TEACHING CORPORATE LAW FROM AN OPTION PERSPECTIVE

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INTRODUCTION

This Essay proposes introducing the option perspective in the teaching of corporate law. Stock options arise naturally in such corporate law cases as *United States v. O'Hagan*.[1] But there are several benefits from considering them early in a corporate law course and more thoroughly and systematically than merely in passing, during a discussion of the misappropriation theory of insider trading. These benefits are fivefold. First, defining stock options right after defining stocks helps to emphasize the differences between the capital appreciation or depreciation aspect of stock ownership and other aspects of stock ownership, such as receiving dividends and having voting rights. In other words, both stockholders and holders of stock options experience financial gains or losses depending on the performance of the stock in question. But, while stockholders enjoy corporate voting rights and dividend payments, holders of stock options do not. It is useful to remind students that if all that an individual cares about is the potential capital appreciation of the shares of a publicly traded corporation,

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[*] Assistant Professor, University of Pennsylvania Law School. Thanks to Chuck O'Kelley for his invitation to participate in this Conference; Joseph A. Grundfest for the Gumby™ options and options origami pedagogical innovations from his capital markets and securities regulation course at Stanford; Paul Mahoney, Frank Partnoy, and audience members for general discussions about options. Special thanks to Don M. Chance, Michael S. Knoll, Kimberly D. Krawiec, and Hillary A. Sale for written comments and suggestions. Finally, thanks to Bill Draper at the Biddle Law Library of the University of Pennsylvania Law School for help in locating sources and assembling research.

[1] 521 U.S. 642 (1997).

there are cheaper ways to participate in that upside potential than buying shares of that corporation. Such an observation is especially timely in this age of Internet startups and various fill-in-the-blank.com initial public offerings. Distinguishing holding shares of stock from holding stock options also leads to discussing a market for corporate voting rights. That discussion raises naturally the questions of whether and why corporate vote selling is or should be illegal. Second, displaying stock option payoffs graphically in terms of "hockey stick" figures leads naturally into a discussion of the zero-sum nature of trading in options, financial engineering via the vertical addition of such graphs, and put-call parity.[2] Third, viewing transactions in corporate equities and debt as being functionally equivalent to trading in options—"the option perspective"—illustrates the conflict of incentives between shareholders and bondholders of a corporation by reinterpreting equity and debt as options on corporate assets. Fourth, this option perspective demonstrates that paying managers in stock and/or stock options can reduce the conflict of interests between managers and shareholders because such incentive compensation increases managers' willingness to undertake risky projects. Fifth, introducing the notion of real options permits a contrast between traditional expected values of corporate projects or mergers versus their real option values.

The value of the option perspective in corporate finance education is acknowledged to such a degree that the leading first-year MBA corporate finance texts devote several chapters to options.[3] A financial option contract provides its owner with the opportunity, but not the obligation, to buy or sell some other underlying financial instrument, such as a bond, stock, index, or specified amount of foreign currency at a pre-specified currency exchange rate. The study of valuing or pricing stock options dates back to Bachelier's

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[2] "Hockey stick" figures, so named for the distinctive shape of their curves, are standard terminology in the options literature. *See, e.g.*, HERSH SHERFIN, BEYOND GREED AND FEAR: UNDERSTANDING BEHAVIORAL FINANCE AND THE PSYCHOLOGY OF INVESTING 273 (2000) (employing "hockey stick" charts).

[3] *E.g.*, RICHARD A. BREALY & STEWART C. MYERS, PRINCIPLES OF CORPORATE FINANCE 581-666 (6th ed. 2000); STEPHEN A. ROSS ET AL., CORPORATE FINANCE 546-619 (5th ed. 1999).

path-breaking dissertation in 1900.[4] The 1997 Nobel Prize in Economics recognized the seminal financial option pricing models of Fisher Black, Robert Merton, and Myron Scholes.[5] Financial options permit decisionmakers to hedge financial risks such as those due to fluctuations in stock prices, interest rates, or currency rates.[6] Financial options revolutionized modern capital markets by allowing participants to reallocate financial risk.[7] Of course, capital market participants can also use financial options to speculate over the likely future course of underlying financial prices. Recent well-publicized huge losses by many parties, including the hedge fund Long-Term Capital Management, from utilizing financial options have led to repeated calls for increased regulation of currency and stock index options. Clearly, financial options are here to stay and will grow in importance. Therefore, an essential part of any manager's education should be an understanding of the role that financial options can play in corporate financing.

While many law students take a course in corporate finance, many others do not. This Essay suggests that the basic course in Corporations is a natural time and place to introduce the option perspective to law students.[8] While such an introduction might arouse their appetite for taking Corporate Finance, more importantly the option perspective is too crucial a way of thinking to be restricted just to law students who take Corporate Finance and/or

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[4] Louis Bachelier, *Theorie de la Speculation* [*Theory of Speculation*], 17 ANNALS DE L'ECOLE NORMALE SUPERIEURE 21-86 (1900), *translated in* THE RANDOM CHARACTER OF STOCK MARKET PRICES 17 (Paul Cootner ed., A. James Boness trans., 1964).

[5] Fisher Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973); Robert C. Merton, *Theory of Rational Option Pricing*, 4 BELL J. ECON. & MGMT. SCI. 141 (1973). For a press release from the Royal Swedish Academy of Sciences describing the contributions underlying the 1997 Nobel Prize in Economics, see Royal Swedish Academy of Sciences, *Information* (visited Jan. 13, 2000) <http://www.nobel.se/announcement-97/economy97.html>.

[6] *See, e.g.*, CHARLES W. SMITHSON ET AL., MANAGING FINANCIAL RISK: A GUIDE TO DERIVATIVE PRODUCTS, FINANCIAL ENGINEERING, AND VALUE MAXIMIZATION 62-63 (1995) (explaining how derivatives hedge against unwanted risk).

[7] Stephen A. Ross, *Options and Efficiency*, 90 Q.J. ECON. 75 (1976) (proving that sufficiently many option markets result in Pareto-efficient allocation of risk). *But see* Peter H. Huang, *A Normative Analysis of New Financially Engineered Derivatives*. 73 S. CAL. L. REV. 471, 500-02 (2000) (explaining that not enough derivatives typically results in inefficient allocations of risk).

[8] *See generally* Frank Partnoy, *Adding Derivatives to the Corporate Law Mix*, 34 GA. L. REV. 599 (2000) (expressing related and similar viewpoint).

Securities Regulation. In addition, Corporate Finance courses and textbooks focus their options coverage on how to utilize quantitative option pricing formulae, as provided by the Black-Scholes and binomial option pricing models.[9] What is being suggested here is to cover in the basic corporate law course only the qualitative aspects of the option perspective.

Two of the leading scholars in corporate law observe that "[m]any common securities and business relationships can be characterized as options. Understanding what factors determine the value of an option can highlight the incentives of the parties to an acquisition or other business transaction."[10] They also point out how "many common relationships can be recharacterized as involving the grant and receipt of an option."[11] In fact, the popular Gilson and Black paperback on finance and investment includes a chapter entitled "The Option Perspective."[12] That chapter is taken from the authors' casebook on corporate acquisitions and transaction planning.[13] This Essay merely suggests introducing the option perspective into legal education earlier than in advanced business law courses, such as Corporate Finance, Corporate Acquisitions, or Securities Regulation. There are two advantages to introducing the option perspective in the basic course on Business Associations or Corporations. First, an early introduction provides an important unifying theme for those law students who later take advanced corporate law courses, helping them realize interconnections between those courses. A second advantage is that many law students who take Corporations do not enroll in advanced corporate law courses. Every law student can profit from appreciating that many legal (and non-legal) decisions involve real options. The option perspective offers important and fundamental insights to many areas of law besides the corporate area.

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[9] Black & Scholes, *supra* note 5; *see* John C. Cox et al., *Option Pricing: A Simplified Approach*, 7 J. FIN. ECON. 229 (1979) (presenting simple discrete-time model for valuing options).

[10] RONALD J. GILSON & BERNARD S. BLACK, (SOME OF) THE ESSENTIALS OF FINANCE AND INVESTMENT 1 (1993).

[11] *Id.* at 245.

[12] *Id.* at 231-53.

[13] RONALD J. GILSON & BERNARD S. BLACK, THE LAW AND FINANCE OF CORPORATE ACQUISITIONS 231-52 (2d ed. 1995).

This Essay is organized as follows. The first Part considers the logistical details of introducing financial options to law students. It suggests primary and secondary reading materials that are suitable for law students. The main reading material is the above-mentioned chapter from the paperback by Ronald Gilson and Bernard Black.[14] The Essay also offers some pedagogical devices that help ease the introduction of the option perspective to law students. Finally, it discusses optional additional topics and extensions. Part II considers the logistical details of introducing real options to law students. It suggests primary and secondary reading materials that are drawn from the management literature but are also appropriate for law students. It also suggests a series of motivating real options that should be familiar to law students. Finally, it discusses optional additional topics and extensions.

I. FINANCIAL OPTIONS AND CORPORATE LAW

Chapter Seven of the Ronald Gilson and Bernard Black paperback on finance and investment[15] is a readable and short introduction to the option perspective that is very accessible to law students. The chapter is only twenty pages long, but in that space the authors accomplish quite a lot. They demonstrate the usefulness of the option perspective for transaction planning.[16] They define the basic terminology of call and put stock options.[17] They display graphs of the gross payoffs for option holders.[18] They explain how trading in options can function as a substitute for and a complement to trading in stocks.[19] They describe how options can be thought of as providing insurance policies against declines in the underlying stock price and in doing so demonstrate the put-call parity result.[20] They cover the fundamental factors that determine a call option's value.[21]

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[14] GILSON & BLACK, *supra* note 10.
[15] *Id.*
[16] *Id.* at 231.
[17] *Id.* at 232-34, 237-38.
[18] *Id.* at 232-33 (Figures 7-1 & 7-2).
[19] *Id.* at 234-35.
[20] *Id.* at 236-37.
[21] *Id.* at 238-44.

Their exposition of how the variance of the underlying stock affects call option value is very lucid, particularly their discussion of the impacts of holding expected return constant and increasing unsystematic risk versus holding expected return constant and increasing systematic risk on call option value.[22] They apply the option perspective to illuminate the conflict between shareholders and bondholders by providing a simple numerical example.[23] They also include an excerpt from Delaware Chancellor William Allen's opinion in the case of *Credit Lyonnais Bank Nederland, N.V. v. Pathe Communications Corp.*[24] This passage contains a hypothetical numerical example that explicitly uses the option perspective to determine the fiduciary duties of directors of a corporation at or near insolvency.[25] The authors go on to explain the subsequent holding that directors owe fiduciary duties to creditors once a corporation becomes insolvent regardless of whether that corporation has filed for bankruptcy.[26] But, as they point out, that case does not resolve the overall tension between maximizing shareholder value and maximizing the value of an entire corporation when that corporation is solvent.[27] Finally, they apply the option perspective to explain that paying managers with stock and/or stock options, or leveraging a corporation through a leveraged buyout, reduces the conflict of interests between shareholders and managers by increasing managers' willingness to undertake risky corporate projects.[28]

There are several differences between owning a stock and owning a call option written on that stock. From a practical viewpoint, a stock option premium is usually a mere fraction of the value of the amount of stock that option potentially controls. This fact explains why stock options are highly leveraged financial instruments. From a legal perspective, a stockholder is entitled to any financial gains or losses from selling the stock in the future, to any periodic

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[22] *Id.* at 240-43 (Figures 7-3 & 7-4).
[23] *Id.* at 245-46 (Table 7-1).
[24] 1991 WL 277613, at *34, n.55 (Del. Ch. Dec. 30, 1991).
[25] GILSON & BLACK, *supra* note 10, at 249-50.
[26] Geyer v. Ingersoll Publications Co., 621 A.2d 784, 781-88 (Del. 1992).
[27] GILSON & BLACK, *supra* note 10, at 250.
[28] *Id.* at 249-50.

dividend payments, and to vote at annual shareholder meetings or special meetings. In contrast, a stock option holder is entitled only to any financial gains or losses from exercising or selling the stock option in the future. The stock option holder is not entitled to receive any periodic dividend payments, nor to exercise voting rights at shareholder meetings. Students can often appreciate these differences further by considering the following hypothetical example of how to circumvent legal prohibitions against the sale of corporate voting rights.[29]

Although New York corporate law prohibits explicitly selling corporate voting rights, stockholders can in principle overcome that legal prohibition by entering into clever and circuitous investment portfolios.[30] For example, "an option strategy known as the conversion arbitrage, in which the investor holds the stock and a put and a call (with the same expiration date and exercise price as the put), essentially leaves the investor holding only the vote and not the cash claim."[31] Corporate voting rights are usually not why a shareholder buys the stock of that corporation. Instead, most shareholders are typically motivated by the right to receive dividends and capital gains. But corporate voting rights can become quite important and valuable when that corporation is facing a contest for the control of its assets. A stylized game-theoretic model of hostile takeover attempts proves that "more value- and welfare-increasing takeovers will occur if vote trading is allowed."[32] In reality, such conversion arbitrage might be of limited utility because of transaction costs and the restricted terms of exchange-listed options.[33]

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[29] *See* Frank H. Easterbrook & Daniel R. Fischel, *Voting in Corporate Law*, 26 J.L. & ECON. 395, 410-11 (1983) (providing early analysis of legal prohibitions against corporate vote trading).

[30] *See* N.Y. BUS. CORP. LAW § 609(e) (Consol. 1983) ("A shareholder shall not sell his vote or issue a proxy to vote to any person for any sum of money or anything of value.").

[31] Douglas H. Blair et al., *Unbundling the Voting Rights and Profit Claims of Common Shares*, 97 J. POL. ECON. 420, 442 (1989).

[32] *Id.*

[33] *Id.*

Another way investors can trade corporate voting rights is by engaging in the following swap transaction.[34] Suppose that Chris owned ten percent of a corporation's stock and would like to sell the corporate voting rights accompanying those shares to Pat. Chris can accomplish this by entering into a contract in which Pat buys the actual shares from Chris at current market value. Pat thus acquires the financial consequences (dividend payments as well as capital gains or losses) and the associated corporate voting rights of being a stockholder. As part of the contract's terms, Pat promises to pay Chris all of the dividends paid by the corporation on those shares until such time as they agree Pat will sell back those shares to Chris for the same price that Pat originally paid. In addition, Pat makes an up-front payment to Chris of some amount, such as an absolute dollar figure or a percentage of the value of the amount of stocks in question, with the percentage being set, for example, at the prevailing London Interbank Offered Rate (LIBOR). The net effect of this contractual transaction is that Chris is able to sell Pat corporate voting rights for some mutually agreed price.

Such a deal splits up stock ownership rights into corporate voting rights and financial rights, and then swaps those corporate voting rights for cash. The feasibility of such a swap certainly depends on the assumption that both counter-parties perform as contractually obligated. Of course, if courts view such private contractual arrangements as being against public policy, those obligations might not be legally enforceable.[35] Presumably, the counter-parties to such a swap would have to disclose it, at least if they were doing it as part of a control contest.[36] If we do not observe these kinds of swaps

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[34] This example is from Joseph A. Grundfest's lectures in his Capital Markets and Securities Regulation course at Stanford.

[35] The Delaware courts traditionally condemned vote buying per se, but recently adopted a more textured view. A series of cases that started with *Schreiber v. Carney*, 447 A.2d 17 (Del. Ch. 1982), recognized that vote buying could be in the interests of shareholders. The focus in this evolving Delaware jurisprudence is whether "the object or purpose is to defraud or in some way disenfranchise the other stockholders." *Id.* at 25-26. Instead of prohibiting vote trading categorically, the Court of Chancery sees vote trading as "a voidable transaction subject to a test for intrinsic fairness." *Id.* at 26.

[36] Thanks to Ed Rock for this point and the following observation. See Edward B. Rock, *Encountering the Scarlet Woman of Wall Street: Speculative Comments at the End of the Century*, 3 THEORETICAL INQUIRIES L. (forthcoming 2000), for an interesting discussion of the market for proxies in the battles for control over the Erie Railroad between Jay Gould and

in reality, then perhaps the desire to buy corporate votes does not exist, people are unaware they can do this, or the above-stated equivalence is overstated. As with the previously discussed conversion arbitrage option strategy, high transaction costs may curtail the use of corporate voting swaps.[37] Another possibility is that people would like to engage in corporate vote trading and are aware of the possibility of doing so in this manner, but are reluctant to engage in contracts that may be unenforceable or illegal.[38] Finally, and most likely, there is the possibility that the lack of observable vote-buying transactions is due to the parties' deliberate secrecy because such transactions are of questionable legality and enforceability.[39] Whether or not such a corporate voting swap is observed in practice, or is even legally enforceable, raises interesting conceptual questions. The point of the hypothetical, however, is to reinforce the difference between owning a stock and owning a stock option, because a stockholder could theoretically enter into the above swap while a stock option holder could not.

Several pedagogical devices—which I offer here in the form of charts and illustrations—help ease the introduction of the option perspective into the basic corporate law course. A source of PowerPoint slides about options can be found in a unique, state-of-the-art multimedia introductory text on derivatives.[40] In addition to the basic and familiar graphs of the gross payoffs for call and put option holders, students find three additional illustrations helpful in understanding options. These are graphs illustrating: the net payoffs for call and put option holders; the gross payoffs for call and put option sellers; and the net payoffs for call and put option sellers. The first and third pairs of graphs involve simply a parallel vertical shifting of the graphs of the respective gross payoffs by the amount

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Cornelius Vanderbilt.

[37] Blair et al., *supra* note 31.

[38] Thanks to Kim Krawiec for suggesting this possibility. *See* PRESIDENT'S WORKING GROUP ON FINANCIAL MARKETS, OVER-THE-COUNTER DERIVATIVES MARKETS AND THE COMMODITY EXCHANGE ACT (1999), *available at* <http://www.treas.gov/press/releases/ps224.htm> (visited Apr. 20, 2000) (recommending changes to Commodity Exchange Act to promote innovation in over-the-counter derivative markets by removing the risk and uncertainty over the legality or enforceability of such contracts).

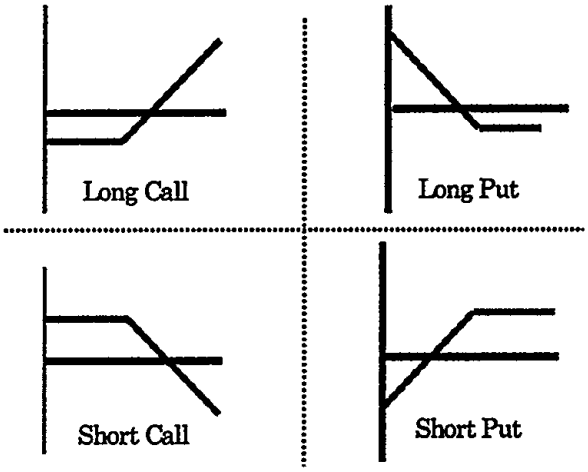
[39] Once again, thanks to Kim Krawiec for suggesting this last possibility.

[40] MARK RUBINSTEIN, DERIVATIVES: A POWERPLUS PICTURE BOOK (1999).

of the option premium. The second pair of graphs drives home to students that option payoffs must be zero-sum between the option buyer or holder and option seller or writer. Students also find it useful to learn the commonplace terminology of being "long" for buying some financial instrument and being "short" for selling that instrument.

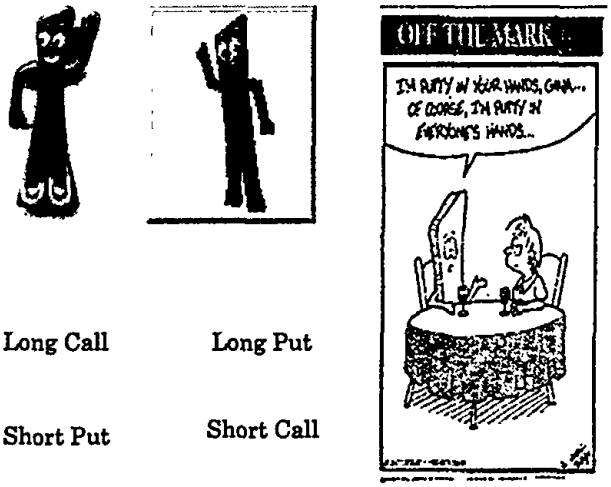
Students find it helpful to manipulate the above option value or payoff graphs actively instead of just passively observing them. One way to accomplish this is to hand students a sheet of paper containing four graphs as depicted in Figure 1. The net payoff to a call option buyer is depicted in the top left corner. The net payoff to a call option seller is depicted in the bottom left corner. The net payoff to a put option buyer is depicted in the top right corner. The net payoff to a put option seller is depicted in the bottom right corner. The sheet of paper should contain two dotted lines, one horizontal and the other vertical, dividing the sheet into four quadrants containing the respective graphs. If students fold the sheet first along the horizontal dotted line they can observe how the net payoffs to an option buyer and to an option seller are reflections across that horizontal dotted line, or mirror images of each other. The zero-sum nature of these payoffs is visually illustrated by their canceling out upon vertical addition. If students then fold that sheet along the vertical dotted line they can observe how the net payoffs to a put option buyer (or seller) and to a call option buyer (or seller) are, similarly, mirror images of each other.

Figure 1: Option Origami for Net Option Payoff Diagrams



Another way of illustrating the zero-sum nature of the payoffs for long and short positions is for the instructor to use a transparency for the long position and to flip that same transparency over to show the short position. These graphs become more student-friendly upon bringing a toy Gumby™ figure to class and bending its arms into the various option payoff shapes. An alternative is to project in-class from a laptop with an Internet connection or download and print out pictures (available from various sites) of Gumby™ figures with their arms bent in the various option payoff shapes.[41] An example is provided in Figure 2.

Figure 2: Options Gumby



Long Call Long Put

Short Put Short Call

Students become more comfortable with the four basic option payoff diagrams by learning to combine these figures with each other. The payoff diagram for any portfolio formed by a combination of stock options is found by vertically adding their individual payoff diagrams. The addition is done vertically because all of the payoff diagrams have as their horizontal axis the underlying stock price or value. Students can determine for themselves, by vertically adding the respective payoff diagrams, that buying a straddle (one call and

[41] *E.g.*, *Official Gumbyworld Home Page* (visited Mar. 3, 2000) <http://www.gumbyworld.com/>; *The Official Gumby Web Site* (visited Apr. 20, 2000) <http://www.gumbyclub.com/>; *Mike-D's Gumby and Pokey Page* (visited Apr. 20, 2000) <http://www.mike-d.com/gumby/gumby.html>.

one put on the same underlying stock with a common strike price) is effectively betting on high volatility. This process is depicted in Figures 3-6. Similarly, selling a straddle (selling one call and one put on the same underlying stock with a common strike price) is effectively betting on the lack of volatility. This process is depicted in Figures 7-10.

Figure 3: Long Call

Long Call: A Strategy for Profiting from High Upside Volatility

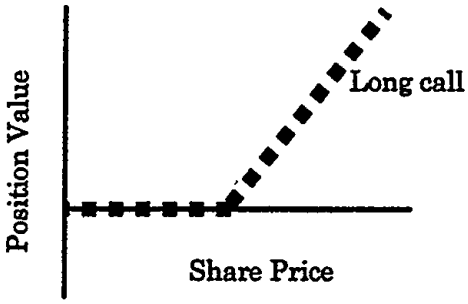


Figure 4: Adding a Long Put

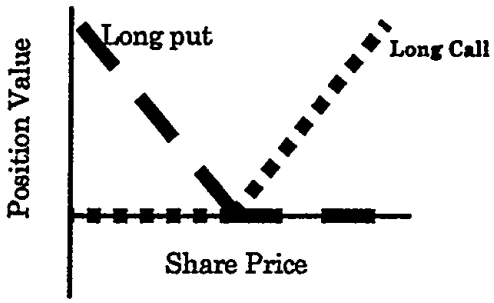


Figure 5: Buying A Straddle

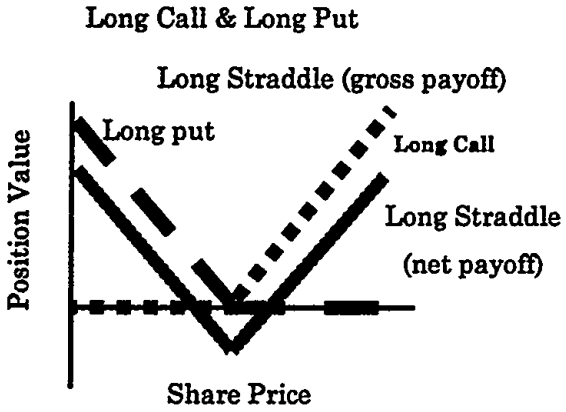


Figure 6: Finished Product: A Long Straddle

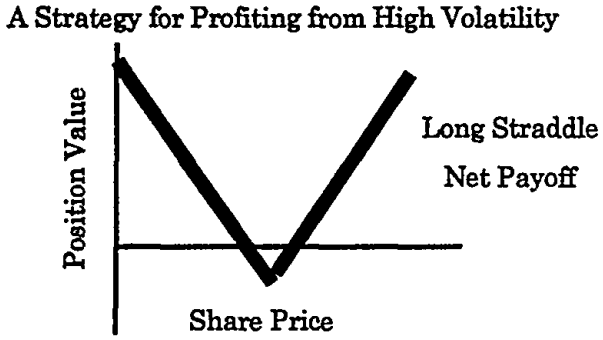


Figure 7: Short Call Option Value (gross to seller)

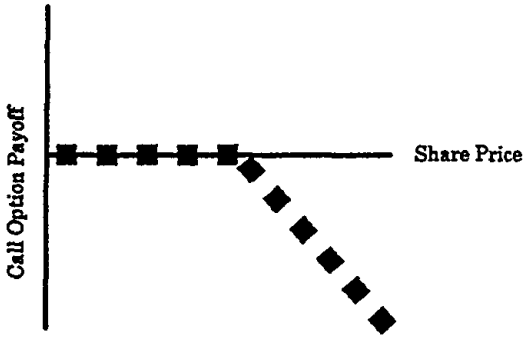


Figure 8: Short Put Option Value (gross to seller)

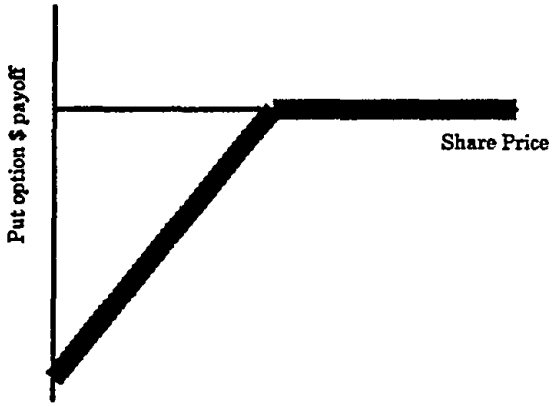


Figure 9: Selling a Straddle
Short Call & Short Put

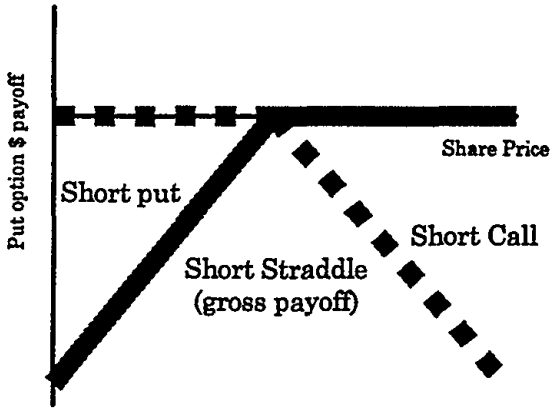
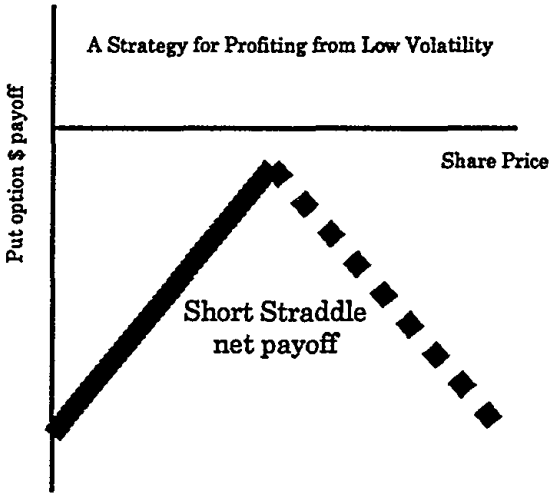


Figure 10: Finished Product:
A Short Straddle



Students can play with more involved option portfolio strategies, such as butterfly spreads (buying a call option with a low strike price, buying another call option with a high strike price, and selling two call options with an intermediate strike price).[42] Once students realize that the payoff diagram for a stock plotted against itself results in a 45-degree line (as depicted in Figure 11), they can add that figure into their collection of diagrams. Students can then engage in such financial engineering as constructing a protective put by buying a stock and buying a put option for that stock. This process is depicted in Figures 11-14. Once students realize that the payoff diagram for a riskless bond plotted against stock value is just a horizontal line (as depicted in Figure 15), they can add that figure to their collection of diagrams. By comparing the payoff diagram of a protective put with the payoff diagram resulting from the strategy of buying a call and investing the present value of the strike price of that put in a riskless bond, students can see for themselves why the put-call parity relationship holds. This process is depicted in Figures 16-19.

Figure 11: Long Stock

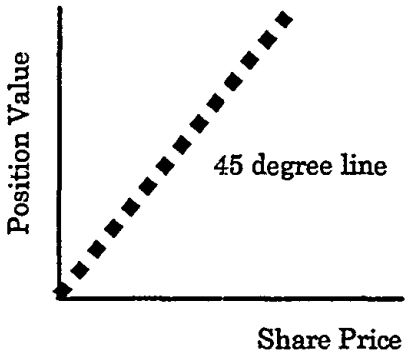
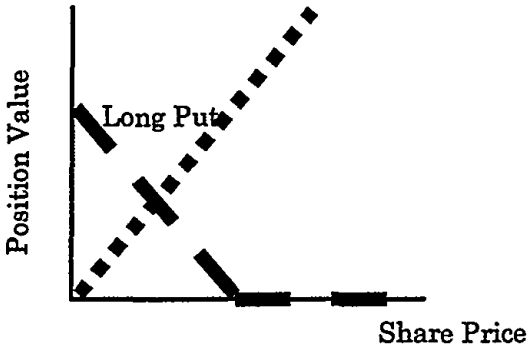


Figure 12: Adding a Long Put

Long Stock & Long Put



[42] *See, e.g.*, ROBERT W. KOLB, FINANCIAL DERIVATIVES 170-73 (1993) (illustrating reason for name "butterfly spread").

Figure 13: Making of a Protective Put

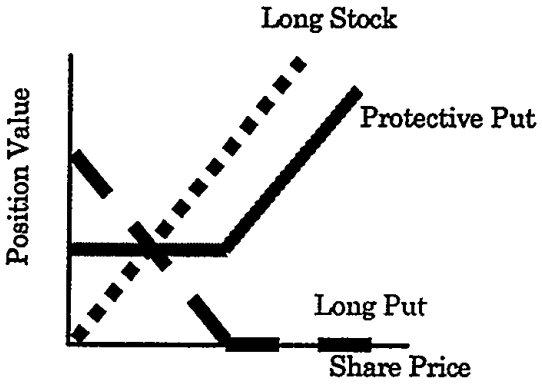


Figure 14: Finished Product: A Protective Put

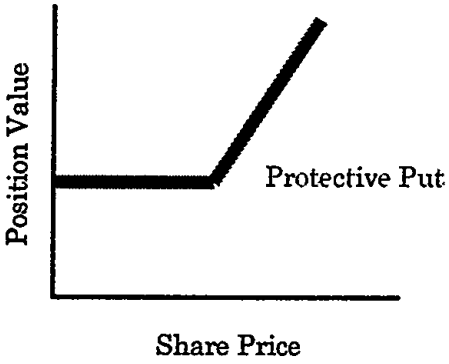


Figure 15: A Riskless Bond (with zero coupons)

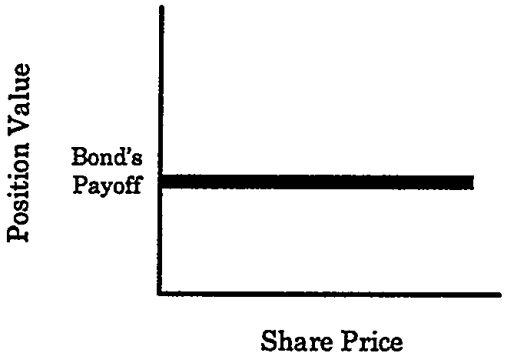


Figure 16: Long Call

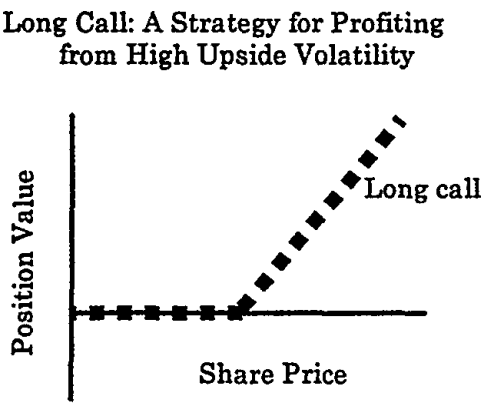


Figure 17: Buy Call & Invest Present Value of Strike Price in a Riskless Bond

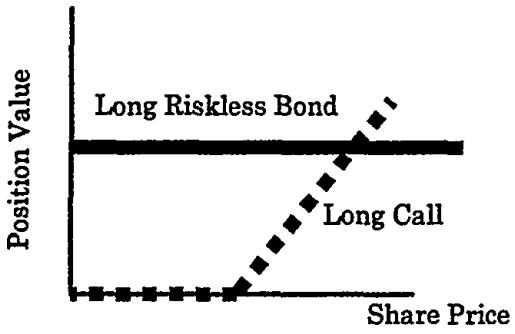


Figure 18: Creating Downside Protection

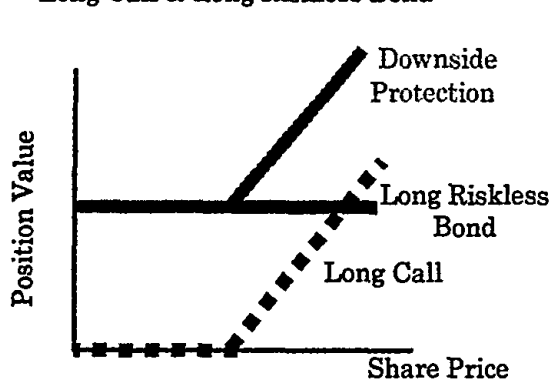
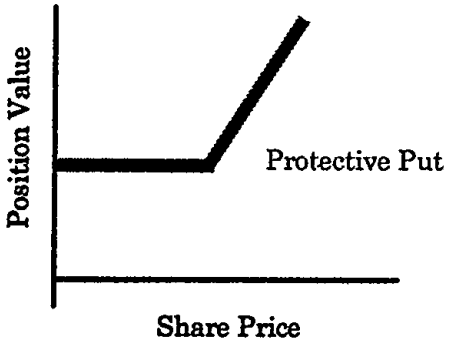


Figure 19: Finished Product: A Synthetic Protective Put



Students can easily see that equity is a call option written on the value of total corporate assets with a date of expiration being the maturity of debt, a strike price equal to the value of bondholders' (and any creditors') claims, and a premium equal to the current stock price. This equivalence is depicted in Figure 20. This fundamental observation implies conflicts of interests between stockholders versus bondholders and creditors. The latter groups do not participate in any upside potential for the stock price and stand to lose their principal upon bankruptcy. If a corporation has no creditors besides its bondholders, the value of total corporate assets equals debt plus equity. In that case, students can also easily see that debt equals the value of total corporate assets minus equity. In other words, bondholders effectively purchased that corporation and sold to stockholders a call option written on corporate assets with an expiration date equal to the maturity of the corporate bonds, a strike price equal to the face value of corporate debt, and a premium equal to the current bond price. This equivalence is depicted in Figure 21. This fundamental observation implies that holding everything else constant, corporate debt value decreases with increased volatility in the value of total corporate assets. It also

explains why bondholders typically insist on covenants that limit management's ability to increase the volatility of total corporate assets. Students usually find it a bit harder to see that owning corporate debt is equivalent to buying a riskless bond having as its payoff the promised payment to bondholders, and selling to stockholders a put option with a strike price equal to the payment to bondholders. The put option written on total corporate assets that stockholders own is an option to default on their corporate bond payments.

Figure 20: Common Stock as a Long Call

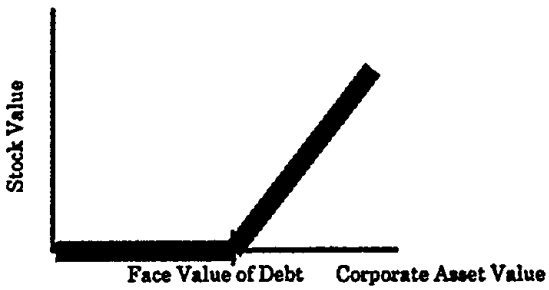
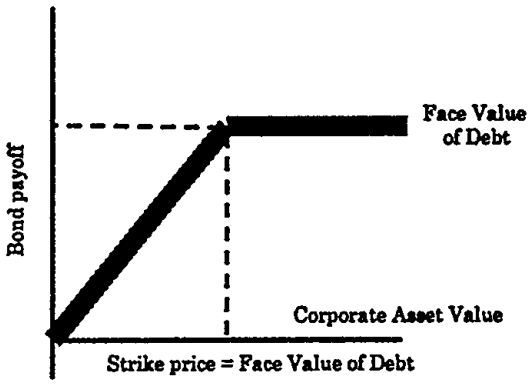


Figure 21: An Option View of Corporate Debt



Of course, the option perspective to corporate securities extends beyond simple debt and equity. If a corporation issues only three securities—common stock, senior debt, and junior debt—then the value of total corporate assets equals the face value of senior debt plus debt, plus the face value of junior debt, plus equity. In that case, students can also easily see that stockholders own a call option written on the value of total corporate assets with a strike price equal to the total value of senior and junior debt. Students also can visualize the respective payoffs to senior and junior debt. These payoffs are depicted in Figure 22. Students usually find it a bit harder to see that owning corporate junior debt is equivalent to buying a portfolio of call options written on the value of total corporate assets. This equivalence is depicted in Figure 23. This portfolio consists of buying a call option with a strike price equal to the promised payment to senior bondholders and selling to stockholders a call option with a strike price equal to the total value of junior and senior debt. This fundamental observation explains why junior bondholders typically insist on covenants that not only limit management's ability to increase the volatility of total corporate assets, but also prohibit or restrict management from issuing additional senior classes of debt.

Figure 22: Senior & Junior Debt Payoffs

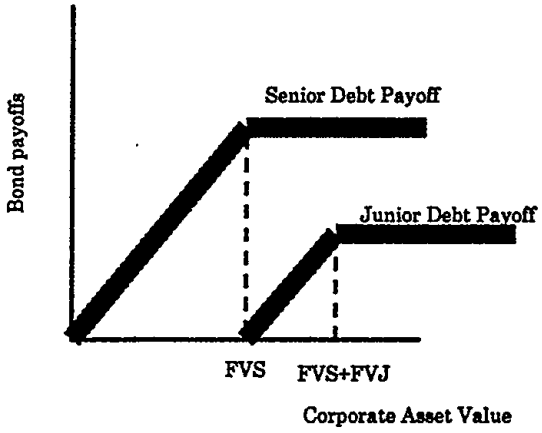
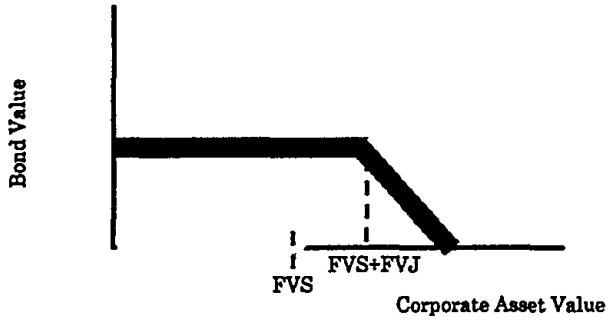


Figure 23: Junior Debt as a Portfolio of Call Options

Junior Debt = Long Call with strike price FVS +
Short Call with strike price FVS + FVJ



The observation that stock is effectively a call option written on corporate value also has implications for how shareholders should structure managerial incentive compensation to better align incentives between managers and shareholders. As Kimberly Krawiec emphasizes in her contribution to this symposium, a crucial if not defining theme of the basic business associations course is "the interaction among the various groups that form the business enterprise."[43] In particular, managers control the day-to-day corporate decisions that most shareholders have no ability, time, or inclination to observe directly or monitor indirectly. A particular difficulty is that managers typically engage in corporate transactions with less risk than well-diversified stockholders would prefer. This occurs even if managers and shareholders have the same degree of risk aversion because managers usually have both their financial capital and human capital tied up in the corporation they manage. When managers undertake low-risk corporate projects, engage in mergers, diversify corporate assets, or buy insurance, they are simply adjusting their concentrated portfolios to a level of risk

[43] Kimberly D. Krawiec, *Building the Basic Course Around Intra-firm Relations*, 34 GA. L. REV. 785, 785 (2000).

that is consistent with their level of risk aversion. It is likely that managers are in fact no more risk averse (and might even be less risk averse because they are wealthier) than shareholders on average. But, because managers own such concentrated portfolios of human capital and financial assets, they will accept low-risk corporate transactions to bring their portfolio risks to more acceptable levels. One way to induce managers to undertake riskier corporate projects is to pay them in stock and/or stock options. Corporations that have more growth options do and should offer more stock options to their CEOs.[44] In fact, recent theoretical work has generated three more specific predictions.[45] First, corporations with more growth opportunities will offer more corporate stock options to non-executive employees. Second, corporations granting larger amounts of stock options to top executives will also grant more stock options deeper in the corporation to non-executive employees. Third, the stock option component in a CEO's compensation package should increase as the importance of that CEO's role in evaluating and selecting projects increases relative to managing assets-in-place duties.

Shareholders can also leverage a corporation by undertaking a leveraged buyout (LBO). Doing an LBO simultaneously attenuates the call option-like features of that corporation's stock and frees up equity so that the remaining stockholders can grant managers a greater equity stake in that corporation. This observation means that, other things being equal, corporations that have more growth opportunities or options have greater payoffs from and thus incentives to undergo an LBO. These corporate growth options are specific examples of the more general category of real options that include waiting-to-invest, flexibility, learning, scaling, timing, and exit options.

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[44] *See, e.g.*, Clifford W. Smith & Rene M. Stulz, *The Determinants of Firms' Hedging Policies*, 20 J. FIN. & QUANT. ANAL. 391 (1985) (examining taxes, contracting costs, and other factors as possible explanations of firms' hedging practices); Clifford W. Smith & Ross L. Watts, *The Investment Opportunity Set and Corporate Financing, Dividend, and Compensation Policies*, 32 J. FIN. ECON. 263 (1992) (suggesting contract theory is more important in explaining cross-sectional variation than tax-based or signaling theories).

[45] John Core & Jun Qian, Option-like Contracts for Innovation and Production 3 (1999) (unpublished manuscript presented in the Applied Microeconomic Theory workshop at the University of Pennsylvania Economics Department).

II. REAL OPTIONS AND (CORPORATE) LAW

Management specialists have studied real options for over a quarter of a century. Real options involve decisions regarding real activities or real commodities whose risk has not been reduced to financial instruments. Examples of real options include options to expand preliminary investments, options to vary production levels, options to wait and learn before making decisions, options to grow, and options to abandon risky projects. Indeed, any sequential investment process involves a series of real options. These options are said to be real options to distinguish them from the financial options, such as stock options, discussed above in Part I. When describing a general investment situation, the phrase "real options" suggests that not only is the option perspective applicable, but also that it should be used, in analyzing the sequential choices that are inherent in investment opportunities. Several recent books and articles focus on the power of applying the option perspective to managerial decisionmaking.[46]

Legal scholars have only recently begun to study the implications of the option perspective for legal rules and institutions.[47] Virtually

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[46] MARTHA AMRAM & NALIN KULATILAKA, REAL OPTIONS: MANAGING STRATEGIC INVESTMENT IN AN UNCERTAIN WORLD (1999); Martha Amram & Nalin Kulatilaka, *Disciplined Decisions: Aligning Strategy with the Financial Markets*, HARV. BUS. REV., Jan.-Feb. 1999, at 95. For additional references about real options, many of which are available as links from <http://www.real-options.com/>, see LENOS TRIGEORGIS, REAL OPTIONS: MANAGERIAL FLEXIBILITY AND STRATEGY IN RESOURCE ALLOCATIONS (1996); Thomas E. Copeland & Philip T. Keenan, *How Much is Flexibility Worth?*, 2 MCKINSEY Q. 38 (1998); Thomas E. Copeland & Philip T. Keenan, *Making Real Options Real*, 3 MCKINSEY Q. 128 (1998); Robert C. Merton, *Applications of Option-Pricing Theory: Twenty-Five Years Later (Nobel Prize Address)*, 88 AM. ECON. REV. 323 (1998); Peter Coy, *Exploiting Uncertainty: The 'Real Options' Revolution in Decision-making*, BUS. WK., June 7, 1999, at 118; Peter Coy, *Options, Options, Everywhere*, BUS. WK., June 7, 1999, at 124; Avinash K. Dixit & Robert Pindyck, *The Options Approach to Capital Investment*, HARV. BUS. REV., Sept.-Oct. 1998, at 105; Nalin Kulatilaka & N. Venkatraman, *Real Options in the Digital Economy*, FIN. TIMES, Sept. 1999, at 26; Timothy A. Luehrman, *Investment Opportunities as Real Options: Getting Started on the Numbers*, HARV. BUS. REV., July-Aug. 1998, at 51; *Strategy as a Portfolio of Real Options*, HARV. BUS. REV., Sept.-Oct., 1998, at 89; S. L. Mintz, *Getting Real*, CFO MAG., Nov. 1999, at 52; Jim Smith, *Much Ado About Options?*, 18 INFORMS 4 (1999); Thor Valdmanis, *Corporate Executives Examine Strategic Tool: A New Way to Assess Risk Arrives*, USA TODAY, May 12, 1999, at B5.

[47] *See, e.g.*, Ian Ayres & J.M. Balkin, *Legal Entitlements as Auctions: Property Rules, Liability Rules, and Beyond*, 106 YALE L.J. 703, 704 n.4 (1996) (citing and discussing recent articles that have recharacterized the difference between liability rules and property rules

every legal actor encounters risk in making decisions. Not only transactional and tax attorneys, but also elected officials, judges, legislators, litigators, negotiators, and regulators face numerous types of risks, including those arising from contractual, financial, appellate, regulatory, statutory, tax, and technological sources. It is increasingly important for these legal decisionmakers to respond effectively to such risks. There are four traditional ways of managing risk: insurance, diversification, acquiring information, and trading in debt and equity. A recent additional way of handling risk involves investing in financial and real options. While financial and real options differ, the common idea underlying both is that risks involve not only dangers, but also opportunities. This is because an option provides the flexibility not to be locked into an irreversible course of action. Both financial and real options allow those facing risky environments to profit from the upside potential while truncating losses from the downside possibility of the risks they face. This is because financial and real options allow legal actors to make future decisions after learning some relevant information.

The basic course in Corporations provides an opportunity to use economics as an organizing principle to teach and compare law cases, as well as an opportunity to use law cases to illustrate and teach economic principles. Similarly, the basic course in Corporations provides an opportunity to apply the financial option perspective to view corporate securities as financial options as well as to use corporate transactions to illustrate real corporate options. The hostile takeovers, mergers, and other corporate transactions that are the subject matter of corporate law all involve real options. The

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in terms of different option strike prices); Bradford Cornell, *The Incentive to Sue: An Option-Pricing Approach*, 19 J. LEGAL STUD. 173 (1990) (proposing to analyze litigation investments as options); Peter H. Huang, *A New Options Theory for Risk Multipliers of Attorneys' Fees in Federal Civil Rights Litigation*, 73 N.Y.U. L. REV. 1943 (1998) (applying the option perspective to calculate risk multipliers for attorney's fees); Paul G. Mahoney, *Contract Remedies and Option Pricing*, 24 J. LEGAL STUD. 139 (1995) (viewing contractual breaches as options); Michael S. Knoll, Put-Call Parity and the Development of the Modern Mortgage (1994) (U.S.C. Law Center Working Paper No. 94-12) (viewing mortgages as options); Joseph A. Grundfest & Peter H. Huang, Real Options and the Economic Analysis of Litigation: A Preliminary Inquiry (1996) (Working Paper No. 131, John M. Olin Program in Law and Economics, Stanford Law School) (providing a general real options analysis of litigation).

standard way of approaching these risky corporate transactions is to compute their expected value, defined to be the weighted average of the possible outcomes, with the weights being their probabilities of actually occurring. For example, the notion of when information regarding speculative corporate transactions is material is phrased in terms of a probability-magnitude test.[48] Such an expected-value approach to speculative corporate transactions implicitly assumes that corporate actors are locked into those corporate transactions without any real options to exit, vary, scale, learn, or abandon investments. Once those real corporate options are recognized, a speculative corporate transaction has a real option value different from and greater than merely its expected value.

Indeed, there are many real options in law outside the corporate area. For example, litigants can decide whether to drop, settle, or continue a lawsuit after they learn material facts during discovery. Thus, any lawsuit involves a sequence of real options to continue or settle that lawsuit. By filing a lawsuit, a plaintiff acquires a series of continuation or settlement options that a defendant has involuntarily written. The defendant also has a package of settlement options. All of the premia for these options are paid to lawyers and the court system rather than to the defendant and plaintiff.

Other examples of real options in the law are the option that a law firm has to hire more entry-level associates versus making lateral hires, and the option that a law firm has to build on a property now versus delaying construction until the future. Examples of real options that law students are familiar with include:

- options that third-year law students have to accept permanent job offers after being summer associates;
- options that financially distressed parties have to declare corporate or personal bankruptcies;

[48] Basic, Inc. v. Levinson, 485 U.S. 224, 238 (1988) (quoting SEC v. Texas Gulf Sulphur Co., 401 F.2d 833, 849 (2d Cir. 1968)).

- options that monopolists have to deter entry by engaging in predatory innovation, leveraging monopoly power, or predatory pricing;[49]
- options that corporate raiders have to make hostile takeover bids;
- options that contracting parties have to breach contracts and pay damages;
- options that governments have to claim properties by eminent domain and pay just compensation; and
- options that property owners have to develop environmental resources later instead of sooner.

An early introduction to the option perspective in legal education allows law students to appreciate that a diverse set of legal doctrinal areas, including antitrust, bankruptcy, civil and criminal procedure, corporations, environmental regulation, jurisprudence, property, securities, and tax all involve the acquisition or granting of often hidden options. Examples of the breadth and scope of applying the real option perspective to law include realizing that corporate appraisal rights are real options, viewing civil procedure as regulating litigation options embedded in lawsuits, and characterizing the preservation of ecosystems and endangered species as real options.

III. CONCLUSION

This Essay advocates introducing the option perspective into the teaching of the basic corporate law course. Although stock options arise naturally in several corporate law cases, there are many benefits to considering them in a more detailed and organized fashion than merely discussing particular cases. This Essay describes five of these benefits. First, defining stock options right after defining stocks differentiates the price change aspect of stock

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[49] Peter H. Huang, *Still Preying on Strategic Reputation Models of Predation: A Review of* John R. Lott, Jr., Are Predatory Commitments Credible? *Who Should the Courts Believe?* (forthcoming 2000).

ownership from other aspects of stock ownership, such as receiving dividends and having voting rights. Second, displaying stock option payoffs visually helps students see the zero-sum nature of trading in options, understand how to perform financial engineering by vertically adding such graphs, and convince themselves pictorially of the put-call parity relationship. Third, the option perspective allows the conflict of incentives between shareholders and bondholders of a corporation to be portrayed in terms of options on corporate assets. Fourth, the option perspective explains why paying managers in stock and/or stock options mitigates the conflict of interests between managers and shareholders in terms of increasing managers' willingness to undertake risky projects. Fifth, introducing the concept of real options as opposed to financial options permits law students to appreciate the difference between traditional expected values and real option values not only for corporate projects, but also in many non-corporate areas of law.