67 *FORDHAM L. REV.* 273 (1998) (discussing agency cost).

191. Rhee, *Application of Finance Theory*, *supra* note 16, at 157 ("[T]he attorney provides not only the intellectual capital and labor but often the financial capital in the form of contingent attorney's fees and costs.").

192. See Charles A. Wolfram, *The Second Set of Players: Lawyers, Fee Shifting, and the Limits of Professional Discipline*, 47 *LAW & CONTEMP. PROBS.* 293, 295–96 (1984). See also David Rosenberg, *The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System*, 97 *HARV. L. REV.* 849, 890 (1984) ("The primary goal of plaintiff attorneys is to maximize not the expected judgment, but rather their own expected return – their fees.").

193. Rhee, *Application of Finance Theory*, *supra* note 16, at 157. See Earl Johnson, Jr., *Lawyers' Choice: A Theoretical Appraisal of Litigation Investment Decisions*, 15 *LAW & SOC'Y REV.* 567 (1980–81) (analyzing the economic determinants of attorney behavior).

194. In these arrangements, overbilling creates significant ethical issues. See Herbert M. Kritzer, *Lawyer Fees and Lawyer Behavior in Litigation: What Does the Empirical Literature Really Say?*, 80 *TEX. L. REV.* 1943, 1967 n.132 (2002).

195. This is a general observation, and I assume that switching costs are not so high that

though some agency cost is inevitable, attorneys do their jobs professionally and their financial incentives are either directly or indirectly linked to the success of their clients over the long-term.

Shared or compatible financial incentives between attorney and client do not mean they necessarily share the same outlook on litigation risk. Unlike a single-play client, an attorney holds a diversified portfolio of cases with various risks. They are not only less risk averse, their cost of variance is lower in the sense that the loss of one case does not have a greater impact. Nevertheless, the attorney cannot prosecute every case to trial. Even if attorneys have substantial control or influence on whether a case is tried or settled, they are constrained by limited resources and capital, including not only financial resources but also reputational capital at risk.¹⁹⁶ Most cases are viewed as settlement prospects. In this reality, attorneys, like their clients, implicitly conduct their business in accordance with the prescriptions of Portfolio Theory: they structure efficient portfolios. Analyzing each case like an investment in a stock, attorneys shun “risky” cases in favor of “safer” cases unless the return is commensurate.¹⁹⁷ No attorney values risk as an inherent good as would be the case if a lawsuit was truly a financial option. Quite the opposite, risk is regarded as bad for one’s business as well as the client’s interest. Risk and reward are tradeoffs.

The role of attorneys is not only relevant to an analysis of agency and transaction costs, but also relevant to an understanding of the essential nature of a legal claim. Attorney services have valuations implications. Ronald Gilson established a link between principles of asset pricing and the value of attorney services.¹⁹⁸ He challenged the common perception that “lawyers are seen at best as a transaction cost, part of a system of wealth redistribution from clients to lawyers; legal fees represent a tax on business transactions to provide an income maintenance program for lawyers.”¹⁹⁹ The provision of attorney services is an NPV (net present value) project: the initial investment (attorney fees) must be weighed against the risk-adjusted returns (benefit of legal advice), lest attorneys add no social value.²⁰⁰ Gilson observed that each transaction

they create a systemic inefficiency in the market for legal services.

196. See Ronald J. Gilson & Robert H. Mnookin, *Cooperation and Competition in Litigation: Can Lawyers Dampen Conflict?*, BARRIERS TO CONFLICT RESOLUTION, *supra* note 156, at 194-95 (suggesting the existence of a “reputation market” for lawyers).

197. This is confirmed by the prominence of progressive contingent fee arrangements, where various fee triggers are linked to procedural contingencies. Typically, a favorable resolution by trial commands the highest percentage fee.

198. Gilson, *supra* note 2.

199. *Id.* at 241-42.

200. “If what a business lawyer does has value, a transaction must be worth more, net of

requires “correctly priced” assets, and the key role of attorneys is to find the most efficient price. In the legal market, however, the assumption of market pricing and efficiency (the prerequisites of efficient capital asset pricing) cannot be made because lawsuits are generally not subject to market pricing.²⁰¹ Under these limiting conditions, the task is to achieve “more accurate asset pricing.”²⁰² Attorneys are crucial to the proper pricing of transactions: “[l]awyers function as *transaction cost engineers*, devising efficient mechanisms which bridge the gap between capital asset pricing theory’s hypothetical world of perfect markets and the less-than-perfect reality of effecting transactions in this world.”²⁰³ Thus, attorneys must add more value to the asset than their fees.

Although Gilson’s article analyzed the role of attorneys in transactional work, his analysis has equal force in the litigation context. Litigators, perhaps more than transactional attorneys, are thought of purely in terms of cost, but this expense cannot be viewed in isolation. Rather than a cost, the services of attorneys can be seen as a capital investment that is expected to yield a return. Attorneys are instrumental in the proper pricing of disputes. They reduce the uncertainty of a legal claim and enhance the value of the asset.²⁰⁴ In short, their work gives the trial option its value.

Aside from asset pricing, attorneys also provide another important benefit, if only unwittingly. While attorney incentives may sometimes differ from that of the client, giving rise to the problem of agency cost, it is also true that the differences in incentive may actually benefit the client. In many cases, individual clients may be single-play actors, but attorneys are always repeat players. Because attorneys hold a portfolio of cases, they are generally less risk-averse than the typical individual client. Accordingly, they may be incentivized to take less of a discount than their clients would, and such frictional influences may actually serve a client’s interest in the end.²⁰⁵ On the other hand, the attorneys of

legal fees, as a result of the lawyer’s participation.” *Id.* at 243 (emphasis removed).

201. *Id.* at 253–54.

202. *Id.* at 255.

203. *Id.*

204. Empirical evidence suggests that attorneys who frequently deal with each other resolve disputes more quickly and are less likely to take the case to trial. See Jason Scott Johnston & Joel Waldfogel, *Does Repeat Play Elicit Cooperation? Evidence from Federal Civil Litigation*, 31 J. LEGAL STUD. 39, 40–41 (2002). One explanation is that these attorneys resolve the uncertainties in a lawsuit more quickly, and, thus, settlements are more frequent and come earlier. Moreover, empirical evidence also suggests that in the United States Tax Court, represented cases achieve better trial results than unrepresented cases. Lederman & Hung, *supra* note 136, at 1239. Interestingly, this study did not find a statistical relationship between represented cases and settlement value. *Id.* Cf. ROSS, *supra* notes 188 & 189.

205. Again, this is supported by Ross’s empirical observation that represented cases yield

institutional clients may be more risk averse than their clients because each client represents a repeat business opportunity. The risk is not simply the loss of one case, but the opportunity to provide services in many future cases. The asset may not be viewed as the case, but rather the client relationship. Attorneys achieve better results than unrepresented clients not only because they are better tactical negotiators,²⁰⁶ but also because they are better situated to negotiate. By diminishing the potentially large gap in risk preferences and having influence on the resolution of a case, attorneys actually reduce the cost of resolution. Thus, the investment outlook and role of attorneys suggest that a lawsuit is an asset.

CONCLUSION

An interdisciplinary application of financial economics to legal bargaining is compelling. This article is a part of a growing effort to close the gap between the two disciplines. At the heart of a contested legal action is a claim to an ambiguous right. Certainty obviates litigation, uncertainty begets dispute. The application of the valuation techniques of financial economics yields new insights into the old problem of legal bargaining and the selection of settlement or trial. The insights offered in this article are several. First, the standard model is an incomplete asset pricing model. It projects an expected value, but does not account for the risk of that gross sum. Second, an option pricing model cannot provide a general framework for the valuation of lawsuits. Only an asset pricing framework considers both the value of the underlying asset and the value of the litigation option, which is really a premium for the forbearance of a right to litigate. Lastly, the process of settlement entails a complex series of mutual gaming transactions wherein the parties seek to hedge unnecessary risk.

Beyond these technical points are some larger implications. The selection of the pricing model implies certain characteristics and preferences of disputants. Although the plaintiff and the defendant are on opposite sides of an economic transaction, they are investors in the same project and an economic model should assume that they share the same perspective on the nature of risk. As a prescriptive rule, each party should maximize return at the lowest variance if we believe that most people are risk averse in some degree. The empirical observation of the real world confirms that disputants typically follow this prescription and

greater settlement value because, in large part, attorneys are better negotiators. *See* ROSS, *supra* note 189. Ross did not elaborate on this point. Presumably, attorneys have better negotiation skills. Better negotiation can also result from enjoying a superior position.

206. *See* ROSS, *supra* notes 186, 187 & 189.

prefer an expected return at the lowest risk, thus explaining the observation that most cases settle.

That said, settlement and trial can be seen as pricing mechanisms to value financial assets for which there is no market. The criticism of trials as an inefficient activity is legion, but this criticism is based on a myopic view of cost. There is no doubt that litigation is costly. But when making a claim that a thing is expensive, it must be asked: costly as to what? Value is a relative concept, and so we ask: what is the true economic cost of resolution? Litigation and settlement are alternative pricing mechanisms to value a legal dispute under conditions of uncertainty and in the absence of market pricing. The cost of settlement is less accessible. What is the price of a bad settlement? Because this cost is not calculable as a cash expense, it often gets brushed aside as an inconsequential or inconvenient fact. Some deals are good, others are bad, such is the game of bargaining, and we leave it at that. But the pricing mechanisms cannot be viewed in terms of economic “efficiency” when the true economic cost is not considered. The cost of resolution must include the concept of a risk-adjusted discount to value. This can only be done through a general framework of an asset pricing model.

